Appendix A

Consultation Documentation

This page intentionally left blank.

Meeting Summary

Project:	Bad Creek Pumped Storage Project (FERC No. 2740)
Subject:	Pre-Application Document Meeting Summary
Date:	Friday, February 18, 2022
Location:	Microsoft Teams Virtual Meeting
Attendees:	Alan Stuart (Duke Energy) John Crutchfield, Jr. (Duke Energy) Sarah Kulpa (HDR) Maggie Salazar (HDR) Erin Settevendemio (HDR) Kerry McCarney-Castle (HDR) Elizabeth Miller (SCDNR) Dan Rankin (SCDNR) Ross Self (SCDNR) Tom Swayngham (SCDNR) Pat Cloninger (SCDNR) Elizabeth Johnson (Dept. of Archives and History [SHPO]) Christine Farrell (Environmental Review Coordinator for NC State Parks) Kevin Mack (NMFS Charleston) Derrick Miller (Forest Service - Francis Marion National Forest) Brian Strong (NC State Parks)

Overview

This meeting summary provides documentation of the Duke Energy Carolinas, LLC Bad Creek Pumped Storage Project (Project) pre-application document (PAD) meeting. The meeting was held via Microsoft Teams to review with primary stakeholders the relicensing process and overview of the Project. A copy of the meeting invitation and presentation are attached to this meeting summary and are also included with the PAD filing.

Welcome and Introductions

Alan Stuart opened the call and welcomed participants. Participants were notified of Duke Energy's intent to initiate the formal relicensing process with the filing of the PAD next week.

Participants introduced themselves.

Safety Moment

Sarah Kulpa presented a safety moment on distracted driving.

Communication Protocol

Duke Energy will host a public website (www.badcreekpumpedstorage.com) for the relicensing, to include information about the Project, the relicensing process, and copies of Duke Energy's filings with the Federal Energy Regulatory Commission (FERC). Duke Energy has developed and will maintain a project

contact list and invited participants to provide feedback on suggested additions to this list. Communications with the project contact list throughout the relicensing will be electronic (i.e., email).

Project Overview

A. Stuart gave an overview of the Project. Participants viewed a brief video that provides a virtual tour and overview of the Project. Alan introduced the project expansion (Bad Creek II Power Complex) concept that is being evaluated by Duke Energy for potential inclusion in the license application that will be filed with FERC in 2025. S. Kulpa inserted that it is very early in the study process for Bad Creek II and even though the expansion is being proposed in the PAD, if based on any of the evaluations to be conducted over the next few years Duke Energy decides not to pursue the expansion, the Project will be relicensed as-is.

Ross Self asked if recycling the water between the upper and lower reservoirs would occur more quickly with the operation of both powerhouses and if that would result in faster responses in Lake Jocassee Lake levels. A. Stuart agreed that the change in lake levels may occur quicker; however, it would still be within the same operating band as determined by the KT agreement. The group discussed how daily and weekly operations of the Bad Creek Project have changed since the Project was constructed in 1991, and how preserving this operational flexibility is important to Duke Energy because Project operations (within authorized limits of the Bad Creek and KT Project licenses) will be influenced by a changing regional power grid over the term of the new license. The Bad Creek II Complex would take advantage of currently unused storage in the upper reservoir.

R. Self asked if intake velocities would be faster, leading potentially to issues with entrainment. A. Stuart noted that Duke Energy has begun the computational fluid dynamic (CFD) modeling efforts as well as entrainment risk analysis and those resource areas will continue to be at the forefront as the process is continued through the study effort.

Relicensing

A. Stuart walked the group through the relicensing process and highlights and benefits of the Integrated Licensing Process (ILP). A. Stuart also briefly introduced the existing regulatory context and PM&E measures already in place at the Bad Creek Project resulting from the original licensing, MOU and 10-year work plans, and the more recent KT license and agreement.

Resource Studies

A. Stuart listed the pre-PAD studies that have already been carried out by Duke Energy (Natural Resources Assessments, Bat Survey, Computational Fluid Dynamic Study, Desktop Entrainment Analysis). Proposed studies in the PAD include water quality, recreation, aesthetics, and cultural resources.

S. Kulpa stated that Duke Energy will be carrying out detailed geotechnical and geological studies to inform the relicensing study process and potential resource impacts; these studies are ongoing as part of the engineering feasibility study for the Bad Creek II Complex.

General Questions/Comments

Elizabeth Miller asked when study results for potential erosion along the Lake Jocassee shoreline (due to discharge of a second powerhouse) might be available. S. Kulpa stated that results of the CFD model may be ready by the time of Study Report submittal; results to wrapped up by early 2023.

E. Miller also asked about the water quality request and if there would be any impacts to Whitewater River? A. Stuart indicated that Whitewater River is not included in the Project Boundary and Project impacts to do not affect this river, which empties into Lake Jocassee.

Dan Rankin asked if the new intake structure tunnels would also be reversable and what the depth of the new discharge structures would be. A. Stuart noted that the new tunnels and units would be reversible (i.e., pass water for pumping and generating) and that he believed the depth of the new discharge structures would be comparable to the existing structure.

Derrick Miller spoke briefly about transmission lines for the existing Project and proposed expansion. D. Miller noted he will review acquisition files for the transmission lines and return results to A. Stuart. The group briefly discussed USFS properties within and areas of interest near the Project. A. Stuart noted that Duke Energy will conduct a siting study to determine the proposed route for the new transmission lines and added that the existing corridor is being studied as one potential option.

Elizabeth Johnson voiced concerns regarding Cultural Resources and indicated support that a Cultural Resources study will be included in the relicensing (for Bad Creek II). The group discussed potential applicability and availability of the 1973 survey that was performed for the original project construction. A. Stuart assured the group that sensitive information regarding the location of previously identified sites was not being included in the public volume of the PAD, but that a separate “privileged” volume would be filed with FERC to include this information.

A. Stuart indicated Duke Energy’s role and interests in the Foothills Trail might interest participants and agencies in North Carolina.

Attachment 1

Attachment 1 – Meeting Invitation

Subject:	Bad Creek Pumped-Storage Project Relicensing Roll-out Call
Location:	Microsoft Teams Meeting
Start:	Fri 2/18/2022 1:00 PM
End:	Fri 2/18/2022 2:00 PM
Recurrence:	(none)
Meeting Status:	Accepted
Organizer:	Stuart, Alan Witten
Required Attendees:	Stuart, Alan Witten; Elizabeth Miller; Olds, Melanie J; hightoCW@dhec.sc.gov; Fritz Rohde; Elizabeth Johnson; afell@scprt.com; SM.FS.aprd@usda.gov; Pace Wilber; John Crutchfield; Kulpa, Sarah; Salazar, Maggie; Settevendemio, Erin; brian.strong@ncparks.gov
Optional Attendees:	Johnson, Elizabeth; Farrell, Christine E; miller.derrick@usda.gov; Miller, Derrick -FS; McCarney-Castle, Kerry; Dan Rankin; Ross Self

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning,

You have been identified as agency members who have regulatory authority and/or may have interest in the relicensing of the Bad Creek Pumped-Storage Project. Some of you I've had a the opportunity to speak with already. Please plan to attend this Microsoft Teams meeting as Duke Energy plans to roll-out information regarding the relicensing of our Bad Creek Project. The relicensing process will officially kick-off later this month when Duke Energy files our Notice of Intent to Relicense and Pre-Application Document.

We believe you will find the information we present during the meeting of utmost value to you and your respective agency. General topics to be covered include:

- Bad Creek Project Overview
- Relicensing Process
- Schedule
- Project improvements

We will reserve time at the end of the meeting for Q & A.

If you cannot attend, **please forward** this meeting request to someone on your organization who may be able to make the meeting. Also, please feel free to forward this to other members in your agency who you believe might be interested in attending.
We look forward to seeing you.

Thank you !
Alan

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Join with a video conferencing device

duke-energy@m.webex.com
Video Conference ID: 114 786 949 3
Alternate VTC instructions

Or call in (audio only)

+1 704-659-4701,,566750047# United States, Charlotte
Phone Conference ID: 566 750 047#
Find a local number | Reset PIN

Learn More | Meeting options

Attachment 2

Attachment 2 – Meeting Presentation

Bad Creek Pumped Storage Project
FERC Relicensing (Project No. 2740)

February 18, 2022

DUKE ENERGY®

1

Safety Moment – Distracted Driving

- Every day about 8 people in the U.S. are killed in crashes reported to involve a distracted driver.
- Stay focused and avoid phone calls and text messages
- If you need to read directions, pull over
- Don't reach for items while driving
- Make all adjustments before driving (mirrors, phone holder, seat position, etc.)
- Keep your emotions in check

2

2

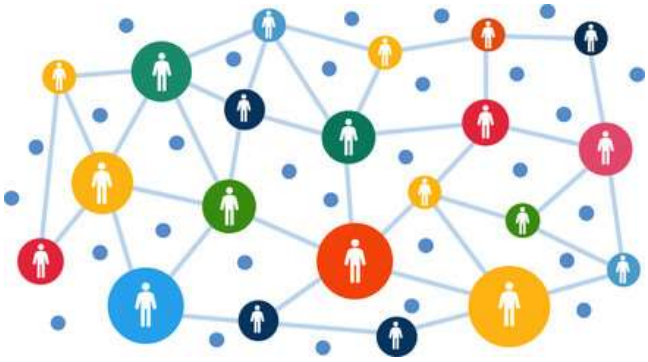
Agenda & Objectives

- Introduce the Duke Energy and HDR relicensing Team and stakeholder representatives
- Provide an overview of the Bad Creek Pumped Storage Project
- Provide an overview of FERC's relicensing process
- Provide details of the upcoming relicensing
- Review aspects of interest to stakeholders

3

Introductions

- Duke Energy
- HDR
- USFWS
- USFS
- NOAA Fisheries
- SCDHEC
- SCDNR
- SCDAH
- SCDPRT
- North Carolina State Parks



4

4

Communications Protocol

- Relicensing contact list
- Public website
- Email

5

5

Bad Creek Project Overview

6

6

Bad Creek Project Overview

- As part of its clean energy transformation and commitment to achieve net-zero carbon dioxide emissions by 2050, Duke Energy is seeking approval from the Federal Energy Regulatory Commission (FERC) to continue operating the Bad Creek Pumped Storage Project for another 50 years.
- The Bad Creek Project can produce enough energy to power nearly 1 million homes, the Bad Creek Project provides emissions-free hydroelectric power to Duke Energy's customers across its Carolinas service area.
- Bad Creek is one of the largest generating facilities in Duke Energy's system; it operates like a massive battery, quickly generating or storing power in response to electricity supply and demand.

7

7

Bad Creek Project Overview

- The Bad Creek Pumped Storage Station uses the Bad Creek Upper Reservoir as the upper pool and Lake Jocassee as the lower pool.
- Construction completed 1991.
- Pumping water from Lake Jocassee up to the Bad Creek Reservoir provides a means of storing energy from surplus baseload generation during low demand periods and provides power back to the grid when energy demand is higher.
- Lake Jocassee is licensed as part of the Keowee-Toxaway Project (FERC No. 2503, license issued 2016).

8

8

Bad Creek Overview - Project Location and Layout

Project Vicinity & FERC Project Boundary

Site Layout

9

9

Virtual Project Tour (Video)

Video removed for PDF'd version due to large file size

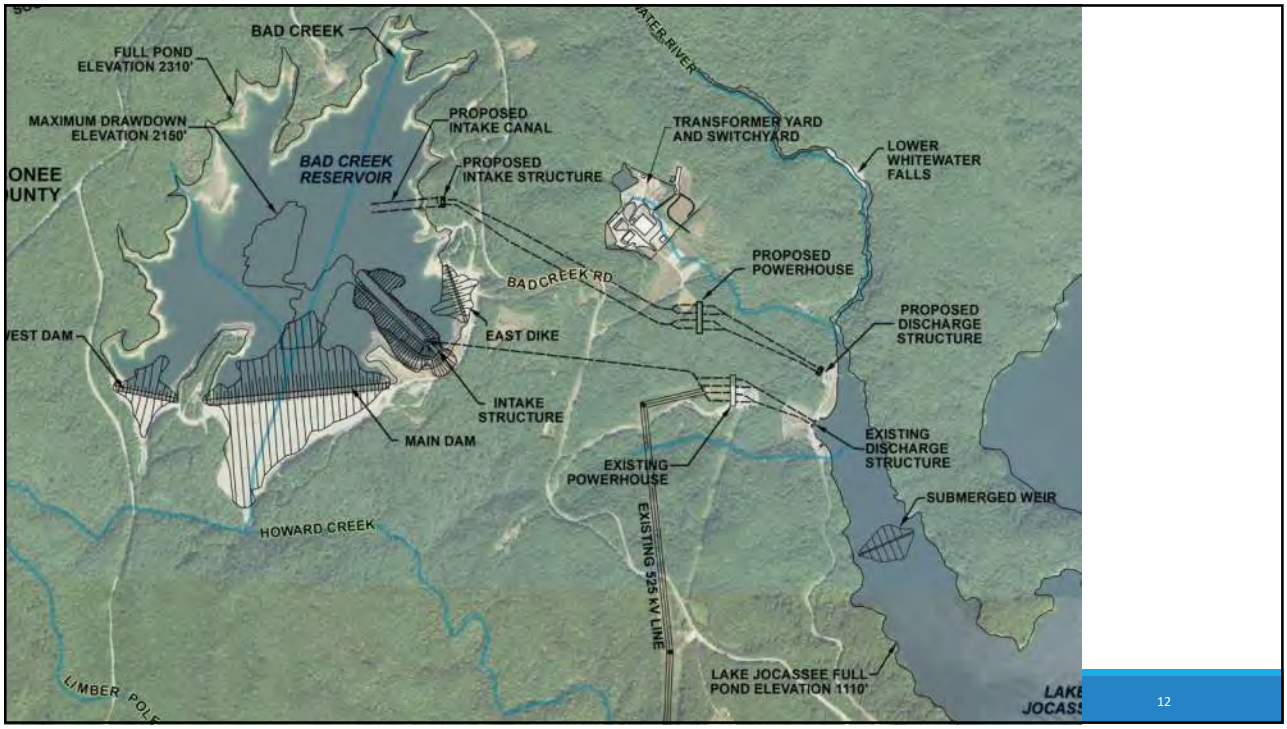
10

10

Expansion Opportunity: Bad Creek II Complex

- Additional energy storage and renewable energy capacity is needed to meet Duke Energy's commitment to net-zero carbon emissions by 2050 and retiring of all coal plants by 2035.
- Existing plant operations only utilize about 30 to 40% of the storage capacity of the Upper Reservoir.
- Duke Energy is studying the feasibility of constructing a second underground powerhouse (including new upper reservoir inlet/outlet structure, water conveyance tunnels, and lower reservoir inlet/outlet structure, switchyard, and transmission line).
- Double the capacity of the Bad Creek Project (additional 1,400 MW).
- Would be constructed within the footprint of the existing Project.
- Construction duration estimated at 6 years.

11



12

The Relicensing Process

13

FERC Relicensing – Who, What, When, Why, How

- Statutory requirement, authorizes the continued operation of a non-federal hydropower facility for the next 30 to 50 years.
  - Bad Creek Project original license issued in 1977 and expires on July 31, 2027.
- 5 to 5.5-year process that will formally begin on February 23, 2022, when Duke Energy files the Notice of Intent and Pre-Application Document.
- Transparent, structured regulatory process (18 CFR Parts 4, 5, and 16) with multiple opportunities for agency and stakeholder engagement.
- Default licensing process is the Integrated Licensing Process, which integrates the license applicant's consultation activities prior to filing of the Final License Application with FERC's scoping responsibilities under NEPA.

14

Relicensing as an Umbrella Regulatory Process

- Relicensing process integrates requirements of other major federal statutes
- Bad Creek II Complex would require additional federal, state, and local permits and authorizations
- Other regulatory approvals to be pursued by Duke Energy in parallel with FERC licensing

Laws / Regulations

Federal Power Act (FPA)
Code of Federal Regulations (CFR)
National Environmental Policy Act (NEPA)
Endangered Species Act (ESA)
Clean Water Act (CWA)
National Historic Preservation Act (NHPA)
Energy Policy Act of 2005 (EPAct)
Fish & Wildlife Coordination Act (FWCA)
Coastal Zone Management Act (CZMA)

15

15

Bad Creek Licensing Background & Regulatory Context

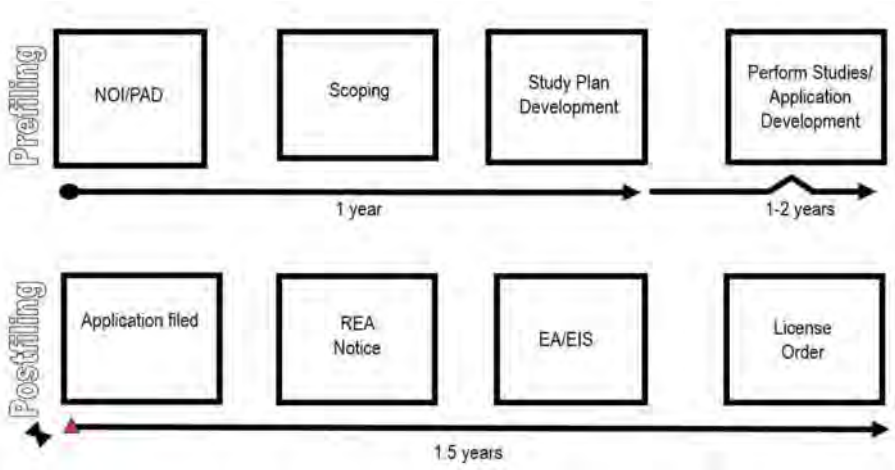
Protection, Mitigation & Enhancement (PM&E) measures established at Bad Creek Project by:

- FERC license
- Exhibit S (Environmental Study Plans)
- Duke Energy and SCDNR Memorandum of Understanding (MOU) and 10-Year Work Plans (last one March 21, 2017)
- Keowee-Toxaway (KT) Relicensing Agreement
- 2018 Amendment for upgrades of existing (4) pump-turbines increases authorized installed capacity for the Project to 1,400 MW

16

16

ILP Overview



17

17

ILP Overview

1. Pre-Application Document (PAD)

- Presents existing, relevant, and reasonably available information
- Serves as the basis for all applicable information and is the springboard for all study and consultation related activities
- Understand project effects, identify potential issues and information gaps, and develop study requests
- Noticed by FERC within 60-days of Filing
- Replaced the Initial Consultation Document (ICD)

2. Notice of Intent (NOI)

- Notifies FERC and public of intent to pursue a license
- Provides project and PCA information for use by FERC
- Identifies applicable municipalities, tribes, and other political organizations

18

18

ILP Overview

3. FERC NEPA Scoping

- FERC issues Scoping Document 1 (SD1) within 60 days of filing NOI and PAD
- SD1 is based on PAD information
- Discuss process plan
- Perform site visit
- FERC scoping meeting - FERC's responsibility

4. Study Plan Development

- Notifies FERC and public of intent to pursue a license
- Provides project and PCA information for use by FERC
- Identifies applicable municipalities, tribes, and other political organizations

19

19

ILP Overview

5. Proposed Study Plan & Study Plan Meeting

- Detailed methodology
- Schedule
- Progress reports / Study reports
- Rationale for not adopting requested study
- Study definition and issue resolution
- Informal resolution of study issues
- Seek clarity of study goals, objectives, and methods
- Understand the criteria and explore issues and study with criteria in mind

6. Revised Study Plan

- Due within 30 days of the end of the comment period on the Proposed Study Plan
- Same components as Proposed Study Plan
- Detailed methodology
- Address all comments and requests

20

20

ILP Overview

7. Study Plan Determination

- Director of Office of Energy Projects will approve original or Revised Study Plan, with any modifications, within 30 days
- Determinations based on established record

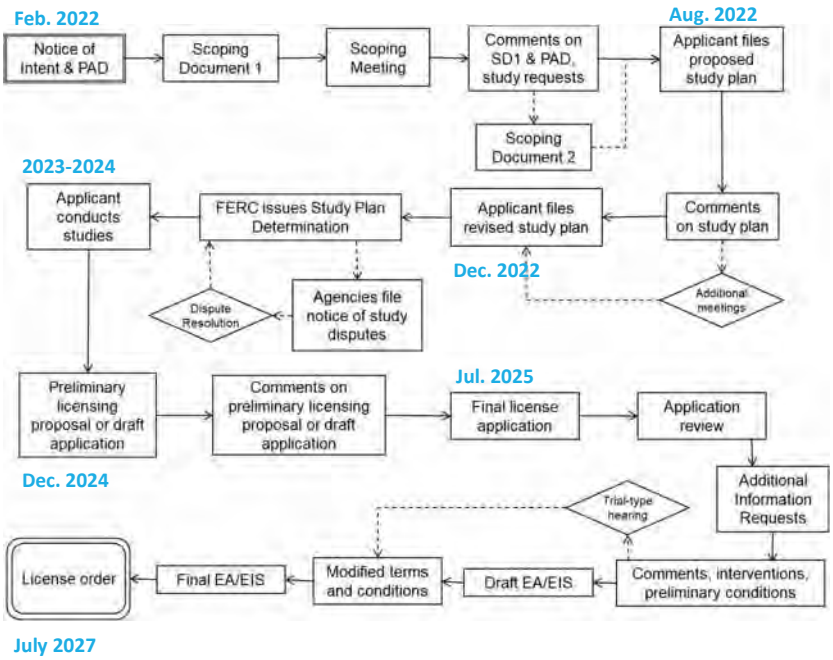
8. Perform Studies and Prepare Application

- Routine and continuous consultation
- Duke Energy prepares and files Study Reports
- Duke Energy holds study meeting(s)
- Duke Energy prepares Preliminary Licensing Proposal (PLP) or Draft License Application (DLA)
- Duke Energy prepares license application

21

FERC Study Criteria

22



Bad Creek Relicensing Overview ILP Process & Milestones

23

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) and Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 24, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 24, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2), if necessary (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sep 6, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024

24

24

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 19, 2024
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 3, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 4, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 3, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 3, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
Deadline to File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the Final License Application (FLA)	March 1, 2025
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 4, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 19, 2025
File USR Meeting Summary (18 CFR §5.15(f))	Licensee	Within 15 days following USR Meeting	Feb 3, 2025
File Comments or Disagreements on USR Meeting Summary (18 CFR §5.15(f))	Stakeholders	Within 30 days following filing of USR Meeting Summary	Mar 5, 2025
File Response to Comments on USR Meeting Summary (18 CFR §5.15(f))	Licensee	Within 30 days following filing of USR Meeting Comments	Apr 4, 2025
Resolution of USR Meeting Summary Dispute (if necessary) (18 CFR §5.15(f))	FERC	Within 30 days following filing of response to USR Meeting Comments	May 4, 2025
Comments on PLP or DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	May 30, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025
Publish Public Notice of FLA Filing (18 CFR §5.17(d)(2))	Licensee	Within 14 days following filing of FLA filing	August 13, 2025

25

25

Resource Issues of Interest

26

26

Studies

- Pre-PAD Studies Performed by Duke Energy (reported in PAD):
  - Natural Resource Assessments (Bad Creek II project facilities areas and existing transmission corridor) – Wetlands, RTE species, Wildlife
  - Bat Survey
  - Desktop Entrainment Analyses (including Bad Creek II Complex)
- Additional relicensing studies proposed in the PAD:
  - Water Quality
  - Recreation
  - Aesthetics (Bad Creek II Complex only)
  - Cultural Resources (Bad Creek II Complex only)

27

27

Next Steps

28

28

WATER STRATEGY, HYDRO
LICENSING AND LAKE SERVICES

Duke Energy Corporation
526 South Church Street / EC12Y
Charlotte, NC 28202

February 23, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740)**
Notice of Intent and Pre-Application Document

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Applicant) is submitting to the Federal Energy Regulatory Commission (FERC or Commission) the Notice of Intent (NOI) to file an application for a new license and Pre-Application Document (PAD) for the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC No. 2740) (Project), located in Oconee County, South Carolina. The existing FERC license for the Project expires on July 31, 2027.

The Bad Creek Reservoir was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee, licensed as part of the Duke Energy Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), serves as the lower reservoir. The Project is operated by Duke Energy under the terms of an Original License issued by the FERC on August 1, 1977, as subsequently amended. The construction of Bad Creek took roughly 10 years, and the Project began operating in 1991. The structures and features included in the Bad Creek Project license include the upper reservoir and dams, inlet/outlet structures in the upper and lower reservoirs, water conveyance system, underground powerhouse, tailrace tunnels, transmission facilities, and a 9.25-mile-long transmission line extending from Bad Creek to the KT Project's Jocassee switchyard.

Given the need for additional significant energy storage and renewable energy generation across Duke Energy's service territories over the Project's new license term, Duke Energy is evaluating opportunities to add storage and generating capacity at the Project by constructing a new power complex (including a new underground powerhouse) adjacent to the existing Bad Creek Powerhouse. Construction of the 1,400-MW Bad Creek II Power Complex is one alternative relicensing proposal presently being evaluated by Duke Energy.

The Applicant is distributing this letter to the stakeholders listed on the Project distribution list provided in Appendix A of the PAD. For those stakeholders who have provided an email address, this letter will be distributed via e-mail; otherwise, it will be distributed via U.S. mail. Stakeholders interested in the relicensing process may obtain a copy of the NOI and PAD electronically through

FERC's eLibrary at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740 or on the Applicant's website at www.badcreekpumpedstorage.com. If any stakeholder would like to request a CD containing an electronic copy of the NOI and PAD, please contact the undersigned at the address listed below. The NOI and PAD are also available for review at the Applicant's business office during regular business hours located at 526 South Church Street Charlotte, NC 28202.

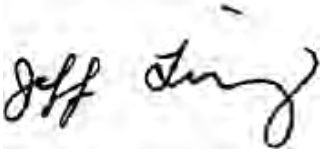
Appendix D of the PAD includes a single-line electrical diagram of the Project, as required by the Commission's PAD content requirements under 18 CFR § 5.6(d)(2)(iii)(D). The information contained in these drawings are deemed as Critical Energy/Electric Infrastructure Information (CEII) under 18 CFR §388.113, thus Appendix D of the PAD is not being distributed to the public and the Applicant is filing Appendix D under the Commission's relevant eFiling guidelines. Appendix E of the PAD includes Privileged information regarding cultural resources and a while a redacted version will be available to the public, the original (non-redacted) report is being filed as Privileged (non-public) to protect the locations of certain cultural resources.

In accordance with 18 CFR §5.5(e) of the Commission's regulations, the Applicant requests that the Commission designate Duke Energy as the Commission's non-federal representative for purposes of consultation under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f and the NHPA implementing regulations at 36 CFR Part 800.

In addition, the Applicant requests that FERC designate Duke Energy as the non-federal representative for the Project for the purpose of consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, pursuant to Section 7 of the Endangered Species Act (ESA) and the joint agency ESA implementing regulations at 50 CFR Part 402.

Duke Energy looks forward to working with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are any questions regarding filing, please contact Alan Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy Carolinas, LLC

Enclosure: Distribution List

cc (w/enclosure): Alan Stuart, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W. Ste 308
Washington, D.C. 20001-2637

Rachel McNamara
Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission,
Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W. Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission,
Office of Energy Projects
888 First St, N.E. Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission,
Office of General Council - Energy
888 First St, N.E. Room 101-56
Washington, D.C. 20426

National Park Service
100 Alabama St S.W. Ste 1924
Atlanta, GA 30303

Jeffrey Duncan
National Park Service
535 Chestnut St Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Bernhart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Herb Nadler
Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

Keith Bluecloud
U.S Bureau of Indian Affairs,
Eastern Regional Office
545 Marriott Dr Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs,
Office of the Solicitor
1849 C St N.W. MS6557
Washington, D.C. 20240

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W. Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers
Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers
Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

U.S. Army Corps of Engineers
Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs
Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
625 E. Wisconsin Ave Ste 200
Milwaukee, WI 53202-4618

U.S. Bureau of Land Management
Jackson District Office
411 Briarwood Dr Ste 404
Jackson, MS 39206-3058

U.S. Department of Agriculture
Office of Chief Economist-OEPNUE
1400 Independence Ave N.W. MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W. Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of
Environmental Policy & Compliance
1849 C St N.W. MS 2430
Washington, D.C. 20240

U.S. Department of Transportation
United States Coast Guard
2100 2nd St S.W.
Washington, D.C. 20593-0001

U.S. Environmental Protection Agency
Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Jamie Higgins
NEPA Policy Office
U.S. Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E. Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W. Room 3238
Washington, D.C. 20240

Melanie Olds
FERC Coordinator
SC Ecological Services Field Office
U.S. Fish and Wildlife Service
176 Croghan Spur Rd Ste 200
Charleston, SC 29407-7558
melanie.olds@fws.gov

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service
Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Tom Rice
U.S. House of Representatives (CD7)
325 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Office of Senator Burr
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Graham
U.S. Senate, Upstate Regional Office
130 South Main St Ste 700
Greenville, SC 29601

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Department of Natural and Cultural Resources, Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Chris Whitmire
North Carolina House of Representatives
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St Ste 5106
Raleigh, NC 27603

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

North Carolina Utilities Commission
P.O. Box 29520
Raleigh, NC 27626-0520

Chris Goudreau
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549 Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
P.O. Box 11649
Columbia, SC 29211-1649

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Heather Preston
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
prestohs@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867 Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867 Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867 Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867 Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867 Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867 Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Honorable Thomas Alexander
Mayor
South Carolina State Senate
P.O. Box 142 Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142 Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Local Governments

Joe Moore
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

David Owens
City of Pickens, SC
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Bereskin
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave 8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave 8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Honorable Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jaime Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Tyler Howe
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

Non-Governmental

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Gerritt Jobsis
Associate Director of Conservation
American Rivers
gjobsis@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave Ste 7
Portland, OR 97232-4169

Garry Rice
Duke Energy
4720 Piedmont Row Dr Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd Ste A
Salem, SC
dwilde@keoweefolks.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdoorcenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123 Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, February 23, 2022 3:12 PM
To: Rachel.McNamara@ferc.gov; jeff_duncan@nps.gov; Rohde, Fritz; david.bernhart@noaa.gov; n, herb - sepa.doe; howard.p.mindel@usace.army.mil; lisa.l.hreha@usace.army.mil; william.g.bailey@usace.army.mil; marvin.l.griffin@usace.army.mil; melanie.olds@fws.gov; Derrick.Miller@usda.gov; Keith.bluecloud@bia.gov; robert.dach@bia.gov; higgins.jamie@epa.gov; jenniferjbarnhart@fs.fed.us; Van_Cato@lgraham.senate.gov; matt_rimkunas@lgraham.senate.gov; joe.moore@cityofbrevard.com; Mayor, Clemson - cityofclemson; dowens@pickenscity.com; dannyedwards@bellsouth.net; abrock@oconeesc.com; kenr@co.pickens.sc.us; jaime.laughter@transylvaniacounty.org; growens@gmail.com; gjobsis@americanrivers.org; kevin@americanwhitewater.org; Rice, Garry S; Stuart, Alan Witten; lputnammitchell@gmail.com; heyward69@gmail.com; dwilde@keoweefolks.org; bereskind@greenvillewater.com; Kulpa, Sarah; fun@jocasseeoutdooreenter.com; mhoffstatter@nwtf.net; d.threatttaylor@tnc.org; tim@ncwf.org; acaggiano@oconeesc.com; oldhouse@palmettotrust.org; gilstrap4@gmail.com; sjewsburyjr@bellsouth.net; sara@scwf.org; cstarker@upstateforever.org; Erika Hollis; Liz Thomas; amin.davis@ncdenr.gov; fred.tarver@ncdenr.gov; renee.gledhill-earley@ncdcr.gov; Goudreau, Chris J.; Chris.Whitmire@ncleg.net; jweese@ncdoj.gov; EMJOHNSON@scdah.sc.gov; prestohs@dhec.sc.gov; hightoCW@dhec.sc.gov; Elizabeth Miller; Lorianne Riggin; bobertzs@dnr.sc.gov; pmccormack@scprt.com; Annethayer@schouse.gov; thomasalexander@scsenate.gov; rexrice@scsenate.gov; billwhitmire@schouse.gov; afell@scprt.com; davidhiott@schouse.gov; billsandifer@schouse.gov; Jerrycarter@schouse.gov; nealcollins@schouse.gov; brian.strong@ncparks.gov; christine.farrell@ncparks.gov; wenonah.haire@catawba.com; ukbthpo-larue@yahoo.com
Cc: Crutchfield Jr., John U
Subject: P-2740 Bad Creek Pumped Storage Project Relicensing Filing
Attachments: Bad Creek_FERC 2740_ PAD NOI Transmittal_Feb.23.2022.pdf

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The Project is operated by Duke Energy under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission) on August 1, 1977, as subsequently amended. The existing FERC license for the Project expires on July 31, 2027. On February 23, 2022 Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent (NOI) to relicense the Project with FERC. The filing of the NOI and PAD mark the formal start of the FERC relicensing process for the Project.

We are notifying stakeholders of the availability of the NOI and PAD. For your convenience, a copy of the cover letter filed with these documents is attached. Please note that, due to file size restrictions, the NOI and PAD have not been included in this email. Duke Energy encourages stakeholders to view the filings on the Project's public relicensing website (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, we look forward to working with you and your organization throughout this relicensing.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

From: Wenonah Haire
To: Stuart, Alan Witten
Subject: [EXTERNAL] Re: P-2740 Bad Creek Pumped Storage Project Relicensing Filing
Date: Thursday, February 24, 2022 12:01:04 AM
Attachments: Bad Creek_FERC 2740_ PAD NOI Transmittal_Feb.23.2022.pdf

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Sorry, but we require hard copies. Please send in care of Caitlin Rogers at 1536 Tom Steven Road, Rock Hill, SC. 29730.

Sincerely,
Wenonah G. Haire, DMD
CIN-THPO
Sent from my iPhone

> On Feb 23, 2022, at 3:14 PM, Stuart, Alan Witten <Alan.Stuart@duke-energy.com> wrote:
>
> Bad Creek Pumped Storage Project Stakeholders:
>
> Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The Project is operated by Duke Energy under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission) on August 1, 1977, as subsequently amended. The existing FERC license for the Project expires on July 31, 2027. On February 23, 2022 Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent (NOI) to relicense the Project with FERC. The filing of the NOI and PAD mark the formal start of the FERC relicensing process for the Project.
>
> We are notifying stakeholders of the availability of the NOI and PAD. For your convenience, a copy of the cover letter filed with these documents is attached. Please note that, due to file size restrictions, the NOI and PAD have not been included in this email. Duke Energy encourages stakeholders to view the filings on the Project's public relicensing website (Bad Creek Pumped Storage Project).
>
> Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, we look forward to working with you and your organization throughout this relicensing.
>
> Alan W. Stuart
> Senior Project Manager, Water Strategy & Hydro Licensing
> Regulated & Renewable Energy
> Duke Energy

526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

Disclaimer

The information contained in this communication from the sender is confidential. It is intended solely for use by the recipient and others authorized to receive it. If you are not the recipient, you are hereby notified that any disclosure, copying, distribution or taking action in relation of the contents of this information is strictly prohibited and may be unlawful.

This email has been scanned for viruses and malware, and may have been automatically archived by **Mimecast Ltd**, an innovator in Software as a Service (SaaS) for business. Providing a **safer** and **more useful** place for your human generated data. Specializing in; Security, archiving and compliance. To find out more Click Here.

From: Goudreau, Chris J.
To: Stuart, Alan Witten
Subject: RE: [External] P-2740 Bad Creek Pumped Storage Project Relicensing Filing
Date: Thursday, February 24, 2022 3:06:06 PM

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Alan,

Thanks for the invitation, but since the project is completely in SC, the NCWRC will not participate in this process. Good luck with the relicensing.

Chris

Chris Goudreau
Hydropower & Special Projects Coordinator
Habitat Conservation Division

NC Wildlife Resources Commission
645 Fish Hatchery Road
Marion, NC 28752
office: 828-803-6045
mobile: 828-606-3977
chris.goudreau@ncwildlife.org

ncwildlife.org

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, February 23, 2022 3:12 PM
To: Rachel.McNamara@ferc.gov; jeff_duncan@nps.gov; fritz.rohde <fritz.rohde@noaa.gov>; david.bernhart@noaa.gov; n, herb - sepa.doe <herbn@sepa.doe.gov>; howard.p.mindel@usace.army.mil; lisa.l.hreha@usace.army.mil; william.g.bailey@usace.army.mil; marvin.l.griffin@usace.army.mil; melanie.olds@fws.gov; Derrick.Miller@usda.gov; Keith.bluecloud@bia.gov; robert.dach@bia.gov; higgins.jamie@epa.gov; jenniferjbarnhart@fs.fed.us; Van_Cato@lgraham.senate.gov; matt_rimkunas@lgraham.senate.gov; joe.moore@cityofbrevard.com; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; dowens@pickenscity.com; dannyedwards@bellsouth.net; abrock@oconeesc.com; kenr@co.pickens.sc.us; Laughter, Jaime <jaime.laughter@transylvaniacounty.org>; growens@gmail.com; gjobsis@americanrivers.org; kevin@americanwhitewater.org; Rice, Garry S <Garry.Rice@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; lputnammitchell@gmail.com; heyward69@gmail.com; dwilde@keoweefolks.org;

bereskind@greenvillewater.com; Sarah.Kulpa@hdrinc.com; fun@jocasseeoutdooreenter.com; mhoffstatter@nwtf.net; d.threatttaylor@tnc.org; tim@ncwf.org; acaggiano@oconeesc.com; oldhouse@palmettotrust.org; gilstrap4@gmail.com; sjewsburyjr@bellsouth.net; sara@scwf.org; cstarker@upstateforever.org; Erika Hollis <ehollis@upstateforever.org>; liz.Thomas@klGates.com; Davis, Amin <amin.davis@ncdenr.gov>; Tarver, Fred <fred.tarver@ncdenr.gov>; Gledhill-earley, Renee <renee.gledhill-earley@ncdcr.gov>; Goudreau, Chris J. <chris.goudreau@ncwildlife.org>; Rep. Chris Whitmire <Chris.Whitmire@ncleg.net>; Weese, Elizabeth J <jweese@ncdoj.gov>; EMJOHNSON@scdah.sc.gov; prestohs@dhec.sc.gov; hightoCW@dhec.sc.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; rigginl@dnr.sc.gov; bobertzs@dnr.sc.gov; pmccormack@scprt.com; Annethayer@schouse.gov; thomasalexander@scsenate.gov; rexrice@scsenate.gov; billwhitmire@schouse.gov; afell@scprt.com; davidhiott@schouse.gov; billsandifer@schouse.gov; Jerrycarter@schouse.gov; nealcollins@schouse.gov; Strong, Brian <brian.strong@ncparks.gov>; Farrell, Christine E <christine.farrell@ncparks.gov>; wenonah.haire@catawba.com; ukbthpo-larue@yahoo.com
Cc: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Subject: [External] P-2740 Bad Creek Pumped Storage Project Relicensing Filing

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to Report Spam.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The Project is operated by Duke Energy under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission) on August 1, 1977, as subsequently amended. The existing FERC license for the Project expires on July 31, 2027. On February 23, 2022 Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent (NOI) to relicense the Project with FERC. The filing of the NOI and PAD mark the formal start of the FERC relicensing process for the Project.

We are notifying stakeholders of the availability of the NOI and PAD. For your convenience, a copy of the cover letter filed with these documents is attached. Please note that, due to file size restrictions, the NOI and PAD have not been included in this email. Duke Energy encourages stakeholders to view the filings on the Project's public relicensing website (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, we look forward to working with you and your organization throughout this relicensing.

DUKE ENERGY.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

Email correspondence to and from this sender is subject to the N.C. Public Records Law and may be disclosed to third parties.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 9, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA USPS First-Class Mail

Chief Bill Harris
Catawba Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Reference: Consultation with Tribes for the Bad Creek Pumped Storage Project No. 2740

Dear Chief Harris:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, Tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 1,400-megawatt (MW) Bad Creek Project is located on Bad Creek in Oconee County, South Carolina. Duke Energy Carolinas, LLC (Duke Energy) owns and operates the project under a license issued by the Commission and has requested to use the Commission's Integrated Licensing Process to relicense the project. A Notice of Intent and Pre-Application Document were filed with the Commission on February 23, 2022. Duke Energy's current license for the Bad Creek Project expires July 31, 2027 and an application for a new license must be filed by July 31, 2025.

The existing Bad Creek Project is a pumped storage project that consists of a 363-acre upper reservoir, impounded by a 2,600-foot-long, 355-foot-high main dam; a 900-foot-long, 170-foot-high west dam; and a 900-foot-long, 90-foot-high east saddle dike. Water flows between the upper reservoir and the lower reservoir (the non-project Lake Jocassee) through a 5,026-foot-long water conveyance system. The project's underground powerhouse contains four Francis reversible-pump turbine-generator units.

Power produced at the project interconnects with the grid through a 9.25-mile-long, 100-kilovolt transmission line.

The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet mean sea level (msl, normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet. In practice, as of 1995, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and efficiency. The project has an average annual generation of approximately 1,884,685 megawatt-hours (MWh).

As part of its relicensing proposal, Duke Energy is contemplating the addition of another generating facility termed the Bad Creek II Complex. The Complex would consist of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. The proposed powerhouse would include four new reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. The average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper or lower reservoirs.

It is very important that a Tribe whose interests could be affected by the relicensing of the Bad Creek Project participate early in the process so that Tribal issues are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project.

In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes[1] or Duke Energy.

---

[1] Commission staff is also inviting the Eastern Band of Cherokee Indians, the Cherokee Nation, and the United Keetoowah Band of Cherokee Indians to participate in the relicensing process.

If at all possible, we would appreciate your response by April 8, 2022. Our regulations require that we hold a meeting with your Tribe no later than thirty days from the filing of Duke Energy's Notice of Intent if a meeting is desired;[2] however, we are waiving that timeframe to ensure that, if your Tribe desires a meeting, we will be able to conduct it at a mutually agreeable time.

The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Room 1A, Washington, D.C. 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. The first page of any filing should include docket number P-2740-053.

If you have any questions or comments, please contact Rachel McNamara at (202) 502-8340 or rachel.mcnamara@ferc.gov. Ms. McNamara will contact you shortly to follow-up on this letter.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

[2] 18 C.F.R. § 5.7.

cc: VIA USPS First-Class Mail

Dr. Wenonah George Haire, THPO
Catawba Nation
ATTN: THPO
1536 Tom Steven Road
Rock Hill, SC 29730

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 9, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA USPS First-Class Mail

Principal Chief Chuck Hoskin, Jr.
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465

Reference: Consultation with Tribes for the Bad Creek Pumped Storage Project No. 2740

Dear Principal Chief Hoskin:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, Tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 1,400-megawatt Bad Creek Project is located on Bad Creek in Oconee County, South Carolina. Duke Energy Carolinas, LLC (Duke Energy) owns and operates the project under a license issued by the Commission and has requested to use the Commission's Integrated Licensing Process to relicense the project. A Notice of Intent and Pre-Application Document were filed with the Commission on February 23, 2022. Duke Energy's current license for the Bad Creek Project expires July 31, 2027 and an application for a new license must be filed by July 31, 2025.

The existing Bad Creek Project is a pumped storage project that consists of a 363-acre upper reservoir, impounded by a 2,600-foot-long, 355-foot-high main dam; a 900-foot-long, 170-foot-high west dam; and a 900-foot-long, 90-foot-high east saddle dike. Water flows between the upper reservoir and the lower reservoir (the non-project Lake Jocassee) through a 5,026-foot-long water conveyance system. The project's underground powerhouse contains four Francis reversible-pump turbine-generator units.

Power produced at the project interconnects with the grid through a 9.25-mile-long, 100-kilovolt transmission line.

The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet mean sea level (msl, normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet. In practice, as of 1995, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and efficiency. The project has an average annual generation of approximately 1,884,685 megawatt-hours (MWh).

As part of its relicensing proposal, Duke Energy is contemplating the addition of another generating facility termed the Bad Creek II Complex. The Complex would consist of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. The proposed powerhouse would include four new reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. The average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper or lower reservoirs.

It is very important that a Tribe whose interests could be affected by the relicensing of the Bad Creek Project participate early in the process so that Tribal issues are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project.

In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes[1] or Duke Energy.

---

[1] Commission staff is also inviting the Catawba Nation, the Eastern Band of Cherokee Indians, and the United Keetoowah Band of Cherokee Indians to participate in the relicensing process.

If at all possible, we would appreciate your response by April 8, 2022. Our regulations require that we hold a meeting with your Tribe no later than thirty days from the filing of Duke Energy's Notice of Intent if a meeting is desired;[2] however, we are waiving that timeframe to ensure that, if your Tribe desires a meeting, we will be able to conduct it at a mutually agreeable time.

The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Room 1A, Washington, D.C. 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. The first page of any filing should include docket number P-2740-053.

If you have any questions or comments, please contact Rachel McNamara at (202) 502-8340 or rachel.mcnamara@ferc.gov. Ms. McNamara will contact you shortly to follow-up on this letter.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

cc: VIA USPS First-Class Mail

Elizabeth Toombs, THPO
ATTN: Tribal Historic Preservation
P.O. Box 948
Tahlequah, OK 74465

[2] 18 C.F.R. § 5.7.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 9, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA USPS First-Class Mail

Principal Chief Richard Sneed
Eastern Band of Cherokee Indians
P.O. Box 1927
Cherokee, NC 28719

Reference: Consultation with Tribes for the Bad Creek Pumped Storage Project No. 2740

Dear Principal Chief Sneed:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, Tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 1,400-megawatt Bad Creek Project is located on Bad Creek in Oconee County, South Carolina. Duke Energy Carolinas, LLC (Duke Energy) owns and operates the project under a license issued by the Commission and has requested to use the Commission's Integrated Licensing Process to relicense the project. A Notice of Intent and Pre-Application Document were filed with the Commission on February 23, 2022. Duke Energy's current license for the Bad Creek Project expires July 31, 2027 and an application for a new license must be filed by July 31, 2025.

The existing Bad Creek Project is a pumped storage project that consists of a 363-acre upper reservoir, impounded by a 2,600-foot-long, 355-foot-high main dam; a 900-foot-long, 170-foot-high west dam; and a 900-foot-long, 90-foot-high east saddle dike. Water flows between the upper reservoir and the lower reservoir (the non-project Lake Jocassee) through a 5,026-foot-long water conveyance system. The project's underground powerhouse contains four Francis reversible-pump turbine-generator units.

Power produced at the project interconnects with the grid through a 9.25-mile-long, 100-kilovolt transmission line.

The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet mean sea level (msl, normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet. In practice, as of 1995, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and efficiency. The project has an average annual generation of approximately 1,884,685 megawatt-hours (MWh).

As part of its relicensing proposal, Duke Energy is contemplating the addition of another generating facility termed the Bad Creek II Complex. The Complex would consist of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. The proposed powerhouse would include four new reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. The average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper or lower reservoirs.

It is very important that a Tribe whose interests could be affected by the relicensing of the Bad Creek Project participate early in the process so that Tribal issues are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project.

In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes[1] or Duke Energy.

---

[1] Commission staff is also inviting the Catawba Nation, the Cherokee Nation, and the United Keetoowah Band of Cherokee Indians to participate in the relicensing process.

If at all possible, we would appreciate your response by April 8, 2022. Our regulations require that we hold a meeting with your Tribe no later than thirty days from the filing of Duke Energy's Notice of Intent if a meeting is desired;[2] however, we are waiving that timeframe to ensure that, if your Tribe desires a meeting, we will be able to conduct it at a mutually agreeable time.

The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Room 1A, Washington, D.C. 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. The first page of any filing should include docket number P-2740-053.

If you have any questions or comments, please contact Rachel McNamara at (202) 502-8340 or rachel.mcnamara@ferc.gov. Ms. McNamara will contact you shortly to follow-up on this letter.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

cc: VIA USPS First-Class Mail

EBCI Tribal Historic Preservation Office
2877 Governors Island Road
Bryson City, NC 28713

[2] 18 C.F.R. § 5.7.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 9, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA USPS First-Class Mail

Chief Joe Bunch
United Keetoowah Band of Cherokee Indians
P.O. Box 746
Tahlequah, OK 74464

Reference: Consultation with Tribes for the Bad Creek Pumped Storage Project No. 2740

Dear Chief Bunch:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, Tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 1,400-megawatt Bad Creek Project is located on Bad Creek in Oconee County, South Carolina. Duke Energy Carolinas, LLC (Duke Energy) owns and operates the project under a license issued by the Commission and has requested to use the Commission's Integrated Licensing Process to relicense the project. A Notice of Intent and Pre-Application Document were filed with the Commission on February 23, 2022. Duke Energy's current license for the Bad Creek Project expires July 31, 2027 and an application for a new license must be filed by July 31, 2025.

The existing Bad Creek Project is a pumped storage project that consists of a 363-acre upper reservoir, impounded by a 2,600-foot-long, 355-foot-high main dam; a 900-foot-long, 170-foot-high west dam; and a 900-foot-long, 90-foot-high east saddle dike. Water flows between the upper reservoir and the lower reservoir (the non-project Lake Jocassee) through a 5,026-foot-long water conveyance system. The project's underground powerhouse contains four Francis reversible-pump turbine-generator units.

Power produced at the project interconnects with the grid through a 9.25-mile-long, 100-kilovolt transmission line.

The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet mean sea level (msl, normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet. In practice, as of 1995, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and efficiency. The project has an average annual generation of approximately 1,884,685 megawatt-hours (MWh).

As part of its relicensing proposal, Duke Energy is contemplating the addition of another generating facility termed the Bad Creek II Complex. The Complex would consist of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. The proposed powerhouse would include four new reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. The average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper or lower reservoirs.

It is very important that a Tribe whose interests could be affected by the relicensing of the Bad Creek Project participate early in the process so that Tribal issues are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project.

In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes[1] or Duke Energy.

---

[1] Commission staff is also inviting the Catawba Nation, Eastern Band of Cherokee Indians, and Cherokee Nation to participate in the relicensing process.

If at all possible, we would appreciate your response by April 8, 2022. Our regulations require that we hold a meeting with your Tribe no later than thirty days from the filing of Duke Energy's Notice of Intent if a meeting is desired;[2] however, we are waiving that timeframe to ensure that, if your Tribe desires a meeting, we will be able to conduct it at a mutually agreeable time.

The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Room 1A, Washington, D.C. 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. The first page of any filing should include docket number P-2740-053.

If you have any questions or comments, please contact Rachel McNamara at (202) 502-8340 or rachel.mcnamara@ferc.gov. Ms. McNamara will contact you shortly to follow-up on this letter.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

cc: VIA Electronic Mail

Whitney Warrior, Director
Historic Preservation Office
United Keetoowah Band of Cherokee Indians
wwarrior@ukb-nsn.gov

[2] 18 C.F.R. § 5.7.

Salazar, Maggie

Subject: FW: [EXTERNAL] SAC-2022-00413 Bad Creek Pumped Storage Project

---

From: SAC.RD.Greenville <SAC.RD.Greenville@usace.army.mil>
Sent: Friday, March 11, 2022 7:21 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: Andrade, Kristin B CIV USARMY CESAC (USA) <Kristin.B.Andrade@usace.army.mil>
Subject: [EXTERNAL] SAC-2022-00413 Bad Creek Pumped Storage Project

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Dear Sir or Madame:

The US Army Corps of Engineers, Regulatory Division, has received your project - Bad Creek Pumped Storage Project in the Greenville Satellite Office. The assigned Project Manager is Kristin Andrade and your project number is SAC-2022-00413. Please direct all future inquiries regarding this matter to (864) 609-4324.

Sincerely,

Kristin Andrade
Team Leader
Northwest Branch/Greenville Office
SAC.RD.Greenville@usace.army.mil
Office (864) 609-4324
Cell (864) 992-0713

Complete our Regulatory Service Survey at
https://regulatory.ops.usace.army.mil/customer-service-survey/

From:	Andrade, Kristin B CIV USARMY CESAC (USA)
To:	Stuart, Alan Witten
Cc:	WQCWetlands@dhec.sc.gov
Subject:	[EXTERNAL] SAC-2022-00413 Bad Creek Pumped Storage Project
Date:	Monday, April 4, 2022 11:13:31 AM
Attachments:	SAC-2022-00413_Bad_Creek_Pumped_Storage_Project_PMBR_04042022.pdf

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Mr. Stuart,

Please see the attached Permit May Be Required Letter (SAC-2022-00413) requested on March 10, 2022.

No hardcopies will be mailed. Please let me know if you have any questions.

Sincerely,

Kristin Andrade
Team Leader
Northwest Branch/Greenville Office
SAC.RD.Greenville@usace.army.mil
Office (864) 609-4324
Cell (864) 992-0713

Complete our Regulatory Service Survey at
https://regulatory.ops.usace.army.mil/customer-service-survey/

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
150 EXECUTIVE CENTER DRIVE, SUITE 205
GREENVILLE, SOUTH CAROLINA 29615

April 4, 2022

Regulatory Division

Mr. Alan Stuart
Duke Energy Carolinas, LLC
526 South Church Street, EC12Y
Charlotte, North Carolina 28202
alan.stuart@duke-energy.com

Dear Mr. Stuart:

This is in response to your February 23, 2022 request for comments (SAC-2022-00413). The work affecting waters of the United States is part of an overall project known as Bad Creek Pumped Storage Project. The project is located in Oconee County, South Carolina.

Based on a review of the information provided and a review of aerial photography and soil survey information, we believe there may be jurisdictional Waters of the United States, including wetlands, streams, or other waters, which are subject to our regulatory authority pursuant to Section 404 of the Clean Water Act. To assist you with determining DA permitting requirements, we recommend performing a detailed delineation of the streams and/or wetlands present within the project corridor.

Any discharge of dredged or fill material into Waters of the United States (including jurisdictional wetlands and streams) present within the project limits will require Department of the Army (DA) permit authorization. For example, construction of permanent or temporary roads, construction of any building, placement of dirt, clearing using heavy equipment, and any other activities that disturbs or alters the existing ground contours are all considered filling activities which require DA authorization. The type of DA authorization required (i.e., general or individual permit) is determined by the location, type, and extent of jurisdictional areas impacted by the project, and by the project design and construction limits.

Additional impacts which may require DA authorization include any work or structure in or impacting the navigable capacity of any navigable waters of the United States. Navigable waters of the United States include all tidal waters. The definition of "work" as used here includes any dredging, excavation, filling, discharge of dredged or fill material, or other modification of a navigable water of the United States.

Until additional data is furnished detailing the extent of the impacts to jurisdictional waters within the construction limits of the proposed project, we are unable to provide

specific DA permit requirements. You are also advised the proposed work may require other federal, state, and/or local authorizations.

In all future correspondence, please refer to file number SAC-2022-00413. A copy of this letter is forwarded to State and/or Federal agencies for their information. If you have any questions, please contact me at (864) 609-4324, or by email at Kristin.B.Andrade@usace.army.mil.

Sincerely,

Date:
2022.04.04
11:07:12 -04'00'

Kristin B. Andrade
Team Leader

Copies Furnished:

SC DHEC - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201
WQCWetlands@dhec.sc.gov

From: Stuart, Alan Witten
To: Navreet Deo
Subject: GIS files
Date: Monday, April 11, 2022 7:42:00 AM
Attachments: ToFERC_BadCreek_Data_20220408.zip
image001.png

Good morning Neetu,

Please find the GIS information used in the Pre-Application Document attached to this email.
I am on vacation this week but will be checking emails daily. If you have any problems with the data just let me know.

Thanks !
Alan

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

FEDERAL ENERGY REGULATORY COMMISSION
MEMORANDUM

DATE : April 12, 2022

FROM: Sarah Salazar, Environmental Biologist
Division of Hydropower Licensing
Office of Energy Projects

TO: Public Files for the Bad Creek Pumped Storage Project
(FERC Project No. 2740-053)

SUBJECT: List of Threatened, Endangered, Candidate, and Proposed Species
Generated by ECOS-IPaC Website on April 11, 2022

On April 11, 2022, Commission staff accessed the U.S. Fish and Wildlife Service's ECOS-IPaC website (https://ecos.fws.gov/ipac/). The endangered persistent trillium and smooth coneflower and the threatened northern long-eared bat and small whorled pogonia may occur within the Bad Creek Pumped Storage Project boundary, or be affected by the project. In addition, the monarch butterfly, a candidate species for federal listing, may occur within the project boundary, or be affected by the project. No proposed species are known to occur within the project boundary or be affected by the project. No designated critical habitat is located within the project boundary.

A copy of the list is attached.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218
http://www.fws.gov/charleston/

In Reply Refer To: April 11, 2022
Project Code: 2022-0030610
Project Name: Bad Creek Pumped Storage Project (FERC No. 2740-053)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Northern Long-eared Bat: Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and

recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

Project Summary

Project Code: 2022-0030610
Event Code: None
Project Name: Bad Creek Pumped Storage Project (FERC No. 2740-053)
Project Type: Power Gen - Hydropower - FERC
Project Description: The existing Bad Creek Pumped Storage Project includes: (1) a 2,600-ft-long, 355-foot-high main dam composed of an impervious core and rockfill shell, and equipped with 5-ft-high flashboards; (2) a 900-ft-long, 170-ft-high west dam; (3) a 900-ft-long, 90 ft-high east saddle dike; (4) a 363-acre upper reservoir with a gross storage capacity of 35,513 acre-ft at a normal maximum elevation of 2,310 ft mean sea level (msl); (5) an upper reservoir intake channel consisting of a dewatering dam and bellmouth inlet; (6) a 5,026-ft-long water conveyance system consisting of: (a) a 856-ft-long, 29.5 ft-diameter vertical access shaft, (b) 1,186-ft-long, 29.5-ft-wide power tunnel, (c) a manifold tunnel, (d) four, 13.6-ft-diameter steel-lined penstocks, (e) four, 316 ft-long, 16.4-ft-diameter draft tube tunnels, and (f) two, 875-ft-long, 24.6 ft-diameter tailrace tunnels; (9) a 433-ft-long, 164-ft-tall underground powerhouse containing four, Francis reversible-pump turbine-generator units with a total installed capacity of 1,400 MW; (7) an 43.5-ft-high equipment building located about 469 ft above the underground powerhouse; (8) a 118-ft-long, 15-ft-wide reinforced concrete, lower reservoir inlet/outlet structure, including four, 30-ft-high, 18-ft-wide steel lift gates; (9) generator leads; (10) a transformer yard; (11) a switchyard consisting of: (a) four step-up transformers, (b) one 9.25-mile-long, 100 kilovolt (kV) transmission line, and (c) one 9.25-mile-long, 525-kV line; (12) a 9.25 mile-long, 254-ft-wide transmission line corridor; and (13) appurtenant facilities. The project also includes an existing 4.8-mile road that leads from the project entrance to the powerhouse area near Lake Jocassee.

There are no recreation facilities or public access within the project boundary.

The project is an automated pumped storage plant where water is regularly moved from the upper reservoir to the lower reservoir during generation, and from the lower reservoir back to the upper reservoir during pumping. All water utilized for generation originates from the 7,980-acre lower reservoir (Lake Jocassee). Lake Jocassee has a gross storage capacity of 1,206,798 acre-ft at a normal maximum elevation of 1,110 ft msl. The project is licensed to operate on a weekly pump-storage cycle with the upper reservoir fluctuating between 2,310 ft msl (normal max. elevation) and 2,150 ft msl (normal min. elevation), resulting in a maximum drawdown of 160 ft and 31,808 acre-ft useable storage capacity. In practice, the project operates in a daily pump-storage cycle by

maintaining the upper reservoir above 2,250 ft msl for approximately 97% of the time to maximize head and unit efficiency. Generation usually occurs during the day, while water is pumped from the lower reservoir to partially replenish the upper reservoir at night.

The average annual generation of the project is about 1,884,685 MWh. The average annual energy required for pumping during the same period is about 2,398,114 MWh. The net energy consumption of the project is 513,429 MWh.

Duke Energy proposes to continue to operate and maintain the project and evaluate the feasibility of constructing and operating a second generating facility, Bad Creek II Complex, which would consist of a new: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line. The proposed powerhouse would include four new, reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. Average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper and lower reservoirs. Duke Energy would propose a project boundary in the license application that will include all lands necessary for access to, or control of, the expanded project.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.98379515,-82.99727163677541,14z

Counties: Oconee County, South Carolina

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Persistent Trillium *Trillium persistens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3583	Endangered
Small Whorled Pogonia *Isotria medeoloides* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31

NAME	BREEDING SEASON
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 27 to Jul 20
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

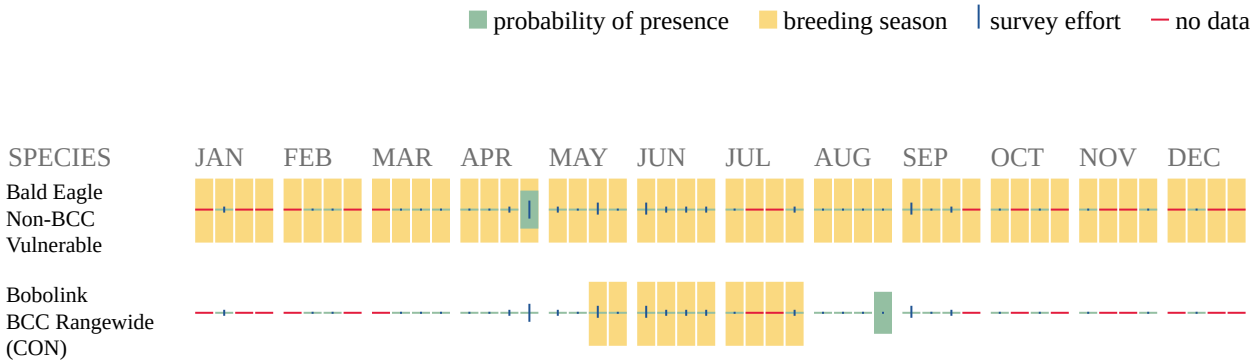
1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

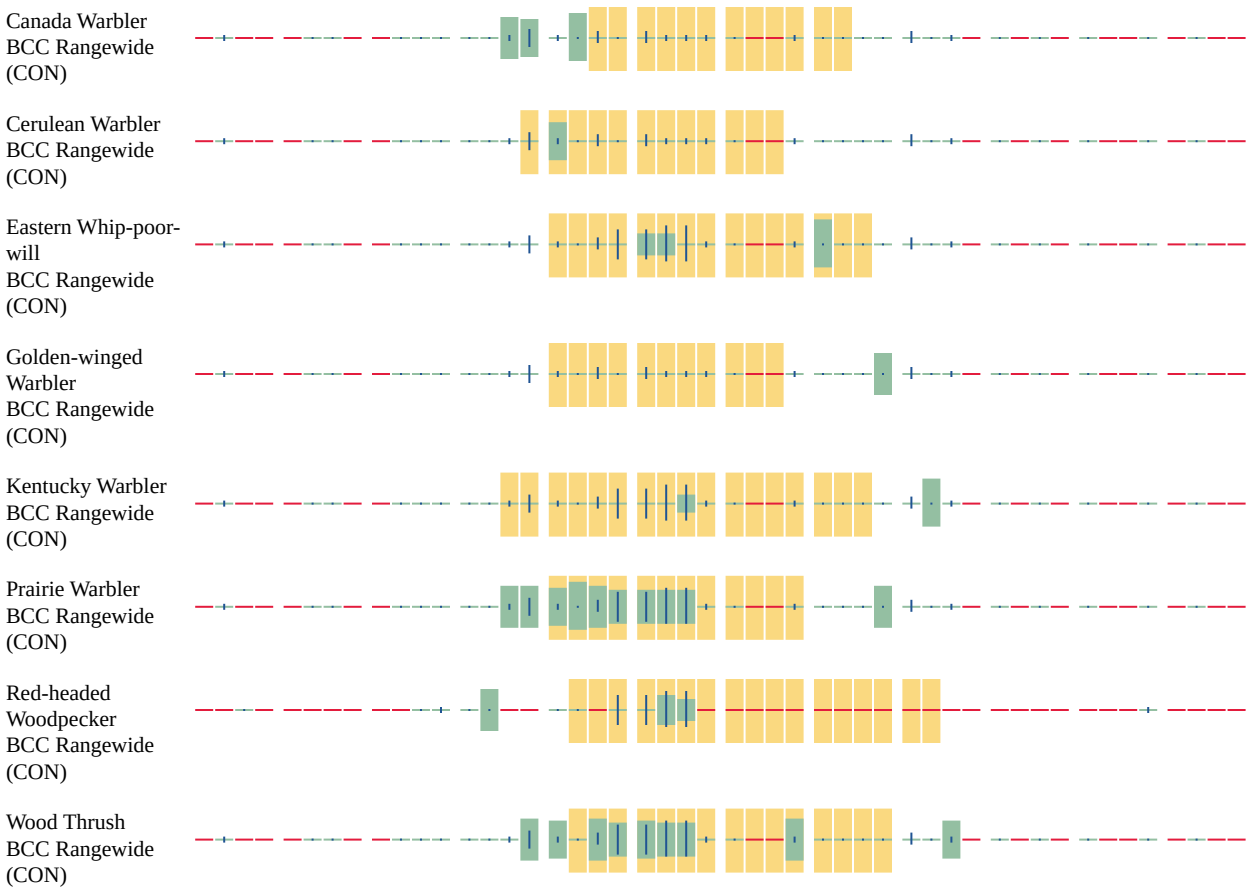
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits

may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);

2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities,

should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: Federal Energy Regulatory Commission
Name: Sarah Salazar
Address: 888 First St., NE
City: Washington
State: DC
Zip: 20426
Email sarah.salazar@ferc.gov
Phone: 2025026863

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Duke Energy Carolinas, LLC Project No. 2740-053

NOTICE OF INTENT TO FILE LICENSE APPLICATIONS, FILING OF PRE-APPLICATION DOCUMENT (PAD), COMMENCEMENT OF PRE-FILING PROCESS, REQUEST FOR COMMENTS ON THE PAD AND SCOPING DOCUMENT, IDENTIFICATION OF ISSUES AND ASSOCIATED STUDY REQUESTS, AND VIRTUAL PUBLIC SCOPING MEETINGS AND VIRTUAL ENVIRONMENTAL SITE REVIEWS

(April 22, 2022)

a. Type of Filing: Notice of Intent to File License Application for New License and Commencing Pre-filing Process

b. Project No.: 2740-053

c. Date Filed: February 23, 2022

d. Submitted By: Duke Energy Carolinas, LLC (Duke Energy)

e. Name of Project: Bad Creek Pumped Storage Project (Bad Creek Project)

f. Location: Oconee County, South Carolina.

g. Filed Pursuant to: 18 CFR Part 5 of the Commission's Regulations.

h. Licensee Contact: Alan Stuart, Licensing Manager, Duke Energy, Mail Code EC-12Q 526 S. Church Street, Charlotte, NC 28202; (803) 640-8765; alan.stuart@duke-energy.com.

i. FERC Contact: Navreet Deo at (202) 502-6304, or e-mail at navreet.deo@ferc.gov.

j. Cooperating agencies: Federal, state, local, and tribal agencies with jurisdiction and/or special expertise with respect to environmental issues that wish to cooperate in the preparation of the environmental document should follow the instructions for filing such requests described in item o below. Cooperating agencies should note the Commission's policy that agencies that cooperate in the preparation of the environmental document cannot also intervene. *See* 94 FERC 61,076 (2001).

k. With this notice, we are initiating informal consultation with: (a) the U.S. Fish and Wildlife Service and/or NOAA Fisheries under section 7 of the Endangered Species Act and the joint agency regulations thereunder at 50 CFR, Part 402; and (b) the State Historic Preservation Officer, as required by section 106, National Historic Preservation Act, and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2.

l. With this notice, we are designating Duke Energy as the Commission's non-federal representative for carrying out informal consultation, pursuant to section 7 of the Endangered Species Act and section 106 of the National Historic Preservation Act.

m. Duke Energy filed with the Commission a Pre-Application Document (PAD; including a proposed process plan and schedule), pursuant to 18 CFR 5.6 of the Commission's regulations.

n. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents via the Internet through the Commission's Home Page (http://www.ferc.gov), using the "eLibrary" link. Enter the docket number(s), excluding the last three digits in the docket number field, to access the document. At this time, the Commission has suspended access to the Commission's Public Reference Room, due to the proclamation declaring a National Emergency concerning the Novel Coronavirus Disease (COVID-19), issued by the President on March 13, 2020, and continued on February 24, 2021. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov, or call toll-free, (866) 208-3676 or TYY, (202) 502-8659.

   Register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via e-mail of new filings and issuances related to these or other pending projects. For assistance, contact FERC Online Support.

o. With this notice, we are soliciting comments on the PAD and Commission staff's Scoping Document 1 (SD1), as well as study requests. All comments on the PAD and SD1, and study requests should be sent to the address above in paragraph h. In addition, all comments on the PAD and SD1, study requests, requests for cooperating agency status, and all communications to and from Commission staff related to the merits of the potential applications must be filed with the Commission.

The Commission strongly encourages electronic filing. Please file all documents using the Commission's eFiling system at http://www/ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at: FERCOnlineSupport@ferc.gov. In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852.

All filings with the Commission must bear the appropriate heading: "Comments on Pre-Application Document," "Study Requests," "Comments on Scoping Document 1," "Request for Cooperating Agency Status," or "Communications to and from Commission Staff." Any individual or entity interested in submitting study requests, commenting on the PAD or SD1, and any agency requesting cooperating status must do so by **June 23, 2022**.

p. Scoping Process

The Commission's scoping process will help determine the required level of analysis and satisfy the NEPA scoping requirements, irrespective of whether the Commission prepares an environmental assessment or Environmental Impact Statement. Due to recent concerns with large gatherings related to COVID-19, we do not intend to hold in-person public scoping meetings or an in-person environmental site review. Rather, we will hold virtual public scoping meetings and a virtual environmental site reviews.

Scoping Meetings

Commission staff will hold two virtual public scoping meetings. An evening meeting will focus on receiving input from the public and a daytime meeting will focus on concerns of resource agencies, Native American tribes, and NGOs. We invite all interested agencies, Native American tribes, NGOs, and individuals to attend one of these meetings to assist us in identifying the scope of environmental issues that should be analyzed in the NEPA document. The scoping meetings will be recorded by a court reporter. All oral and written comments will become part of the Commission's public record. Oral comments will be limited to 5 minutes in duration.

Date and Time
Meeting for the general public Monday, May 16, 2022 7:00 p.m. - 9:00 p.m. EDT Call in number: 800-779-8625 Participant passcode: 3472916
Meeting for resource agencies, Tribes, and NGOs Tuesday, May 17, 2022 10:00 a.m. -12:00 p.m. EDT Call in number: 800-779-8625 Participant passcode: 3472916

Scoping Document 1 (SD1), which outlines the subject areas to be addressed in the environmental document, was mailed to the individuals and entities on the Commission's mailing list and Duke Energy's mailing list. Copies of SD1 may be viewed on the web at http://www.ferc.gov, using the "eLibrary" link. Follow the directions for accessing information in paragraph n. Based on all oral and written comments, a Scoping Document 2 (SD2) may be issued. SD2 may include a revised process plan and schedule, as well as a list of issues, identified through the scoping process.

Environmental Site Review

Duke Energy and Commission staff will hold two virtual Environmental Site Reviews of the Bad Creek Project on May 16, 2022, starting at 6:00 p.m., and May 17, 2022 at 9:00 a.m. Please contact Alan Stuart of Duke Energy at (803) 640-8765, or alan.stuart@duke-energy.com, by May 9, 2022 if you plan to attend the environmental site review. Meeting details will be provided by Duke Energy staff once attendance is confirmed.

Meeting Objectives

At the scoping meetings, staff will: (1) briefly describe the relicensing process, as well as the projects and their operation; (2) initiate scoping of the issues; (3) review existing information and identify preliminary information and study needs; and (4) review the process plan and schedule for pre-filing activities. Meeting participants should come prepared to discuss their issues and/or concerns. Please review the PAD in preparation for the scoping meetings. Directions on how to obtain a copy of the PAD and SD1 are included in item n of this notice.

Kimberly D. Bose,
Secretary.

FEDERAL ENERGY REGULATORY COMMISSION
Washington, DC 20426
April 22, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Subject: Scoping Document 1 for the Bad Creek Pumped Storage Project, P-2740-053

To the Parties Addressed:

The Federal Energy Regulatory Commission (Commission) is currently reviewing the Pre-Application Document (PAD), filed on February 23, 2022, by Duke Energy Carolinas, LLC (Duke Energy) for relicensing the Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The project is located in Oconee County, South Carolina. No federal lands have been identified within the project boundary.

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Commission staff will prepare an environmental document (NEPA document), which will be used by the Commission to determine whether, and under what conditions, to issue a new license for the project. To support and assist our environmental review, we are beginning the public scoping process to ensure that all pertinent issues are identified and analyzed, and that the NEPA document is thorough and balanced.

We invite your participation in the scoping process and are circulating the attached Scoping Document 1 (SD1) to provide you with information on the Bad Creek Project. We are also soliciting your comments and suggestions on our preliminary list of issues and alternatives to be addressed in the NEPA document. We are also requesting that you identify any studies that would help provide a framework for collecting pertinent information on the resource areas under consideration necessary for the Commission to prepare the NEPA document for the project.

We will hold two virtual scoping meetings for the Bad Creek Project to receive input on the scope of the NEPA document. An evening scoping meeting will be held at 7:00 p.m. on Monday, May 16, 2022. A daytime scoping meeting will be held at 10:00 a.m. on Tuesday, May 17, 2022. There will also be a virtual environmental site review an hour before each scoping meeting (at 6:00 p.m. on Monday, May 16, 2022 and 9:00 a.m. on Tuesday, May 17, 2022).

We invite all interested agencies, Native American Tribes, non-governmental organizations, and individuals to attend one or all of these meetings. Further information on our environmental site review and scoping meetings is available in the enclosed SD1 (see section 2.2, Comments, Scoping Meetings, and Environmental Site Review).

SD1 is being distributed to both Duke Energy's distribution list and the Commission's official mailing list for the project (see section 9.0 of the attached SD1). If you wish to be added to or removed from the Commission's official mailing list, please send your request by email to FERCOnlineSupport@ferc.gov or by mail via the U.S. Postal Service to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. All written or emailed requests must specify your wish to be added to, or removed from, the mailing list, and must clearly identify the following on the first page: **Bad Creek Pumped Storage Project No. 2740-053**.

Please review SD1 and, if you wish to provide comments, follow the instructions in section 6.0, *Request for Information and Studies*. If you have any questions about SD1, the scoping process, or how Commission staff will develop the NEPA document for this project, please contact Navreet Deo at (202) 502-6304, or via email at: navreet.deo@ferc.gov. Additional information about the Commission's licensing process and the Bad Creek Project may be obtained from our website, www.ferc.gov. The deadline for filing comments is **June 23, 2022**. The Commission strongly encourages electronic filings.

Enclosure: Scoping Document 1

SCOPING DOCUMENT 1

BAD CREEK PUMPED STORAGE PROJECT
(PROJECT NO. 2740-053)

SOUTH CAROLINA

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

April 2022

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SCOPING 3

2.1 PURPOSES OF SCOPING 3
2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEWS 3

3.0 PROPOSED ACTION AND ALTERNATIVES 6

3.1 NO-ACTION ALTERNATIVE 6
3.1.1 Existing Project Facilities 6
3.1.2 Existing Project Operation 7
3.2 LICENSEE'S PROPOSALS 7
3.2.1 Proposed Project Facilities and Operation 7
3.2.2 Proposed Environmental Measures 8
3.3 DAM SAFETY 12
3.4 ALTERNATIVES TO THE PROPOSED ACTION 12
3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY 12
3.5.1 Federal Government Takeover 12
3.5.2 Non-power License 12
3.5.3 Project Decommissioning 13

4.0 SITE-SPECIFIC RESOURCE ISSUES 14

4.1 RESOURCE ISSUES 14
4.1.1 Geology and Soils Resources 14
4.1.2 Aquatic Resources 14
4.1.3 Terrestrial Resources 15
4.1.4 Threatened and Endangered Species 15
4.1.5 Recreation, Land Use, and Aesthetics 16
4.1.6 Cultural Resources 16
4.1.7 Socioeconomics 16
4.1.8 Noise, Air Quality, and Traffic 16
4.1.9 Developmental Resources 17

5.0 PROPOSED STUDIES 17

6.0 REQUEST FOR INFORMATION AND STUDIES 18

7.0 NEPA DOCUMENT PREPARATION SCHEDULE 20

8.0 COMPREHENSIVE PLANS 21

9.0 MAILING LISTS 24

APPENDIX A - STUDY PLAN CRITERIA

APPENDIX B - PROCESS PLAN AND SCHEDULE

LIST OF FIGURES

Figure 1: Location and Existing Facilities of the Bad Creek Pumped Storage Project (source: Duke Energy, Bad Creek Project PAD). 2

SCOPING DOCUMENT 1

Bad Creek Pumped Storage Project, No. 2740-053

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (Commission or FERC), under the authority of the Federal Power Act (FPA),[1] may issue new licenses for terms ranging from 30 to 50 years for the construction, operation, and maintenance of non-federal hydroelectric projects. On February 23, 2022, Duke Energy Carolinas, LLC (Duke Energy), licensee for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project or project), filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to file an application for new license with the Commission.

The Bad Creek Project is located in Oconee County, South Carolina, about 8 miles north of the Town of Salem (figure 1). The project facilities consist of an upper reservoir, a main dam, a west dam, an east saddle dike, a water conveyance system, an underground powerhouse, access roads, and voltage transformation facilities. The project has a total installed capacity of 1,400 megawatts (MW). The total average annual generation of the project is about 1,884,685 megawatt-hours (MWh). A detailed description of the project is provided in section 3.0, *Proposed Action and Alternatives*. A map of the project site is shown on figure 1. The project does not occupy federal lands.

The National Environmental Policy Act (NEPA) of 1969,[2] the Commission's regulations, and other applicable laws require that we independently evaluate the environmental effects of relicensing the Bad Creek Project as proposed, and also consider reasonable alternatives to the licensee's proposed action. We will prepare either an environmental assessment (EA) or an Environmental Impact Statement (EIS) for the Bad Creek Project that describes and evaluates the probable effects, if any, of the licensee's proposed action and alternatives. The Commission's scoping process will help determine the required level of analysis and satisfy the NEPA scoping requirements, irrespective of whether the Commission issues an EA or an EIS.

[1] 16 U.S.C. § 791(a)-825(r).

[2] 42 U.S.C. §§ 4321-4370(f).

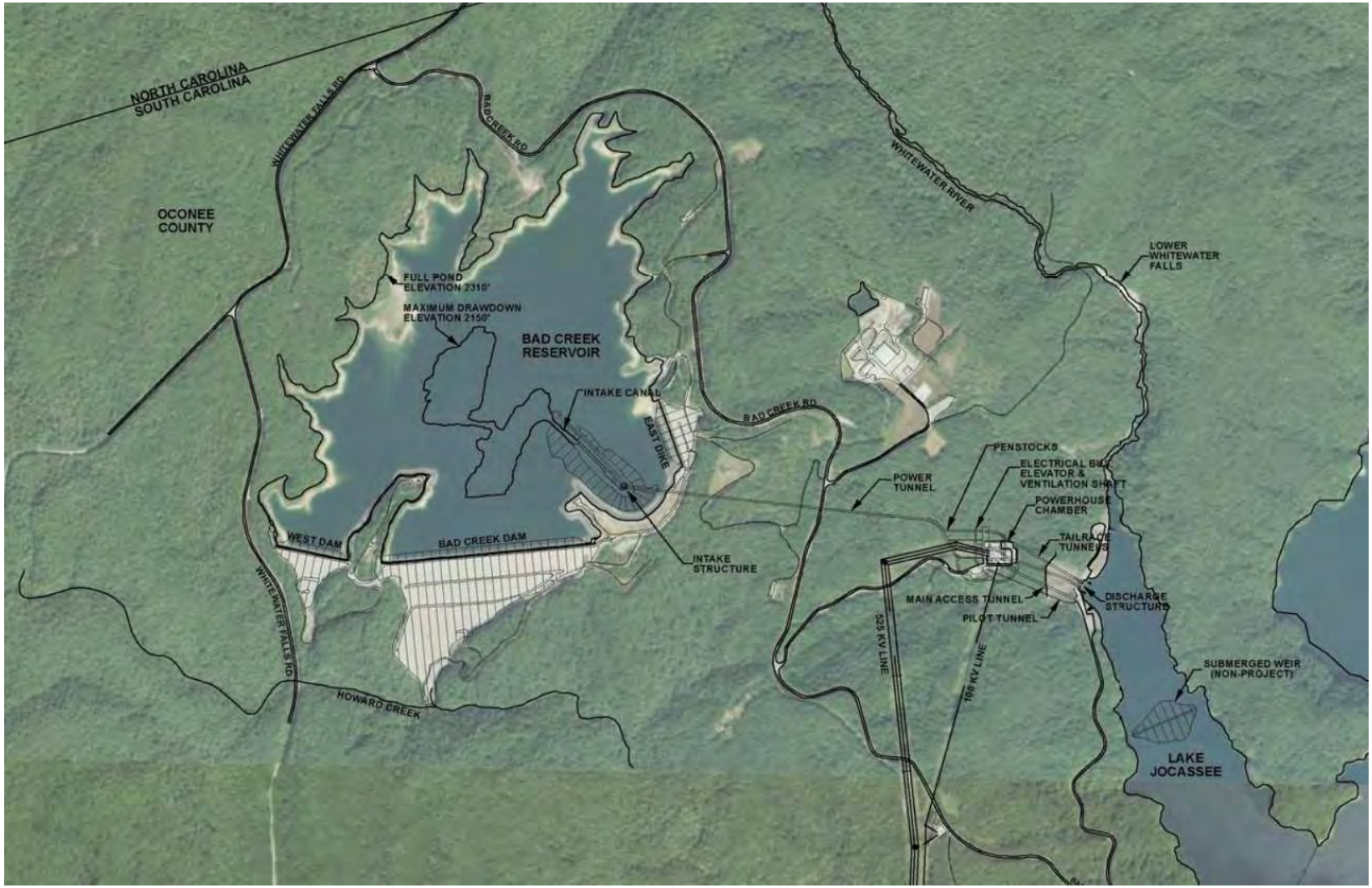


Figure 1: Location and Existing Facilities of the Bad Creek Pumped Storage Project (source: Duke Energy, Bad Creek Project PAD).

2.0 SCOPING

This Scoping Document 1 (SD1) is intended to advise all participants as to the proposed scope of the Commission's NEPA document and to seek additional information pertinent to this analysis. This document contains: (1) a description of the scoping process and schedule for the development of the NEPA document; (2) a description of the proposed action and alternatives; (3) a preliminary identification of environmental issues and proposed studies; (4) a request for comments and information; (5) a proposed outline for the NEPA document; and (6) a preliminary list of comprehensive plans that are applicable for the project.

2.1 PURPOSES OF SCOPING

Scoping is the process used to identify issues, concerns, and opportunities for mitigation or enhancement associated with a proposed action. In general, scoping should be conducted early in the planning stage of a project. The purposes of the scoping process are as follows:

- invite the participation of federal, state, and local resource agencies, Native-American tribes, non-governmental organizations (NGOs), and the public to identify significant environmental and socioeconomic issues related to the proposed project;

- determine the resource issues, depth of analysis, and significance of issues to be addressed in the NEPA document;

- identify reasonable alternatives to the proposed action that should be evaluated in the NEPA document;

- solicit, from participants, available information on the resources at issue, including existing information and study needs; and

- determine the resource areas and potential issues that do not require detailed analysis during review of the project.

2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEWS

During preparation of the NEPA document, there will be several opportunities for the resource agencies, Native-American tribes, NGOs, and the public to provide input.

These opportunities will occur:

- during the public scoping process and study plan meetings, when we solicit oral and written comments regarding the scope of issues and analysis for the NEPA document;

- in response to the Commission's notice that the project is ready for environmental analysis; and

- after issuance of the NEPA document.

Due to recent concerns with large gatherings related to COVID-19, there will not be an in-person public scoping meeting or an in-person environmental site review. We are soliciting written comments and recommendations on the preliminary list of issues and alternatives to be addressed in the NEPA document. In addition to written comments solicited by this SD1, we will hold two virtual, public scoping meetings and Duke Energy will hold two virtual environmental site reviews. An evening scoping meeting will focus on receiving input from the public and a daytime scoping meeting will focus on concerns of resource agencies, Native-American tribes, and NGOs. We invite all interested agencies, Native-American tribes, NGOs, and individuals to attend either one of these meetings to assist us in identifying the scope of environmental issues that should be analyzed in the NEPA document. We also invite all stakeholders to attend the virtual environmental site reviews preceding each scoping meeting. Please contact Mr. Alan Stuart by email at alan.stuart@duke-energy.com, or by phone at 803-640-8765, on or before Wednesday, May 9, 2022 if you plan to attend either one of the environmental site reviews. The dates and times of the virtual meetings and environmental site reviews are as follows:

Evening Environmental Site Review
Date & Time: Monday May 16, 2022, 6:00 p.m. to 6:45 p.m.
Please contact Duke Energy at alan.stuart@duke-energy.com, or 803-640-8765, for site review access details.

Evening Scoping Meeting
Date & Time: Monday, May 16, 2022, 7:00 p.m. to 9:00 p.m.
Phone in number: 800-779-8625
Participant passcode: 3472916
Call in using the phone number and passcode.

Daytime Environmental Site Review
Date & Time: Tuesday May 17, 2022, 9:00 a.m. to 9:45 a.m.
Please contact Duke Energy at alan.stuart@duke-energy.com, or 803-640-8765, for site review access details.

Daytime Scoping Meeting
Date & Time: Tuesday May 17, 2022, 10:00 a.m. to 12:00 p.m.
Phone in number: 800-779-8625
Participant passcode: 3472916
Call in using the phone number and passcode.

The scoping meetings will be recorded by a court reporter, and all statements will become part of the Commission's public record for the project. Oral comments will initially be limited to 5 minutes in duration. Interested parties who choose not to speak or who are unable to attend the scoping meetings may provide written comments and information to the Commission, as described in section 6.0. These meetings are posted on the Commission's calendar located on the internet at http://www.ferc.gov/EventCalendar/EventsList.aspx?View=monthview, along with other related information.

Scoping meeting participants should come prepared to discuss their issues and/or concerns as they pertain to the relicensing of the Bad Creek Project. It is advised that participants review the PAD in preparation for the scoping meetings. The PAD may be viewed on the Commission's website (www.ferc.gov) using the "eLibrary" link. Enter the docket number, P-2740, to access the documents. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov, or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

Following the scoping comment period, all issues raised will be reviewed and decisions made as to the level of analysis needed. If this preliminary analysis indicates that any issues presented in this scoping document have little potential for causing significant effects, the issue(s) will be identified and the reasons for not providing a more detailed analysis will be given in the NEPA document.

If we receive no substantive comments on SD1, then we will not prepare a Scoping Document 2 (SD2). Otherwise, we will issue an SD2 to address any substantive comments received during the scoping process. The SD2 will be issued for informational purposes only; no response will be required. The NEPA document will address recommendations and input received during the scoping process.

3.0 PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA, the environmental analysis will consider the following alternatives, at a minimum: (1) a no-action alternative, (2) the applicant's proposed action, and (3) alternatives to the proposed action.

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Bad Creek Project would continue to operate as required by the current project license (i.e., there would be no change to the existing environment). No new environmental protection, mitigation, or enhancement measures would be implemented. This alternative is the baseline environmental condition for comparison with other alternatives.

3.1.1 Existing Project Facilities

The existing Bad Creek Project includes: (1) a 2,600-foot-long, 355-foot-high main dam composed of an impervious core and rockfill shell, and equipped with 5-foot-high flashboards; (2) a 900-foot-long, 170-foot-high west dam; (3) a 900-foot-long, 90-foot-high east saddle dike; (4) a 363-acre upper reservoir with a gross storage capacity of 35,513 acre-feet at a normal maximum elevation of 2,310 feet mean sea level (msl); (5) an upper reservoir intake channel consisting of a dewatering dam and bellmouth inlet; (6) a 5,026-foot-long water conveyance system consisting of: (a) a 856-foot-long, 29.5-foot-diameter vertical access shaft, (b) 1,186-foot-long, 29.5-foot-wide power tunnel, (c) a manifold tunnel, (d) four, 13.6-foot-diameter steel-lined penstocks, (e) four, 316-foot-long, 16.4-foot-diameter draft tube tunnels, and (f) two, 875-foot-long, 24.6-foot-diameter tailrace tunnels; (7) a 433-foot-long, 164-foot-tall underground powerhouse containing four, Francis reversible-pump turbine-generator units with a total installed capacity of 1,400 MW; (8) an 43.5-foot-high equipment building located about 469 feet above the underground powerhouse; (9) a 118-foot-long, 15-foot-wide reinforced concrete, lower reservoir (Lake Jocassee) [3] inlet/outlet structure, including four, 30-foot-high, 18-foot-wide steel lift gates; (9) generator leads; (10) a transformer yard; (11) a switchyard consisting of: (a) four step-up transformers, (b) one 9.25-mile-long, 100-kilovolt (kV) transmission line, and (c) one 9.25-mile-long, 525-kV line; (12) a 9.25-mile-long, 254-foot-wide transmission line corridor; and (13) appurtenant facilities.

[3] *See* 156 FERC ¶ 62,122 issued August 16, 2016.

The project also includes an existing 4.8-mile road that leads from the project entrance to the powerhouse area near Lake Jocassee.

There are no recreation facilities within the project boundary, and there is no public access to Bad Creek Reservoir due to potential large daily fluctuations in water and public safety considerations. As a requirement of the project's existing license, Duke Energy constructed a portion of the 77-mile Foothills Trail, which is located outside of the project boundary and is maintained by the Foothills Trail Conservancy. Duke Energy does not propose to include the Foothills Trail as a project recreation facility under the new license.

3.1.2 Existing Project Operation

The Bad Creek Project is an automated pumped storage plant where water is regularly moved from the upper reservoir to the lower reservoir during generation, and from the lower reservoir back to the upper reservoir during pumping. All water utilized for generation originates from the 7,980-acre lower reservoir, Lake Jocassee. The lower reservoir has a gross storage capacity of 1,206,798 acre-feet at a normal maximum elevation of 1,110 feet msl. The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet msl (normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet.

However, in practice, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and unit efficiency. Generation usually occurs during the day, while water is pumped from the lower reservoir to partially replenish the upper reservoir at night.

The average annual generation of the project is about 1,884,685 MWh based on the period of record from 2015 to 2020. The average annual energy required for pumping during the same period is about 2,398,114 MWh. Therefore, the net energy consumption of the project is 513,429 MWh. The average cycle efficiency is about 78.6 percent.

3.2 LICENSEE'S PROPOSALS

3.2.1 Proposed Project Facilities and Operation

Duke Energy proposes to use the ILP pre-filing period to analyze the potential to develop a Bad Creek II Complex (Complex). The Complex would consist of a new: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground

powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line.

The Complex powerhouse would include four new, reversible pump-turbine units with an installed generating capacity between 106 MW and 425 MW, and a starting capacity between 308 MW and 372 MW for pumping. Average annual generation for the project would increase by up to 25,856 MWh. With the new pump-turbine units, generating and pumping capacity would increase due to a combination of an increase in flow and improvement in the hydraulic design of the generation runners. The overall cycle capacity would increase by an estimated 80 percent, when all four units are in operation.

No modifications are proposed to the existing upper and lower reservoirs. However, construction of the Complex would require modifications to the existing project boundary to enclose the new facilities. While Duke Energy owns all property required for the existing project in fee simple, a portion of the potential Complex transmission line corridor is currently maintained under a property easement. Duke Energy intends to identify a new project boundary in the final license application that would include all lands necessary for access to, or control of, the expanded project facilities.

If, during prefiling, Duke Energy determines that it will not include the Complex in its final licensing proposal, the licensee proposes instead to continue to operate the project as required by the existing license.

3.2.2 Proposed Environmental Measures

Duke Energy identifies several preliminary studies and environmental protection, mitigation, and enhancement (PM&E) measures in its PAD. The PM&E measures described below address both the potential effects of the new Complex, and the effects of continued project operation, on resources in the project area, as appropriate. The potential need for additional PM&E measures will be evaluated during the relicensing process.

General

- Continue to operate the project in a pumped-storage mode in accordance with the Keowee-Toxaway Project Relicensing Agreement.[4]

[4] The Keowee-Toxaway Relicensing Agreement includes operating provisions and protection, mitigation, and enhancement measures associated with the Keowee-Toxaway

- Consult with resource agencies and other stakeholders through the relicensing process to update the Memorandum of Understanding and 10-Year Work Plans between Duke Energy and the South Carolina Department of Natural Resources to maintain high quality fisheries in Lakes Jocassee and Keowee.

Geology and Soil Resources

- Identify feasible upland areas within the project boundary and/or property owned by Duke Energy to deposit spoils from construction of the proposed Complex.

- Complete a geotechnical investigation and geologic assessment to identify the potential effects of construction and operation of the proposed Complex and inform mitigation measures to maintain geological stability.

Aquatic Resources

- Continue to implement the following operational protocols to reduce entrainment at the Bad Creek Project: (1) minimize, to the extent practicable, the length of time during which the Lake Jocassee surface elevation is below 1,099 feet msl; (2) if Lake Jocassee surface elevation falls below 1,099 feet msl, implement operational changes on turbine unit availability and other operational considerations to minimize fish entrainment, such as turning lights off near inlet/outlet structures and implementing a unit startup and shutdown sequence;[5] and (3) if Lake Jocassee is projected to remain below elevation 1,099 feet msl for 30 or 60 days, notify and/or consult with the resource agencies to determine if additional measures are needed to minimize entrainment.

- Develop a water quality monitoring plan in consultation with the resource agencies that describes methods and reporting criteria for monitoring water

Hydroelectric Project No. 2503 (Keowee-Toxaway Project). Lake Jocassee, the Bad Creek Project's lower reservoir, is part of the Keowee-Toxaway Project.

[5] The pumping protocol includes starting up unit 4 first, followed by units 2, 3, and 1 sequentially. Unit order is reversed during the shutdown sequence.

quality (i.e., DO, temperature, pH, specific conductance, and turbidity) before construction, during construction, and during project operation.

- Develop an erosion and sedimentation control plan to minimize the effects of construction related erosion and sedimentation on water quality and aquatic habitat.

- Develop spill prevention, control, and safety management plans to prevent vehicle spilled fluids from entering the watersheds and harming water quality during construction and operation.

- Consult with the resource agencies and stakeholders through the relicensing process to determine: (1) appropriate measures to protect trout in Lake Jocassee; (2) the need for additional fisheries research and enhancements; and (3) measures for the protection of water quality, fish, and other aquatic resources during construction and operation of the Complex.

Terrestrial Resources and Threatened and Endangered Species

- Consult with resource agencies through the relicensing process to determine: (1) appropriate seasonal restrictions for vegetation clearing and measures for revegetation plans that are protective of plant and wildlife resources; and (2) measures to reduce the potential spread of invasive species during project construction and operation.

- Consult with resource agencies through the relicensing process to determine the need for pre-construction surveys for, and/or conservation measures to protect: (1) special status species such as Chamberlain's dwarf salamander, golden-winged warbler, Edmund's snaketail, Carolina hemlock, Georgia aster, and sun-facing coneflower; and (2) federally listed species including the persistent trillium, smooth coneflower, and small whorled pogonia.

- Consult with resource agencies prior to conducting tree clearing activities to protect special status bats, including the little brown bat, tricolored bat,

eastern small-footed bat, and the federally listed northern long-eared bat and Indiana bat.

Recreation, Land Use, and Aesthetics

- Prepare an updated recreation plan for the project.

- Consult with agencies and relicensing participants to identify and propose measures to address short-term construction-related impacts on boating or land-based recreation amenities.

- Employ common mitigation techniques to reduce impacts to visual resources during and after construction, including minimizing disturbance (e.g., limiting tree clearing and vegetation removal to the extent possible), lighting control, strategic placement of facility appurtenances, and reduction of visual contrast caused by new rights-of-way, access roads laydown areas, and staging areas.

Cultural Resources

- Identify National Register of Historic Places-eligible cultural resources and appropriate resource protection, avoidance, or mitigation measures for historic archaeological, and traditional cultural resources including, but not limited to, development of a Historic Properties Management Plan, installment of temporary fencing to protect cultural resources during construction (if present), avoidance of sensitive areas not directly within the footprint of the Complex facilities (as feasible), and monitoring during construction by a qualified archaeologist for construction in areas where cultural resources are likely to be present.

Developmental Resources

- Complete the ongoing Bad Creek II Complex Feasibility Design Study to analyze potential effects that may result from construction of the Complex, including construction of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse with four pump-turbine units, lower reservoir inlet/outlet structure, transformer yard, and transmission line.

- Conduct a comprehensive transmission line siting study for the proposed Complex to determine environmental effects and identify the preferred route for the new line.

3.3 DAM SAFETY

It is important to note that dam safety constraints may exist and should be taken into consideration in the development of proposals and alternatives considered in the pending proceeding. For example, proposed modifications to the dam structure, such as the addition of flashboards or fish passage facilities, could impact the integrity of the dam structure. As the proposal and alternatives are developed, the applicant must evaluate the effects and ensure that the project would meet the Commission's dam safety criteria found in Part 12 of the Commission's regulations and the Engineering Guidelines (http://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp).

3.4 ALTERNATIVES TO THE PROPOSED ACTION

Commission staff will consider and assess all alternative recommendations for operational or facility modifications, as well as PM&E measures identified by Commission staff, federal and state agencies, Native-American tribes, NGOs, and the public.

3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

At present, we propose to eliminate the following alternatives from detailed study in the NEPA document.

3.5.1 Federal Government Takeover

In accordance with section 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the FPA.[6] We do not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

3.5.2 Non-power License

A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the

[6] 16 U.S.C. §§ 791(a)-825(r).

non-power license. At this time, no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Bad Creek Project should no longer be used to produce power. Thus, we do not consider a non-power license a reasonable alternative to relicensing the project.

3.5.3 Project Decommissioning

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing in most cases.[7] Decommissioning can be accomplished in different ways depending on the project, its environment, and the particular resource needs.[8] For these reasons, the Commission does not speculate about decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or a participant in a relicensing proceeding demonstrates that there are serious resource concerns that cannot be addressed with appropriate license measures and that make decommissioning a reasonable alternative.[9] Duke Energy does not propose decommissioning, nor does the record to date demonstrate there are serious resource concerns that cannot be mitigated if the project is relicensed; as such, there is no reason, at this time, to include decommissioning as a reasonable alternative to be evaluated and studied as part of staff's NEPA analysis.

[7] *See*, e.g., *Eagle Crest Energy Co*., 153 FERC ¶ 61,058, at P 67 (2015); *Public Utility District No. 1 of Pend Oreille County*, 112 FERC ¶ 61,055, at P 82 (2005); *Midwest Hydro, Inc*., 111 FERC ¶ 61,327, at PP 35-38 (2005).

[8] In the unlikely event that the Commission denies relicensing a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2020). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

[9] *See* generally *Project Decommissioning at Relicensing*; Policy Statement, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); *see also City of Tacoma, Washington*, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

4.0 SITE-SPECIFIC RESOURCE ISSUES

4.1 RESOURCE ISSUES

In this section, we present a preliminary list of environmental issues to be addressed in the NEPA document. We identified these issues, which are listed by resource area, by reviewing the PAD and the Commission's record for the Bad Creek Project. This list is not intended to be exhaustive or final, but contains those issues raised to date that could have substantial effects. The resource issue listed below would address the potential effects of the new Complex, as well as the effects of continued project operations under the existing license, as appropriate. After the scoping process is complete, we will review the list and determine the appropriate level of analysis needed to address each issue.

4.1.1 Geology and Soils Resources

- Effects of project construction and spoil disposal on soil erosion and sedimentation.
- Effects of project operation on shoreline erosion along the lower reservoir.
- Effects of project construction on slope instability in the project area.
- Effects of seismic activity in the project area on construction of the Complex, and vice versa.

4.1.2 Aquatic Resources

- Effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in Lake Jocassee and streams in the project vicinity.
- Effects of project operation on water levels in Lake Jocassee.
- Effects of project operation on water quality in Lake Jocassee, including water temperature, dissolved oxygen (DO) concentrations, and vertical mixing of DO.
- Effects of reservoir fluctuations associated with project operation on aquatic habitat and biota in Lake Jocassee.
- Effects of vertical mixing of DO associated with project operation on fish populations in Lake Jocassee.

- Effects of project operation on aquatic habitat and biota in Howard Creek.[10]

- Effects of project induced impingement, entrainment, and turbine mortality on fish populations in Lake Jocassee.

4.1.3 Terrestrial Resources

- Effects of project construction, operation, and maintenance activities, including maintenance for roads and transmission line rights-of-way, and project-related recreation on native plant communities, wetlands, and the spread and control of non-native, invasive plants.

- Effects of the existing and proposed project transmission lines on raptors and other birds, including electrocution and collision hazards.

- Effects of permanent and temporary wildlife habitat loss due to construction of proposed project features and disposal of spoils, including potential loss of habitat that supports foraging and/or nesting raptors and other birds.

- Effects of noise, lighting, vehicular traffic, and human presence during project construction, operation, and maintenance activities on wildlife, including special-status wildlife species, especially during sensitive periods (e.g., migrating or breeding).

- Effects of project construction, operation, maintenance, and project-related recreation on special status species, including the monarch butterfly, a federal candidate species, and its habitat.

4.1.4 Threatened and Endangered Species

- Effects of project construction, operation, maintenance, and project-related recreation on the endangered persistent trillium (*Trillium persistens*), smooth coneflower (*Echinacea laevigata*), and Indiana bat (*Myotis sodalis*),

[10] Howard Creek is a tributary of Lake Jocassee and receives seepage flows from the two earthen dams of the Bad Creek upper reservoir.

and the threatened northern long-eared bat (*Myotis septentrionalis*) and small whorled pogonia (*Isotria medeoloides*).[11]

4.1.5 Recreation, Land Use, and Aesthetics

- Effects of proposed project construction, operation, and maintenance on recreational use in the project-affected area.

- Effects of project construction, operation, and maintenance existing land uses in the project-affected area.

- Effects of project construction, operation (including the presence of project facilities), and maintenance activities on visual resources.

4.1.6 Cultural Resources

- Effects of project construction, operation, and maintenance activities on historic and archaeological resources, traditional cultural properties, and access to exercise traditional practices and treaty rights.

4.1.7 Socioeconomics

- Effects of project construction and operation activities on local roads (including traffic), housing, businesses, employment opportunities, and government services.

- Effects of project construction and operation activities on human health or the environment in identified environmental justice communities.

4.1.8 Noise, Air Quality, and Traffic

- Effects of project construction on noise levels in the project area.

- Effects of project construction activities on air quality.

- Effects of project construction on traffic and road networks in the project area.

[11] On April 11, 2022, Commission staff accessed the U.S. Fish and Wildlife Service's Information for Planning and Consultation (IPaC) database, and filed the IPaC official species list for the Bad Creek Project on April 12, 2022. The Indiana bat is discussed in Duke's PAD, but it does not appear on the official species list for the project.

4.1.9 Developmental Resources

- Effects of proposed or recommended environmental measures on project generation and economics.

5.0 PROPOSED STUDIES

Initial study proposals from Duke Energy are identified by resource area, below in Table 1, and in the PAD. Further studies may need to be added to this list based on comments provided to the Commission and Duke Energy from agencies, Native-American tribes, and interested parties during the study planning process.

Table 1. Duke Energy's initial study proposals for the Bad Creek Project (source: Duke Energy, Bad Creek Project PAD).

Resource Area and Issue	Duke Energy's Proposed Study
1. General	Use a three-dimensional computational flow dynamics model (CFD)[12] to evaluate the effects of water discharge from the Complex on shoreline erosion, vertical mixing of DO, and water-based recreation in Lake Jocassee.
2. Geology and Soil Resources	Identify feasible upland areas within the project boundary and/or property owned by Duke Energy to deposit spoils from construction of the Complex.
3. Geology and Soil Resources	Complete a geotechnical investigation and geological assessment to identify potential effects of the Complex, and inform mitigation measures to maintain geological stability.
4. Fish and Aquatic Resources	Conduct a water quality study that includes: (1) a literature review of available water quality data, (2) water quality standards, (3) current designated uses in the project boundary and Lake Jocassee, (4) an evaluation of the potential impacts of excavated material in upland disposal areas and at the submerged weir on water quality; and (5) development of a water quality monitoring plan in consultation with the resource agencies to monitor water quality prior to construction, during construction, and after construction.

[12] In the PAD, Duke Energy indicates that a preliminary CFD model has been developed and will be updated to reflect the working design of the Complex.

Resource Area and Issue	Duke Energy's Proposed Study
5. Fish and Aquatic Resources	Implement updates to the desktop entrainment study[13] based on consultation with stakeholders during the relicensing process.
6. Fish and Aquatic Resources	Conduct presence/absence surveys for mussels and other protected aquatic species in streams potentially impacted by potential project construction.
7. Recreation	Develop an understanding of existing recreation use and needs for future recreation development at the project through a mixed-method approach including background research, stakeholder consultation, and data collection to include spot and/or continuous visitor counts, aerial photography, and visitor use surveys.
8. Recreation and Public Safety	Evaluate safety risks to the public generally, and boaters specifically during both construction and operation of the Complex.
9. Aesthetic Resources	Assess aesthetic resources near the project and evaluate impacts of construction and operation of the Complex on these resources.
10. Cultural Resources	Conduct archaeological surveys for all non-steep landforms as well as architectural surveys of any structures at or near the project that are 40 or more years old.
11. Developmental Resources	Complete the Bad Creek II Feasibility Design Study to analyze potential effects that may result from construction of the Complex.
12. Developmental Resources	Conduct a transmission line siting study for the potential Complex.

6.0 REQUEST FOR INFORMATION AND STUDIES

We are asking federal, state, and local resource agencies, Native-American tribes, NGOs, and the public to forward to the Commission any information that will assist us in conducting an accurate and thorough analysis of the project-specific effects associated

[13] Appendix F of Duke Energy's PAD includes a desktop entrainment analysis that evaluated the addition of a second powerhouse identical in size and capacity to the existing powerhouse.

with relicensing the Bad Creek Project. The types of information requested include, but are not limited to:

- information, quantitative data, or professional opinions that may help define the scope of the analysis, and that helps identify significant environmental issues;

- identification of, and information from, any other EA, EIS, or similar environmental study (previous, on-going, or planned) relevant to the proposed relicensing of the Bad Creek Project;

- existing information and any data that would help characterize environmental conditions and habitats and in the assessment of project effects on environmental resources;

- the identification of any relevant federal, state, or local resource plans, documentation showing why any resources should be excluded from further study or consideration; and

- study requests by federal and state agencies, local agencies, Native-American tribes, NGOs, and the public that would help provide a framework for collecting pertinent information on the resource areas under consideration necessary for the Commission to prepare the NEPA document for the project.

All requests for studies filed with the Commission must meet the criteria found in Appendix A, *Study Plan Criteria*.

The requested information, comments, and study requests should be submitted to the Commission no later than **June 23, 2022**. All filings must clearly identify the following on the first page: **Bad Creek Pumped Storage Project (P-2740-053)**. Scoping comments may be filed electronically via the Internet. *See* 18 C.F.R. 385.2001(a)(1)(iii) and the instructions on the Commission's website http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

In lieu of electronic filing, you may submit a paper copy. Submissions sent via the U.S. Postal Service must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose,

Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852.

Register online at http://www.ferc.gov/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov

Any questions concerning the scoping meetings, environmental site review, or how to file written comments with the Commission should be directed to Navreet Deo at (202) 502-6304, or navreet.deo@ferc.gov. Additional information about the Commission's licensing process and the Bad Creek Project may be obtained from the Commission's website, www.ferc.gov.

7.0 NEPA DOCUMENT PREPARATION SCHEDULE

The NEPA document will be distributed to all persons and entities on the Commission's service and mailing lists for the Bad Creek Project. The document will include our recommendations for operating procedures, as well as environmental protection and enhancement measures that should be part of any new license issued by the Commission. All recipients will then have 30 days to review the NEPA document and file written comments with the Commission. All comments on the NEPA document filed with the Commission will be considered in preparation of the license order.

The major milestones, including those for preparing the NEPA Document,[14] are as follows:

Major Milestone	Target Date
Scoping Meeting	May 2022
License Application Filed	July 2025
Ready for Environmental Analysis Notice Issued	September 2025
Deadline for Filing Comments, Recommendations, and Agency Terms and Conditions/Prescriptions	November 2025
NEPA Document Issued	July 2026
Comments on NEPA Document Due	August 2026
Major Milestone	Target Date
Deadline for Filing Modified Agency Recommendations	October 2026

[14] This schedule assumes that a single EA would be prepared. If a draft and final EA, or EIS is prepared, the target dates for comments on the draft EA or EIS and deadline for filing modified agency recommendations may need to be revised.

If Commission staff determines that there is a need for additional information or additional studies, the issuance of the Ready for Environmental Analysis notice could be delayed. If this occurs, all subsequent milestones would be delayed by the time allowed for the licensee to respond to the Commission's request. A copy of the process plan, which has a complete list of the relicensing milestones for the Bad Creek Project, including those for developing the license application, is attached as Appendix B to this SD1.

8.0 COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. section 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. The staff has preliminarily identified and reviewed the plans listed below that may be relevant to the Bad Creek Project. Agencies are requested to review this list and inform the Commission staff of any changes. If there are other comprehensive plans that should be considered for this list that are not on file with the Commission, or if there are more recent versions of the plans already listed, they can be filed for consideration with the Commission according to 18 C.F.R. § 2.19 of the Commission's regulations. Please follow the instructions for filing a plan at http://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf.

The following is a list of comprehensive plans currently on file with the Commission that may be relevant to the Bad Creek Project:

Atlantic States Marine Fisheries Commission. 1996. Interstate fishery management plan for weakfish. (Report No. 27). May 1996.

Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (*Acipenser oxyrhynchus*). (Report No. 31). July 1998.

Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.

Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.

Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). (Report No. 36). April 2000.

Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.

Atlantic States Marine Fisheries Commission. 2008. Amendment 2 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2008.

Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.

Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. February 2010.

Atlantic States Marine Fisheries Commission. 2013. Amendment 3 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. August 2013.

Atlantic States Marine Fisheries Commission. 2014. Amendment 4 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2014.

Forest Service. 2004. Sumter National Forest revised land and resource management plan. Department of Agriculture, Columbia, South Carolina. January 2004.

National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.

National Marine Fisheries Service, North Carolina Wildlife Resources Commission, South Carolina Department of Natural Resources, and U.S. Fish and Wildlife Service. 2017. Santee Basin Diadromous Fish Passage Restoration Plan. 2017.

National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

South Carolina Department of Health and Environmental Control. 1989. Assessment of non-point source pollution for the State of South Carolina. Columbia, South Carolina. April 1989.

South Carolina Department of Health and Environmental Control. 1989. Non-point source management program for the State of South Carolina. Columbia, South Carolina. April 1989.

South Carolina Department of Parks, Recreation, & Tourism. 2008. South Carolina State Comprehensive Outdoor Recreation Plan (SCORP). Columbia, South Carolina. April 2008.

South Carolina Department of Parks, Recreation, & Tourism. 2002. The South Carolina State Trails Plan. Columbia, South Carolina. 2002.

South Carolina Department of Natural Resources. 2014. South Carolina's State Wildlife Action Plan 2015. Columbia, South Carolina. October 2014.

South Carolina Department of Natural Resources. 2004. South Carolina Water Plan-Second Edition. Columbia, South Carolina. January 2004.

South Carolina Water Resources Commission. 1985. Instream flow study - Phase I: identification and priority listing of streams in South Carolina for which minimum flow levels need to be established. Report No. 149. Columbia, South Carolina. June 1985.

South Carolina Water Resources Commission. 1988. Instream flow study - Phase II: determination of minimum flow standards to protect instream uses in priority stream segments. Report No. 163. Columbia, South Carolina. May 1988.

South Carolina Water Resources Commission. National Park Service. 1988. South Carolina rivers assessment. Columbia, South Carolina. September 1988.

South Carolina Wildlife and Marine Resources Department. 1989. South Carolina instream flow studies: a status report. Columbia, South Carolina. June 1, 1989.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

9.0 MAILING LISTS

The list below is the Commission's official mailing list for the Bad Creek Project included in this scoping document. If you want to receive future mailings for this proceeding and are not included in the list below, please send your request by email to efiling@ferc.gov or by mail to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. All written or emailed requests to be added to the mailing lists must clearly identify the following on the first page, as appropriate: **Bad Creek Pumped Storage Project (P-2740-053).** You may use the same method if requesting removal from the mailing list below.

Register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this project or other pending projects. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

Official Mailing List for the Bad Creek Pumped Storage Project

Paul Nolan Energy Consultant 5515 17th Street North Arlington, Virginia 22205-2722	David Bernhart Assistant Regional Administrator NOAA National Marine Fisheries Service-SERO 263 13th Avenue South St. Petersburg, Florida 33701-5505
Patrick T McHenry Honorable U.S. House of Representatives 224 Cannon Washington, District of Columbia 20515	

APPENDIX A

STUDY PLAN CRITERIA

18 C.F.R. Section 5.9(b)

Any information or study request must contain the following:

1. Describe the goals and objectives of each study proposal and the information to be obtained;

2. If applicable, explain the relevant resource management goals of the agencies or Native-American tribes with jurisdiction over the resource to be studied;

3. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

4. Describe existing information concerning the subject of the study proposal, and the need for additional information;

5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

7. Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

APPENDIX B

BAD CREEK PUMPED STORAGE PROJECT
PROCESS PLAN AND SCHEDULE

Shaded milestones are unnecessary if there are no study disputes. If the due date falls on a weekend or holiday, the due date is the following business day. Early filings or issuances will not result in changes to these deadlines. As appropriate, the process plan and schedule may be revised in the future.

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§ 5.5(a)	Duke Energy	Filing of NOI and PAD	Actual filing date	2/23/2022
§ 5.7	FERC	Initial Tribal Consultation Meeting	Within 30 days of NOI and PAD notice (Waived)	3/25/2022
§5.8	FERC	FERC Issues Notice of Commencement of Proceeding and SD1	Within 60 days of NOI and PAD notice	4/22/2022
§5.8 (b)(3)(viii)	FERC/ Stakeholders	Public Scoping Meetings and Environmental Site Review	Within 30 days of NOI and PAD notice and issuance of SD1	5/16/2022 & 5/17/2022
§ 5.9	Stakeholders / FERC	File Comments on PAD, SD1, and Study Requests	Within 60 days of NOI and PAD notice and issuance of SD1	6/23/2022
§5.10	FERC	FERC Issues SD2, if necessary	Within 45 days of deadline for filing comments on SD1	8/5/2022
§5.11(a)	Duke Energy	File PSP	Within 45 days of deadline for filing comments on SD1	8/8/2022
§5.11(e)	Duke Energy / Stakeholders	Study Plan Meetings	Within 30 days of deadline for filing proposed Study Plans	9/6/2022
§5.12	Stakeholders	File Comments on PSP	Within 90 days after proposed study plan is filed	11/7/2022

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.13(a)	Duke Energy	File RSP	Within 30 days following the deadline for filing comments on proposed Study Plan	12/5/2022
§5.13(b)	Stakeholders	File Comments on RSP	Within 15 days following Revised Study Plan	12/20/2022
§5.13(c)	FERC	FERC Issues SPD	Within 30 days following Revised Study Plan	1/4/2023
§5.14(a)	Mandatory Conditioning Agencies	Notice of Formal Study Dispute	Within 20 days of Study Plan determination	1/24/2023
§5.14(l)	FERC	Study Dispute Determination	Within 70 days of notice of formal study dispute	4/4/2023
§5.15(a)	Duke Energy	Conduct First Season Field Studies	May 2023 – April 2024	
§5.15(c)(1)	Duke Energy	File ISR	No later than one year from Study Plan approval	1/4/2024
§5.15(c)(2)	Duke Energy	ISR Meeting	Within 15 days of Initial Study Report	1/19/2024
§5.15(c)(3)	Duke Energy	File ISR Meeting Summary	Within 15 days of Study Results Meeting	2/5/2024
§5.15(c)(4)	Stakeholders / FERC	File Meeting Summary Disagreements/Modifications to Study/Requests for New Studies	Within 30 days of filing Meeting Summary	3/4/2024
§5.15(c)(5)	Duke Energy	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	4/3/2024
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination	Within 30 days of filing responses to disputes	5/3/2024

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.15	Duke Energy	Conduct Second Season Field Studies	May 2024 – April 2025	
§5.15 (f)	Duke Energy	File USR	No later than two years from Study Plan approval	1/3/2025
§5.15(c)(2)	Duke Energy	USR Meeting	Within 15 days of Updated Study Report	1/18/2025
§5.15(c)(3)	Duke Energy	File USR Meeting Summary	With 15 days of Study Results Meeting	2/3/2025
§5.15(c)(4)	Stakeholders / FERC	File Meeting Summary Disagreements/ Modifications to Study Requests/Requests for New Studies	Within 30 days of filing Meeting Summary	3/4/2025
§5.15(c)(5)	Duke Energy/ Stakeholders	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	4/3/2025
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination	Within 30 days of filing responses to disagreements	5/1/2025
§5.16(a)	Duke Energy	File PLP (or DLA) with FERC and distribute to Stakeholders	Not later than 150 days before final application is filed	3/3/2025
§5.16 (e)	FERC / Stakeholders	Comments on PLP, Additional Information Request	Within 90 days of filing Preliminary Licensing Proposal (or Draft License Application)	6/2/2025
§5.17 (a)	Duke Energy	License Application Filed	Within 2 years of license expiration	7/31/2025

Meeting Summary

Project:	Bad Creek Pumped Storage Project (FERC No. 2740)
Subject:	Bad Creek Relicensing Stakeholder Team Kick-off Meeting
Date:	Tuesday, May 31, 2022
Location:	Duke Energy - Greenville Office 425 Fairforest Way Room 100 Greenville, SC 29607
Attendees:	Elizabeth Miller (SC DNR) Rowdy Harris (SCPRT) Sue Williams (Advocates for Quality Development) Gerry Yantis (Advocates for Quality Development) Phil Mitchell (Fisher Knob HOA) Andrew Gleason (Foothills Trail Conservancy) Bill Ranson (Foothills Trail Conservancy) Glen Hilliard (Foothills Trail Conservancy - Advisor) Dale Wilde (Friends of Lake Keowee Society) Wes Cooler (Naturaland Trust) Andy Douglas (SC Wildlife Federation) Chris Starker (Upstate Forever) Erika Hollis (Upstate Forever) Michael Abney (Duke Energy) Jennifer Bennett (Duke Energy) Ed Bruce (Duke Energy) Jeff Lineberger (Duke Energy) Christy Churchill (Duke Energy) John Crutchfield (Duke Energy) Lynne Dunn (Duke Energy) Paul Keener (Duke Energy) Maverick Raber (Duke Energy) Alan Stuart (Duke Energy) Nick Wahl (Duke Energy) Ben Williamson (Duke Energy) Sarah Kulpa (HDR) Maggie Salazar (HDR)

Overview

This meeting summary provides documentation of the Duke Energy Carolinas, LLC Bad Creek Pumped Storage Project (Project) stakeholder meeting in support of the Project relicensing. The meeting was held in person at Duke's office in Greenville, SC. A copy of the presentation and a copy of the sign-in sheets are attached to this meeting summary (Attachments 1 and 2).

Welcome and Introductions

Alan Stuart welcomed participants, reviewed the agenda, and introduced the purpose of the meeting. Individuals provided an introduction and signed in. A. Stuart noted that the U.S. Fish and Wildlife Service and the S.C. Department of Health and Environmental Control will participate in the core stakeholder group, but could not attend this meeting. Chris Starker asked if the cultural resource agencies and Tribes will participate. A. Stuart confirmed the tribal entities to which Duke and FERC have reached out (Eastern Band of Cherokee Indians, Catawba Indian Nation, United Keetowah Band of Cherokee Indians, Cherokee Nation of Oklahoma, and also noted that Dr. Wenonah Haire (Catawba Indian Nation Tribal Historic Preservation Officer) asked for a copy for the Pre-Application Document (PAD) which was sent. A. Stuart thanked participants who had returned and completed the stakeholder "application" he recently distributed.

Participants introduced themselves and described their role/interest in the relicensing, including:

- Fisher Knob HOA – 21 homeowners, shared access road off Highway 130, concerned about access during construction and interest in developing a secondary access road
- Upstate Forever – multiple issues, including focus on clean water
- Naturaland Trust – ownership of 500 acres in the vicinity of Lake Jocassee and in the vicinity of the Bad Creek-Jocassee transmission corridor
- Advocates for Quality Development – focus on sustainable and quality development in Pickens and Oconee Counties
- Friends of Lake Keowee Society – natural resource education, environmental monitoring
- SC Wildlife Federation – preservation and habitat protection and enhancement, adopt-a-stream programs

Safety Moment

A. Stuart presented a safety moment on distracted driving.

Project Overview

A. Stuart familiarized participants with the Project location. As a follow-up to a question raised during the Scoping Meeting about alternate pumped storage sites previously studied by Duke Energy, A. Stuart presented the approximate locations of the Coley Creek and Limber Pole project tracts. Duke Energy retains ownership and development rights of these parcels for future pumped storage development. A. Stuart explained that Duke expects to retain these rights, because future generation and storage needs are uncertain, but does not have any active plans for their development. A. Stuart noted that the Foothills Trail goes through the Coley Creek tract. Wes Cooler asked what the boundaries shown on the presentation slide represent, and A. Stuart noted that it is just the parcel boundary, not a particular project or reservoir boundary and pointed out the conceptual dam locations on the figure. A. Stuart noted that Coley Creek Project Tract is likely the Long Spur Ridge site brought up by Chris Starker in the Scoping Meeting. A. Stuart noted that Duke had put together a pre-filing application for Coley Creek 20-30 years ago but it was never filed with FERC. Jeff Lineberger clarified that the size of the project boundary scaling is not to scale on the figure shown but is generally accurate depicting the potential locations, however Lake Jocassee is a prime location for pumped storage due to the elevation and rainfall.

A. Stuart updated the group on the ongoing Bad Creek powerhouse upgrades.

A. Stuart provided examples of Relicensing (or Settlement) Agreements including both “off-license” (i.e., outside of FERC jurisdiction and project boundary) and “in-license” agreements. A. Stuart noted that a settlement agreement with the stakeholders is a desirable outcome for this relicensing.

A. Stuart reviewed the Integrated Licensing Process (ILP process and reasoning for choosing this regulatory process instead of the Traditional Licensing Process (TLP).

A. Stuart noted that Duke Energy is anticipating making a decision in 2024 (prior to the license application filing) on whether to advance the development proposal for the Bad Creek II Complex, but that Duke Energy could change direction before or after that time. In the event that the license issued by FERC (expected 2027) includes provisions for construction and protection, mitigation and enhancement measures (PME) for Bad Creek II, and the project is then cancelled by Duke, Duke would pursue an amendment of the license to remove these conditions. A. Stuart noted that a cost benefit analysis will be internally reviewed for the Bad Creek II Complex at multiple points over the next few years, and cost could inhibit the viability of the project expansion. However, A. Stuart clarified that at this point, construction of the Bad Creek II Complex is a good path forward for storing more energy needed to meet Duke’s generation needs for current and future renewable generation.

A. Stuart reinforced that this group will be the core stakeholders and reviewed expectations, including time commitments, agreement (not signing) with the terms of a charter, and process efficiency. Specific Resource Committee meetings will be set up by Duke Energy resource specialists. Meeting summaries will be taken and shared with the larger stakeholder group. A. Stuart reviewed the Resource Committee Duke leads:

- Lead Technical Manager – John Crutchfield
- Aquatics – Mike Abney and Nick Wahl
- Cultural Resources – Christy Churchill
- Recreation & Aesthetics – Jennifer Bennett
- Water Quality – Maverick Raber
- Operations – Lynne Dunn and Ed Bruce
- Wildlife & Botanical – Mike Abney and Scott Fletcher

A. Stuart clarified that the Proposed Study Plans will be worked on this year. Sarah Kulpa noted that baseline terrestrial surveys had been performed in support of the PAD, and detailed species surveys are not proposed for the ILP, because project construction isn’t scheduled to begin until 2027. Where detailed species (or wetlands) surveys are required by regulatory agencies, Duke would expect to perform those at an appropriately close interval prior to disturbance.

A. Stuart told the group that a secure SharePoint site will be used for sharing files, reviews, and document control. S. Kulpa reminded the group of the public website and noted the SharePoint site would be internal to the core stakeholder group. HDR will provide technical support/troubleshooting for SharePoint access. Access is easier if individuals have a Microsoft online/365 account. A. Stuart suggested a virtual tutorial for using SharePoint. A. Stuart noted that correspondence logs will be maintained through the relicensing. A. Stuart hopes to do quarterly newsletters so that stakeholders can share with their constituents.

A. Stuart noted that site visits to (tours) the Bad Creek facility are starting to being held again now that the COVID pandemic is subsiding. Availability of Duke Energy's group bus is necessary for scheduling. Interested individuals and organizations should contact Duke.

A. Stuart reviewed the overall relicensing schedule and provided milestones and important comment periods for the stakeholders, FERC staff, and Duke Energy.

Dale Wilde noted that FOLKS support the Bad Creek II Complex, however recommended Duke Energy to increase their public engagement and information sharing, so misinformation is not spread. A. Stuart agreed and noted that the public website is a means to disseminate information to anyone who wants it. A. Stuart will look into public meetings or an additional education campaign further internally.

A. Stuart added that later in the process, Duke Energy would likely engage a professional facilitator for stakeholder meetings (similar to role of Ken Kearns – now retired – in the Keowee-Toxaway relicensing). Duke has not yet identified a facilitator and welcomes suggestions from the group.

J. Lineberger noted that the relicensing process is much different than when the Bad Creek Project was originally constructed.

A. Stuart noted that the next stakeholder meeting would be in near the near future, but date is TBD. Greenville will likely be the meeting point since there are people coming from Charlotte, NC and Charleston, SC. Resource Committee group leads will schedule the meetings and provide next steps. Virtual (Teams) meetings will also be utilized to increase stakeholder team meeting efficiencies and reduce travel.

A. Stuart asked the group for identification of representative and alternative/or agency contacts by June 14, 2022 and sign up for Resource Committees by June 23, 2022.

Attachment 1

Attachment 1 – Meeting Presentation

Bad Creek Hydroelectric Project (FERC No. 2740)

Relicensing Stakeholder Kick-off Meeting

May 31, 2022

MEETING AGENDA

- Welcome
- Safety Moment
- Introductions
  - Duke Energy
  - Consultants
  - State and Federal Agencies
  - Local and County Governments
  - Non-Governmental Organizations
- Bad Creek Project and Relicensing Process Presentation
- Lunch (provided)
- Relicensing Process Next Steps/2022 Detail Schedule Review
- Open Discussion
- Action Items
- Adjourn

Safety Moment – Distracted Driving

Every day about 8 people in the U.S. are killed in crashes reported to involve a distracted driver.

Stay focused and avoid phone calls and text messages

If you need to read directions, pull over

Don’t reach for items while driving

Make all adjustments before driving (mirrors, phone holder, seat position, etc.)

Keep your emotions in check

Introductions

- Duke Energy
- Consultants
- State and Federal Agencies
- Local and County Governments
- Non-Governmental Organizations

Today's Objectives

Introduce Relicensing in Detail

Background Information

Integrated Licensing Process

Duke's Relicensing Process

Request Participation

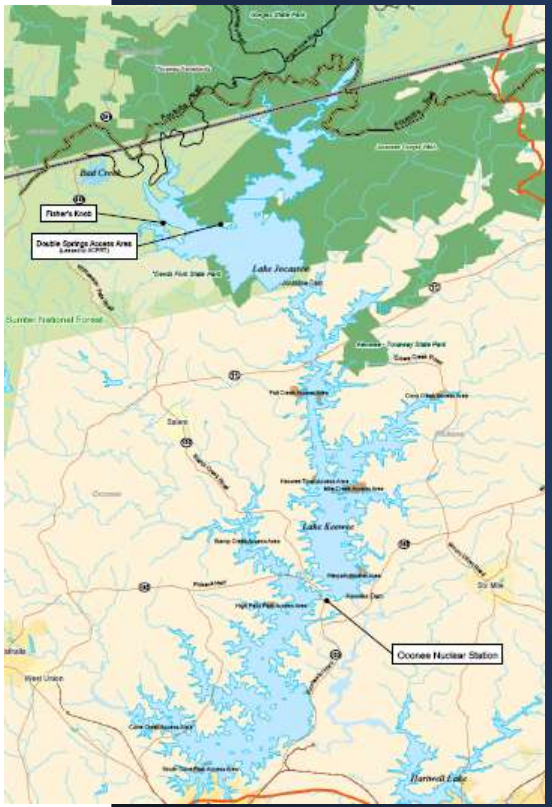
Process Input/Feedback

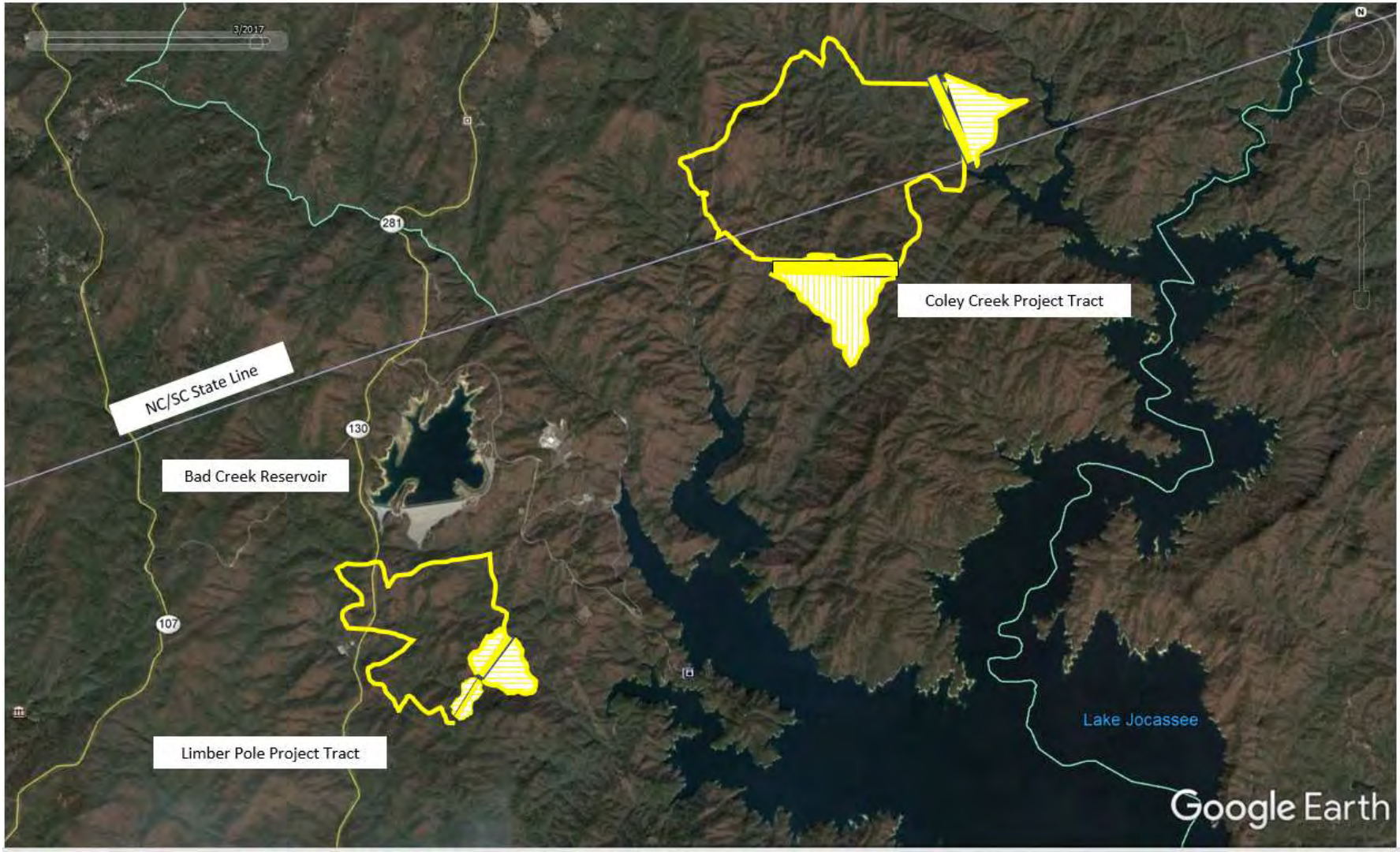
Stakeholder Team

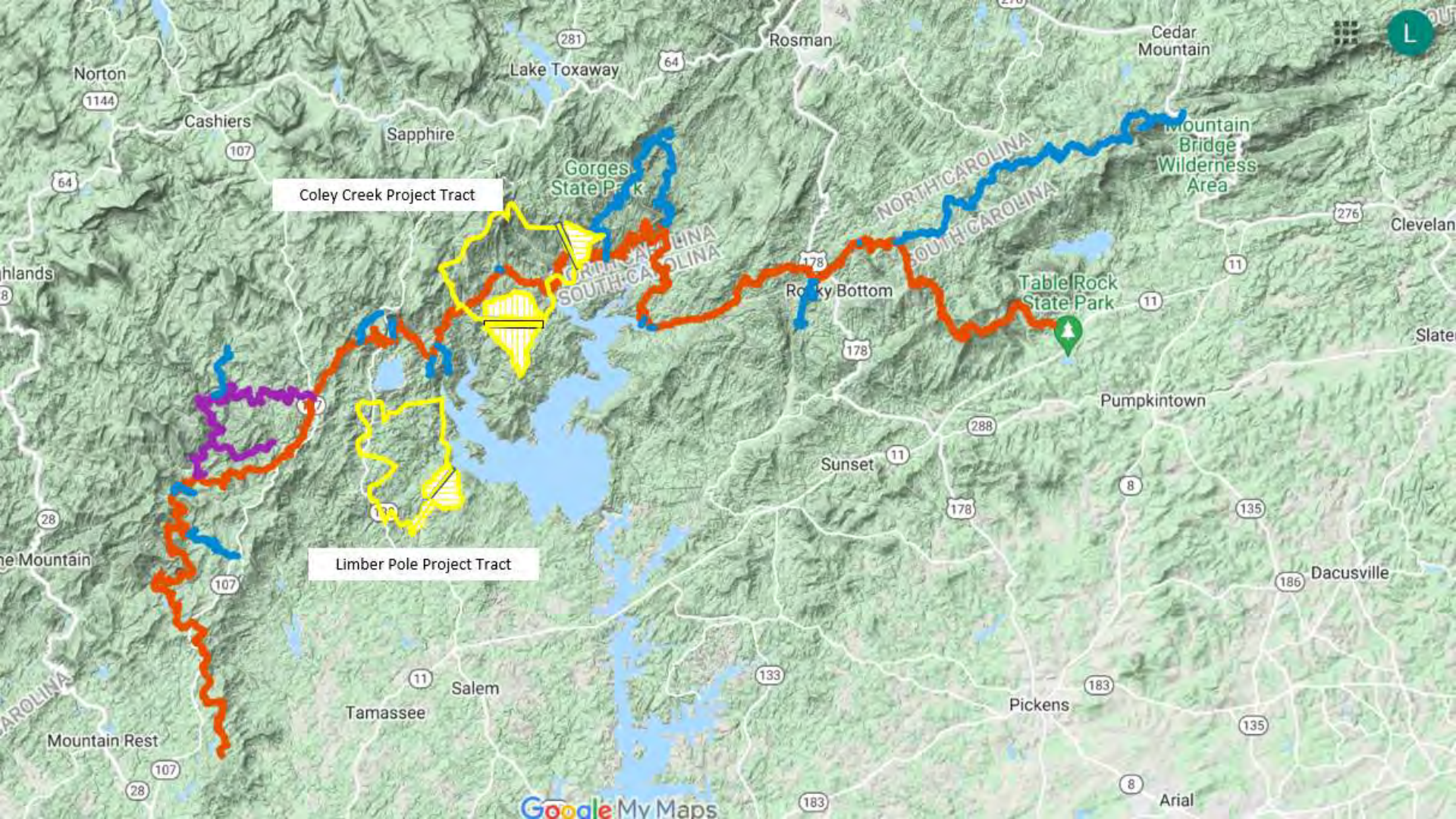
- Resource Committees

BC Project - Overview

- Single Development
  - Oconee County, SC
- Original License Issued 1977
- License Application Due July 31, 2025

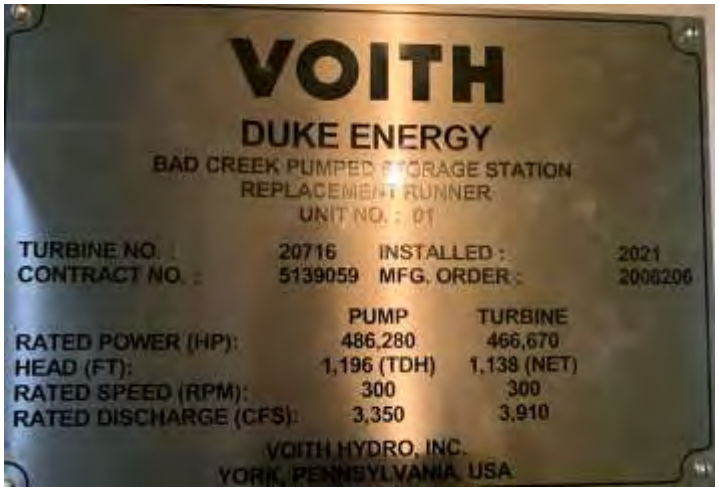



3/2017
281
Coley Creek Project Tract
NC/SC State Line
130
Bad Creek Reservoir
107
Limber Pole Project Tract
Lake Jocassee
Google Earth


Coley Creek Project Tract
Limber Pole Project Tract
Norton
Cashiers
Sapphire
Lake Toxaway
Rosman
Cedar Mountain
Gorges State Park
Mountain Bridge Wilderness Area
NORTH CAROLINA
SOUTH CAROLINA
Rocky Bottom
Table Rock State Park
Pumpkintown
Sunset
Salem
Tamassee
Mountain Rest
Pickens
Dacusville
Arial
Google My Maps

BC Powerhouse

- 1,400 MW Authorized Installed Capacity
- 4 - Pumped/Generator Turbines
  - Francis Style
  - Maximum Hydraulic Capacity = 19,760 cfs (Gen Mode)
  - Unit rotation speed = 300 rpms (Gen mode)



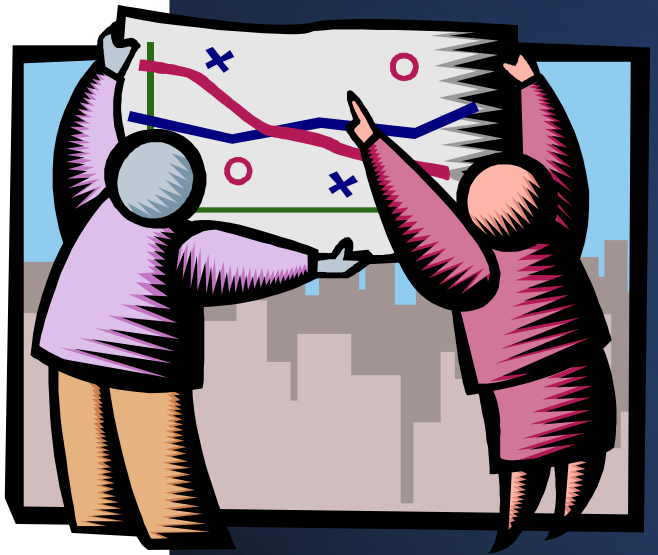
Existing Uprated Bad Creek – Maximum Flow		
Item	Turbine Mode	Pump Mode
Duration (hours)	20	26
MWh	30,379	38,803
Maximum Power (MW)	1,695	1,595

Existing Uprated Bad Creek – Best Efficiency		
Item	Turbine Mode	Pump Mode
Duration (hours)	23	26
MWh	31,440	38,803
Maximum Power (MW)	1,426	1,595

Duke Energy's Relicensing Roles

- File a timely & complete application
  - Conduct studies
  - Maintains schedules
  - Prepares documents

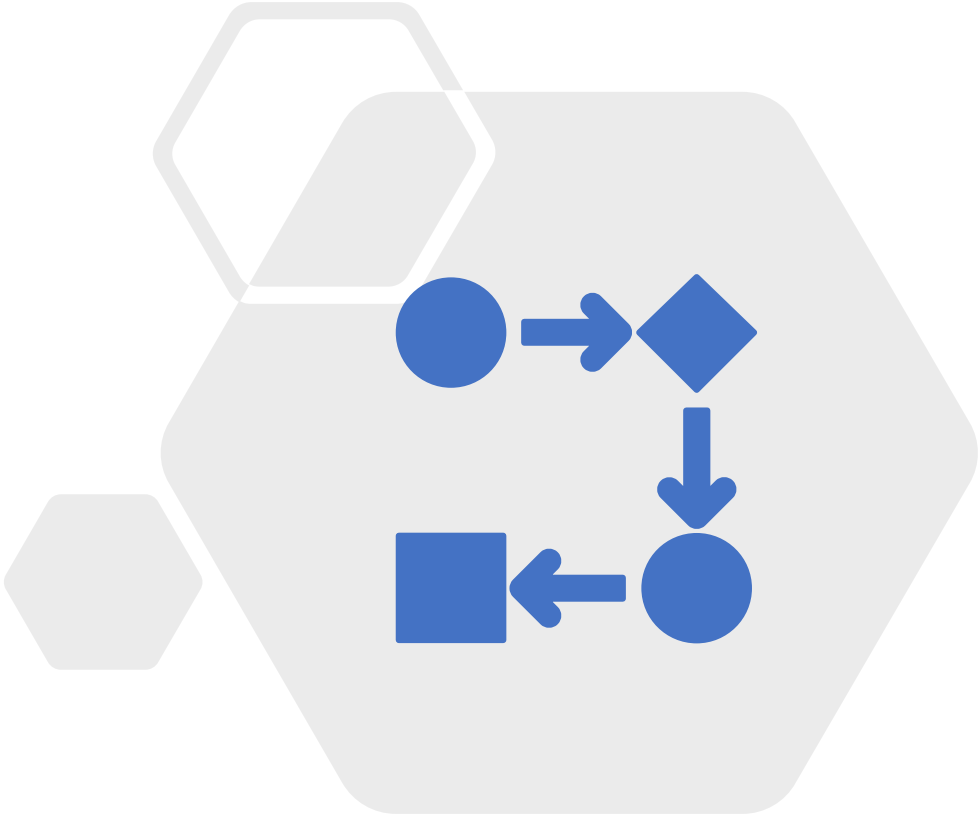
- Convener
  - Sponsors Stakeholder Team
  - Coordinates Resource Committees



Stakeholder Interests

- Sustainable, cost-effective solutions
- Cooperation
- Mutual-gain negotiations
- Relicensing Agreement

The Relicensing Process



Integrated Licensing Process (ILP)

ILP	TLP/ALP
Rigid timeline	Process can linger
PAD	First Stage Consultation Document
Scoping early in process	Scoping after license application is filed
Study Plan approval by FERC	No study approval

ILP Lessons Learned

Stay ahead of the process

Understand the process and schedule

Study criteria

Objective of study

Resource management goals OR Public interest considerations

Existing data and reason more is needed

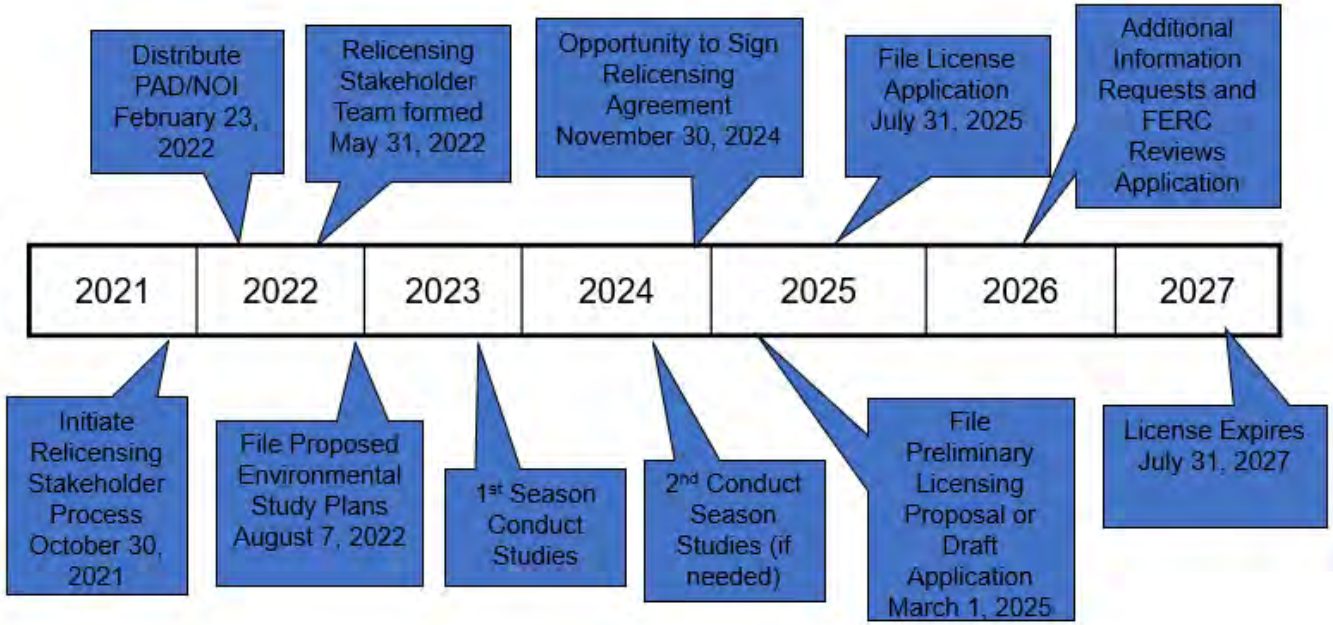
Project nexus

Methodology

Cost considerations

Be efficient with communications & meetings

Bad Creek ILP Relicensing Timeline Overview



RELICENSING STAKEHOLDER TEAM

FEDERAL AGENCIES

- ❑ U.S. Fish and Wildlife Service
- ❑ U.S. Forest Service – Sumter National Forest

SOUTH CAROLINA STATE AGENCIES

- ❑ South Carolina Department of Archives and History
- ❑ South Carolina Department of Health and Environmental Control
- ❑ South Carolina Department of Natural Resources
- ❑ South Carolina Department of Parks, Recreation & Tourism

TRIBES

- ❑ Catawba Indian Nation
- ❑ Eastern Band of Cherokee Indians

LOCAL GOVERNMENT

- ❑ Oconee County

NON-GOVERNMENTAL ORGANIZATIONS

- ❑ Advocates for Quality Development
- ❑ Fishers Knob Homeowners Association
- ❑ Foothills Trail Conservancy
- ❑ Friends of Lake Keowee Society
- ❑ Naturaland Trust
- ❑ South Carolina Wildlife Federation
- ❑ Upstate Forever

Expectations for Stakeholders

5-year time commitment

Quarterly meetings transition to monthly

Resource Committee Meetings more frequent and as needed

Charter

Attendance requirements

Conduct in and out of meetings

Process Efficiency

Electronic communications & tools

Efficient use of meeting time

Virtual Meetings ok so long as they are productive and useful in keeping deadlines.

Relicensing Agreements (RA)

- Optional
- Resolve all substantial issues
- Legally binding contracts
- Duke RAs
  - Keowee-Toxaway
  - Nantahala
  - Tuckasegee
  - Catawba-Wateree

Electronic Communications

Communications Protocol

Objectives

- Efficient dissemination of information
- Limit paper consumption
- Maintain consultation record

Primary Communications Channels will be Electronic

Electronic Communications

- Meeting notices, agenda, summaries, study plans, study reports – Email & Website
- Quarterly Newsletters- Email
- Information Requests will be funneled through respective Resource Committee
- Study reports – Email & Website*
- Preliminary Licensing Proposal, License Application – Website and DVD*

** Hard copies available to agencies and tribes upon written request*

BC Relicensing: Resource Committees

- Lead Technical Manager (John Crutchfield)

- Aquatics (Mike Abney and Nick Wahl)
- Cultural Resources (Christy Churchill)
- Recreation & Aesthetics (Jennifer Bennett)
- Water Quality (Maverick Raber)
- Operations (Lynne Dunn and Ed Bruce)
- Wildlife & Botanical (Mike Abney and Scott Fletcher)

Study Request Criteria

Describe	Describe the goals and objectives of each study proposal and the information to be obtained.
Explain	If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.
Explain	If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Study Request Criteria (cont.)

Describe	Describe existing information concerning the subject of the study proposal, and the need for additional information.
Explain	Explain the nexus between project operations and effects on the resource to be studies, and how the study results would inform the development of license requirements.
Explain	Explain how any proposed study methodology is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

Study Request Criteria (cont.)

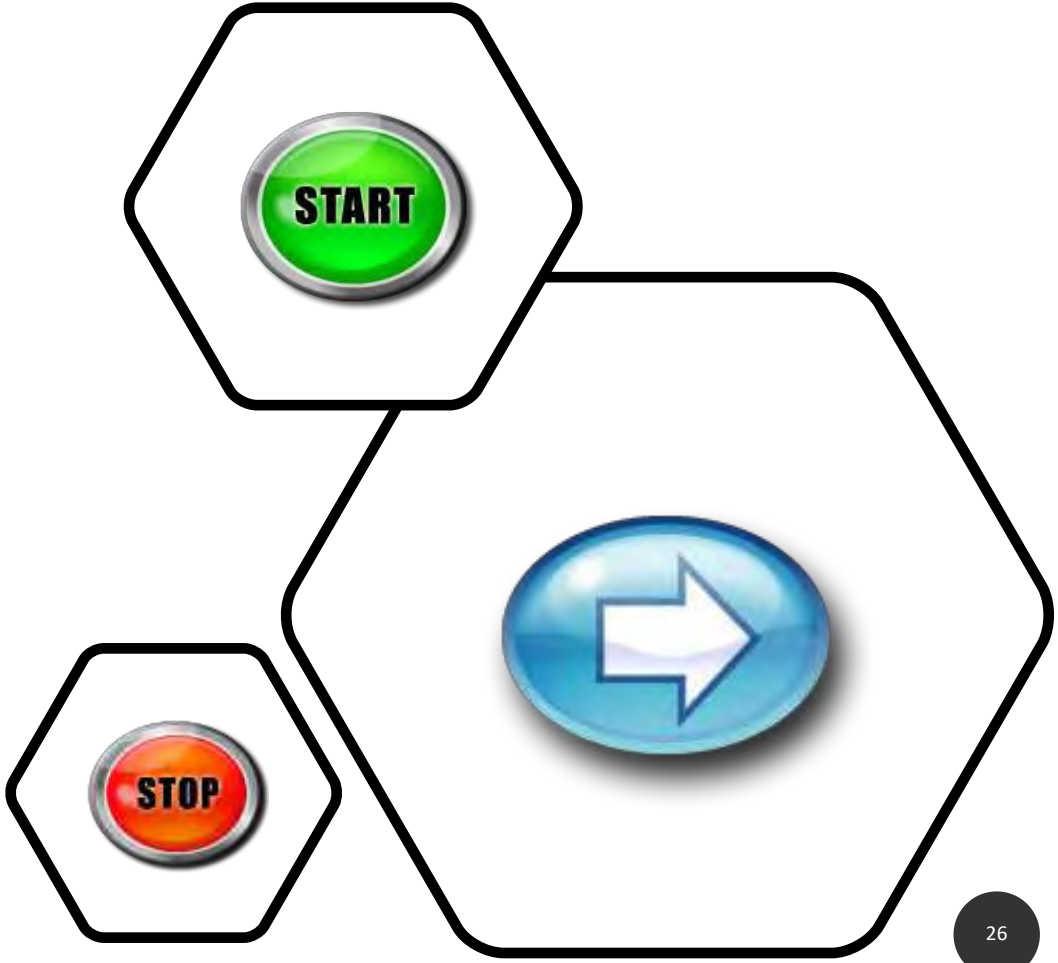
Describe	Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Study Plan Criteria

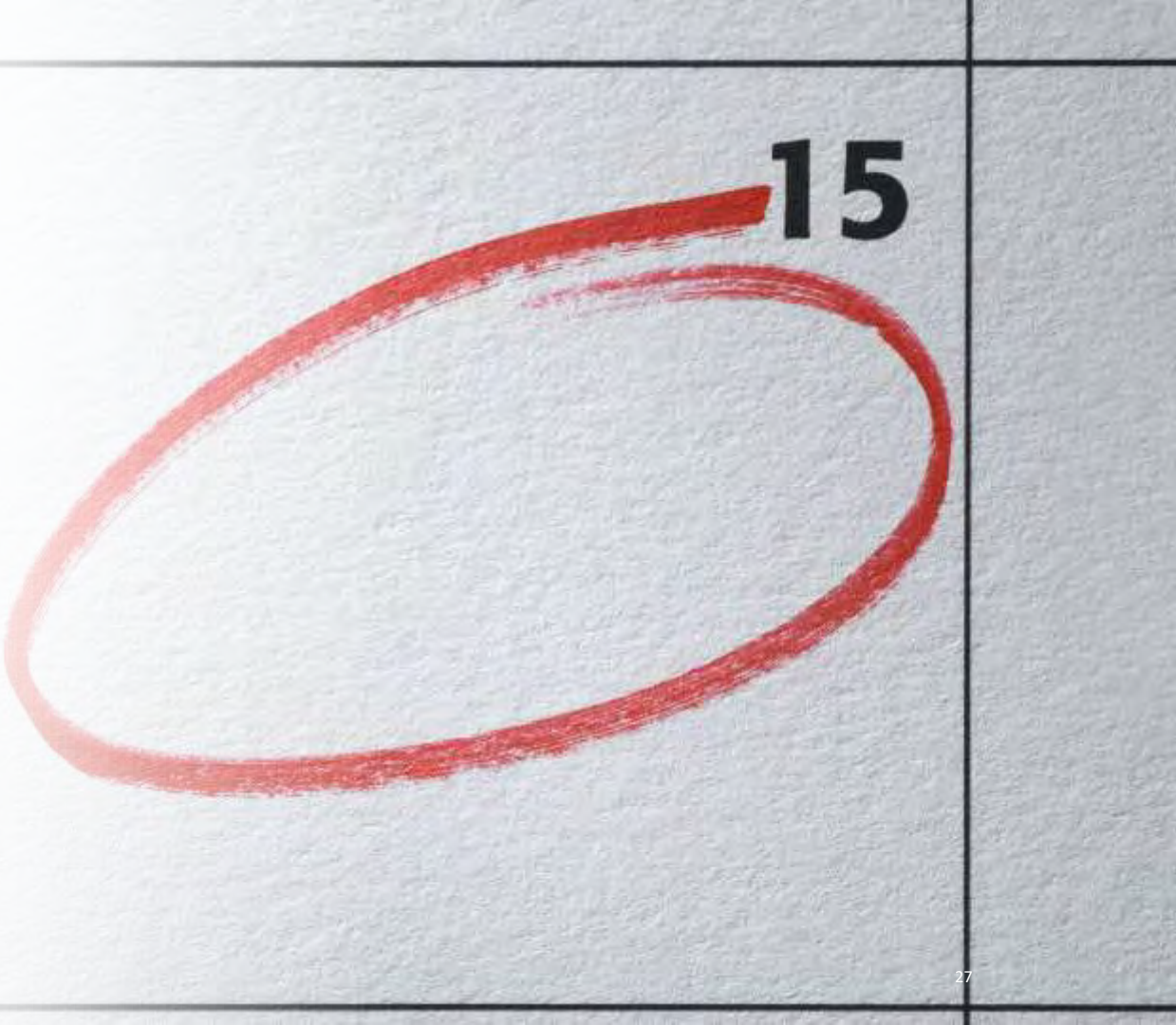
The potential applicant's proposed plan must include with respect to each study:

1. A detailed description of the study and methodology used
2. A schedule for conducting the study
3. Provisions for periodic progress reports
4. If the potential applicant does not adopt a proposed study, an explanation of why the study was not adopted.

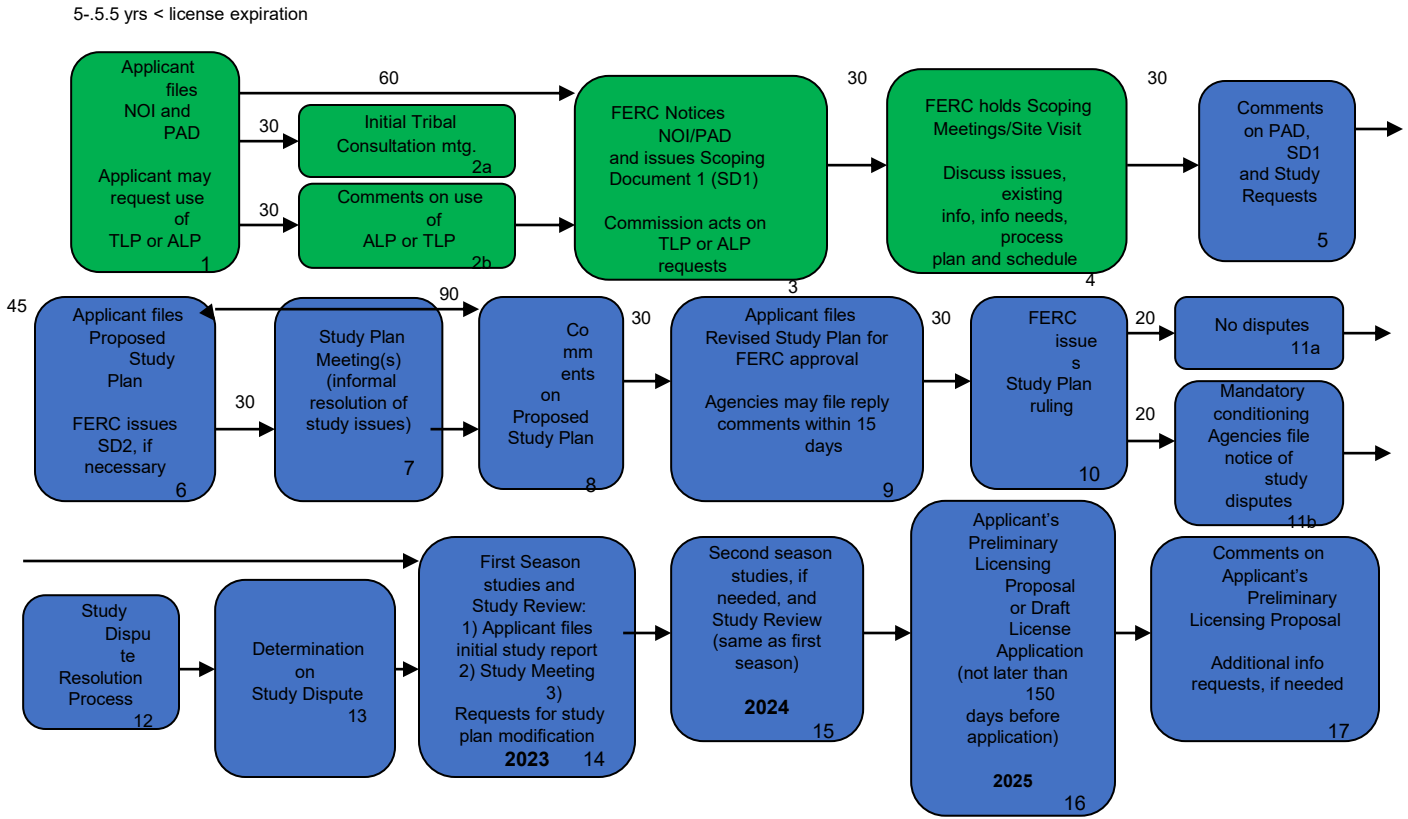
Process Improvements



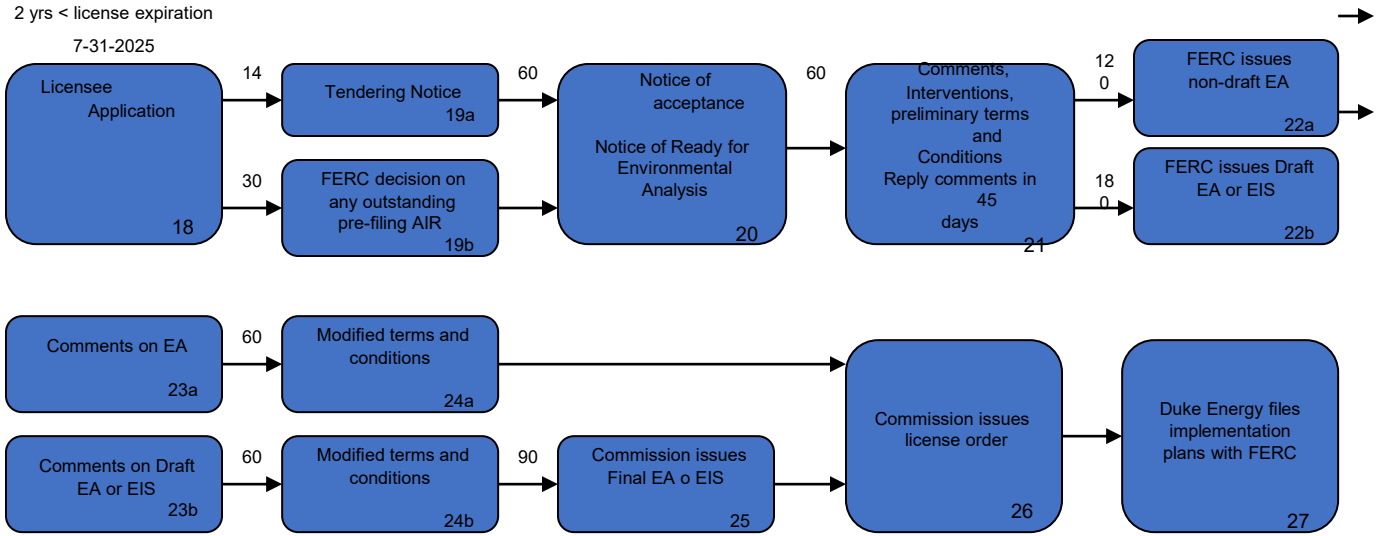
Relicensing Process Detail Schedule



Bad Creek ILP: Pre-Application Activities



Bad Creek ILP: Post-Application Activities



Bad Creek Relicensing Dates
2023: Filing of PAD
2025: Filing of License Application
2027: Existing License Expires

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) and Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 24, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	**Licensee Stakeholders**	**Within 60 days following Notice of NOI/PAD and SD1**	**June 23, 2022**
Issue Scoping Document 2 (SD2), if necessary (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sep 6, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024

Action Items

- Formal Request
  - Stakeholder Team Representative & Alternate OR Agency contact(s) (June 14, 2022)
- Resource Committees Formed (June 23, 2022)

Questions

Contact

BC Relicensing Project Manager

Alan Stuart

Alan.Stuart@duke-energy.com

980.373.2079

This page intentionally left blank.

Attachment 2

Attachment 2 – Sign-In Sheet

DUKE ENERGY

Bad Creek Relicensing (FERC No. 2740)
Stakeholder Team Kick-off Meeting
May 31, 2022

HDR

NAME	AFFILIATION	PRIMARY PHONE NUMBER
Bill Ransom	Foothills Trail Conservancy	864.325.1702
Andrew Gleason	Foothills Trail Conservancy	864-546-1589
Elizabeth Miller	SCDNR	843-953-3881
WES COOLER	NATURALAND TRUST	864.918.3826
Dale wilde	Friends of lake keowee	207-604-6539
John Crutchfield	Duke Energy	919-757-1095
Chris Starker	Upstate Forever	864-250-0500 x115
Erika Hollis	Upstate Forever	864-250-0500 x117
PHIL MITCHELL	FISHER KNOB HOMEOWNERS ASSOC AT BAD CREEK	864-614-9481
Nick Wahl	Duke Energy	980-875-4705
Maggie Salazar	HDR	610-299-0959
Sarah Kulpa	HDR	315-415-8703
Michael Abney	Duke Energy	704-975-4358
Ed Bruce	Duke Energy	704-607-3734
Jennifer Bennett	Duke Energy	828-514-3168.

DUKE ENERGY

Bad Creek Relicensing (FERC No. 2740)
Stakeholder Team Kick-off Meeting
May 31, 2022

HDR

NAME	AFFILIATION	PRIMARY PHONE NUMBER
Lynne Dunn	Duke Energy	910-412-1338
Paul Keener	Duke Energy	704.215.0559
Christy Churchill	Duke Energy	704 925 2008
Glenn Hilliard	Foothills Trail Conservancy	(678) 958-6758
Gerry Yantis	AQD. Advocates for Quality Development	571-205-3254
Sue Williams	AQD	619-892-8660
Andy Douglas	SC Wildlife Fed	864 380 6983
Jeff Lineberger	Duke Energy	704-564-5613
MAVERICK RABER	DUKE ENERGY	919-698-2522
BEN WILLIAMSON	DUKE ENERGY	770-362-4854
Roudy Harris	SCPRT	864-992-2328
		IP-128

This page intentionally left blank.

FEDERAL ENERGY REGULATORY COMMISSION

South Carolina Bad Creek Pumped Storage Project

Duke Energy Carolinas, LLC

PROJECT NO.: 2740-053

TELEPHONIC SCOPING MEETING

Monday, May 16, 2022

7:00 p.m.

P R O C E E D I N G S

OPERATOR: Hello Mr. Toledo and thank you for participating. You are now in the room to provide your comments to the Court Reporter. You will have five minutes to speak. I will give you a warning when you have 30 seconds remaining. Please state and spell your name for the record and whether you are speaking on behalf of a group or affiliation and then begin your comment.

Thank you, you may begin.

MR. TOLEDO: I can pass my time onto someone else. I'm not ready at this time.

OPERATOR: All right. Thank you. One moment.

All right. Hello Mr. Andrew Gleason. You are now in the room to provide your comments to the Court Reporter. You will have five minutes to speak. I will give you a warning when you have 30 seconds remaining. Please state your name, please state and spell your name for the record and whether you were speaking on behalf of a group or affiliation, then begin your comment. Thank you, you may begin.

MR. GLEASON: Sure, my name is Andrew Gleason and I am -- I'm sorry. My name is spelled A-N-D-R-E-W G-L-E-A-S-O-N and I am representing the Foothills Trail Conservancy. The Foothills Trail Conservancy supports Duke Energy, the Bad Creek II Project and the Relicensing.

We have partnered for nearly 50 years to build, maintain and preserve South Carolina's premier hiking trail system, The Foothills Trail. The Conservancy is excited to take over the management of the Duke portion of the trail and look forward to ironing out all the details in the future.

The Conservancy's desire is to continue to partner with Duke Energy to improve the infrastructure, the parking and the trail expansions of the entire system. Thank you.

MR. BOWLER: Hey Neetu, can you hear me?

MS. DEO: Yup, I can hear you.

MR. BOWLER: Do you want to do your introduction?

MS. DEO: Sure. Okay, so um -- thank you everybody for joining us. This is the scoping meeting for the relicensing of the Bad Creek pump storage Project P2740 Sub-Docket 053. We'll have more time for questions and comments at the end of the presentation but there's just some information that we want to cover before we take any more questions or comments.

So to get started, my name is Neetu Deo. I'm the coordinator and the engineer on this relicensing and what we'll be talking about today is the scoping process, taking you guys through the ILP, the relicensing process,

basically what to expect when you can participate, comment periods and the purposes of scoping.

So before we delve into that, just a few housekeeping items. We usually hold these meetings in person and so due to the format change because of COVID it would be very, very helpful if everyone on the call follows along in Scoping Document No. 1 and everything that we're going to be talking about today is in Scoping Document No. 1 so no need to rush to take notes or trying to write everything down.

We have a Court Reporter on the line who is going to be transcribing this meeting and that transcript will be uploaded to the public record through e-Library.

The topics that we're going to cover today include FERC jurisdiction, as I mentioned the licensing process and timelines, a very brief project overview just to supplement what you just heard and learned if you were on the site visit; information needs and how stakeholders can participate in the relicensing process.

So let's start with some team intros on the FERC side. As I mentioned, I am Project Coordinator and I'll also be doing the engineering and geo soils analysis.

Next, we have Adam Peer who is our Aquatics and Terrestrial Threatened and Endangered Species Resource expert. We also have Sarah Salazar who will be doing

Terrestrial Resources and Threatened and Endangered Wildlife.

Rachel McNamara who will be doing Cultural Resources and recreational resources and we also have Stephen Bowler on the line who is the Chief of the South Branch.

Okay, so let me know if you have any questions or if I'm going along too quickly. I'm going to get started and we'll see what happens.

So the first topic to cover is jurisdiction. So in short, it's the Commission's responsibility to review, approve and condition most non-Federal hydrogenation plants and we have four main criteria that determine jurisdiction.

That includes whether or not a Project is located on a navigable waterway, whether the Project occupies Federal lands, whether the Project affects interstate commerce by connecting to interstate electricity grids or if the Project utilizes a surplus water source from a Federal dam.

So in reviewing and approving non-Federal hydro-projects, our goal is to balance competing interests and the most obvious example of this is balancing the conservation and protection of environmental resources while also prioritizing energy production and renewable energy development.

So next, I'd like to go over the ILPs. This relicensing is going to use FERC's integrated licensing process. The ILP has a set schedule that's meant to expedite the licensing process and it's a front-loaded process to try to get input from stakeholders and agencies at the beginning so that includes comments and study requests and details like that.

There are two main stages for the ILPs. The first one is prefiling and prefiling begins when a license files their PAD for NOI and when the final license application is filed and this whole process usually starts about 5 years before an existing license is due to expire.

The next phase is post-filing and post-filing begins after the license application is filed with FERC and it ends if or when FERC chooses to issue a new license order.

During the post-filing stage, stakeholders are able to file comments and motions to intervene and this is also the period when FERC staff will prepare the NEPA document and that's basically the document that basically provides the environmental analysis for the Project.

So in terms of where we are right now, we are in prefiling and that began when Duke Energy filed their PAD. The PAD is meant to summarize all of the existing information on the Project and in the study area and

identify data gaps and study needs and also to set the schedule for the ILP.

So far in prefiling, FERC Staff has initiated tribal consultation. We've issued Scoping Document No. 1 and we are currently in our scoping meeting and site visit phase.

So moving on to scoping. Scoping is the first step in the NEPA process and the purpose of scoping is to solicit comments on the pre-application document, have stakeholders and agencies help us identify any additional resource issues that have not been covered by the PAD or the Scoping Document.

It's our chance to gather information and data to help in our analysis for the NEPA document and it's also when we collect study requests. So, basically with a scoping meeting and the comment period what we're trying to do is to make sure that we got everything right in the scoping document and it includes all the resources and issues that will need to be evaluated.

So after scoping, we have the study planning phase. So based on information that's in the PAD and SD1, we invite stakeholders and agencies to submit their study requests during the comment period.

We ask that the study requests be sent in as soon as possible and clearly relate how their request

pertains to any mandatory conditioning authority during the Federal Power Act or Clean Water Act and we ask that it address the seven study criteria and those study criteria can be found in Scoping Document No. 1 and as well as on our FERC webpage.

So in this case, the deadline for comments on the PAD and SD1 and study requests will be June 23, 2022. Duke's proposed study plans will follow that and it's due on August 8, 2022, that will invite another comment period which will end on November 7.

Before the PFC comments deadline there will also be a study plan meeting which is another opportunity for stakeholders to engage with FERC Staff and provide comments.

Following that, Duke will issue a revised study plan tentatively around December of this year and the deadline for comments on the revised study plan will be December 20, 2022. Fifteen days after the revised study plan/comment period ends, FERC staff will then issue a study plan determination that either approves, modifies or rejects all of the study proposal that have been received.

And if you're feeling kind of overwhelmed by all of the deadlines that I just shot at you, those are all included in the Scoping Document. There's a schedule in one of the appendices so don't worry about trying to, you know

write all that down and know it by memory.

So following the study plan period are the study seasons where Duke will actually carry out the studies and gather information to develop their final study report. So this period typically lasts 1-2 years and after each year of studies, Duke will file a study report and also hold a meeting to review the information that they've gathered and determine the need for any changes or modifications to the study plan.

This is also a period for stakeholders to again comment on the process and the studies and also to request new studies or modifications.

If you were on the site visit call that began at 6, most of this will sound familiar to you but just to briefly go over the Bad Creek Project, the project is located in Oconee County, South Carolina. It forms a 363-acre upper reservoir and uses Lake Jocasee as the lower reservoir.

Main Project facilities include the water conveyance system and that includes an intake, power tunnels and discharge tunnels that will move water back and forth between the upper and lower reservoir. There is an underground powerhouse that contains four pump turbine units for total installed capacity of 1400 Megawatts.

There's also two 9-mile long transmission lines

associated with the Project and that's how the Project connects to the grid and most importantly the existing license is set to expire on July 31, 2027.

So like I mentioned before, we are right around that 5-year period of when you know, prefiling starts and you want to start getting study requests and information together.

So next, we are going to go over resource issues listed in SD-1 but before we move on to that are there any questions of what I've covered so far? [Silence]

MR. BOWLER: Operator, can you tell people how they can raise their hands to indicate they have a question?

OPERATOR: If you'd like to ask a question, please press *1, un-mute your phone and record your name clearly when prompted.

Again, if you have a question, please press *1, un-mute your phone and record your name clearly when prompted.

I'm showing no questions at this time.

MS. DEO: Okay, thank you.

Okay, so we will get started going over the resource issues that FERC staff has identified so far and these are all listed beginning on Page 14 of Scoping Document No. 1. So what we'll do is have each resource

specialist cover the effects that they've identified for the resource issue and again at the end we will open it up for any questions before moving on to any proposed studies.

So beginning with Geology and Soil Resources. At this time based on the PAD and the information that we have, we've identified the effects of Project construction and spoil disposal from soil erosion and sedimentation that refers to any proposed construction associated with the Bad Creek II complex or any other PMZ measures that are recommended.

Effects of Project operation on shoreline erosion along the lower reservoir. So that would be Lake Jocasee. Affects of project construction on slope instability in the Project area and that once again refers to the potential Bad Creek II Complex or any other modifications that are made to the existing Project facilities.

And last but not least, effects of seismic activity in the project area on construction of the complex and vice versa. So I think if you're familiar with some of the geology there are fault lines in the area and the risk of seismic activity is low but that's still something that we'll consider in our analysis.

And moving on to Aquatic Resources, Adam, would you like to take over?

MR. PEER: Sure, so before we move on can we just ask if anybody has any comments or questions for the Geologic Resources issues?

OPERATOR: As a reminder, if you have a comment or question, please press *1, un-mute your phone and record your name clearly when prompted. Thank you.

Looks like we have a question from Dale Wilde. Your line is now open.

MS. WILDE: Yes, I just had a brief question on the geology part with the seismic activity. If there was historical data from the last construction of the tunnel that exists right now?

MS. DEO: I'm not sure. That might be a question better directed at Duke. Allan, is that something that you know off the top of your head?

Allan, you may have to press *1 to be able to speak.

Okay, I think he's having trouble connecting but that kind of information is usually included in a supporting design report submitted by the licensee during relicensing and that's something that our Dam Safety Division also works on closely so that information will definitely be available.

I don't know when the tunnel was constructed that you're referring to but I think we'll definitely share what we have an I think Duke will provide that information

as well.

MR. STUART: Neetu can you hear me now?

MS. DEO: I can hear you, yup.

MR. STUART: Yeah, okay. Sorry, we were trying to actually -- um we're not exactly sure what seismic information we have but I head most of what you said and we can check with our Dam Safety Group to see what they might have as well to supplement anything. Obviously, some stuff cannot be shared publically as you guys know but we can certainly look into that.

MS. DEO: Any other questions.

OPERATOR: There are a few questions. One moment.

The next question is from Adam Tyson. Your line is now open.

Mr. Tyson, please check your mute button. The next question is from William Ranson. Your line is now open.

MR. RANSON: Can you hear me?

MS. DEO: Yes.

MR. RANSON: I'm a retired geologist at Furman University familiar with the geology of the area and also a friend of Malcolm Shafer who was the Duke geologist that mapped the Bad Creek area so all of that geologic -- all of those geologic data from the initial construction before --

the initial study before construction of Bad Creek should all be available.

The faults there are ancient faults. There are lots of fractures and there's always an opportunity for some motion but these faults have been inactive for hundreds of millions of years.

MS. DEO: Thank you.

OPERATOR: I'm showing no further questions.

MS. DEO: All right. So if there are no other questions on Geology and Soils we will move on to aquatic resources at the Project.

MR. PEER: Okay, so for aquatic resources we identified the effects of construction and spoils on water quality, aquatic habitat and aquatic biota in Lake Jocasee and streams in the Project vicinity.

We also identified the effects of Project operation on water levels in Lake Jocasee. We identified the effects on Project operation on water quality in Lake Jocasee including water temperature, dissolved oxygen concentration and vertical mixing. We identified the effects of reservoir fluctuations associated with Project operation on aquatic habitat and biota in Lake Jocasee.

We also identified the effects of vertical mixing of dissolved oxygen associated with Project operation on the fish population in Lake Jocasee and we identified the

effects of Project operation on aquatic habitat and biota in Howard Creek. Howard Creek is a tributary of Lake Jocasee that receives seepage flow from the -- dams of the Bad Creek upper reservoir.

And then finally we identified the effects of Project-induced impingement, entrainment and turgor mortality on fish populations in Lake Jocasee. And that's it for aquatic resources. Do we have any questions?

OPERATOR: As a reminder, if you would like to ask a question please press *1. One moment while we wait on any further questions. I'm showing no questions at this time.

MS. DEO: All right. in that case we will move on to Terrestrial Resources, I believe.

MS. SALAZAR: Hello everyone. Can you hear me?

MS. DEO: Yup.

MS. SALAZAR: This is Sarah Salazar and we're going to cover the terrestrial resources for us. So we identified the effects of Project construction, operation and maintenance activities including maintenance for roads and transmission line rights-of-way and project related recreation on native plant communities, wetlands, and the spread and control of non-native invasive plants.

Next, we identified the effects of the existing and proposed Project transmission lines on raptors and other

birds including electrocution and collision hazards.

Next we identified the effects of permanent and temporary bio-based habitat loss due to construction of proposed Project features and disposal of spoils including potential loss of habitat or supports foraging and during nesting raptors and other birds and when I refer to construction here I need to explain that the beginning is related to the Bad Creek II Project. Bad Creek II development may or may not happen. We'll see.

Next, the effects that we identified. The effects of noise, lightening, vehicular traffic and human presence during Project construction, operation and maintenance activities on wildlife including special status wildlife species especially during sensitive periods such as migrating or breeding.

Then we also identified the effects of Project construction operation and maintenance and Project-related recreation on special status species including the Monarch butterfly, which is a Federal candidate species and its habitat.

So that is all for Terrestrial. Do we have any questions about those?

OPERATOR: As a reminder, if you'd like to ask a question please press *1. One moment while we wait on any further questions. [Pause]

I'm showing no questions.

MS. SALAZAR: Okay. So I guess I can move right on to the threatened and endangered species. We have identified the effects of Project construction operation, maintenance and Project-related recreation on the endangered Chrysalis Trillium and I will spare you all the scientific names of these species by the way but if you're interested they are in the Scoping Document No. 1.

Also the endangered smooth coneflower and Indiana Bats and the threatened Northern Long-Eared Bats and the Small Worlds Begonia and I just want to make a quick note that the Indiana Bat was discussed in Duke's PAD but it actually doesn't appear on the official Species List for the Project that we generated on U.S. Fish and Wildlife Services Information for Planning and Consultation website.

We issued our official species list for the Project on April 12, 2022 and it includes the footprints of the existing Project boundary including the transmission line as well as an estimation of the proposed expansion of the Project area. So that covers it for the threatened and Endangered Species. Does anyone have any questions?

OPERATOR: As a reminder, if you'd like to ask a question please press *1. One moment while we wait on any further questions. [Pause]

I'm showing no questions at this time.

MS. MCNAMARA: This is Rachael McNamara. I'll be walking through the next section, where I'll begin with Recreation land use and Aesthetics.

Duke proposed to look at the effects of the proposed Project construction, operation and maintenance on recreation use in the affected area. Effects of Project construction, operation and maintenance on existing land uses and also effects of Project construction, operation and maintenance on visual resources including the Project of -- the presence of Project facilities of those visual resources. Are there any questions?

OPERATOR: As a reminder, if you'd like to ask a question please press *1. Looks like we have one question. One moment.

The next question is from Glenn Hilliard. Your line is now open.

MR. HILLIARD: Yes. This is Glenn Hilliard. I was the founding Chair of the Foothills Trail and Foothills Trail Conference and now Conservancy and at the earlier meeting I had a whole series of questions that affect some of these recreation land use and aesthetics.

I'm not going to repeat them, they are already in the record but I will be glad to go through them if there's anything that's not considered part of the record from the earlier call.

MS. MCNAMARA: Hi. I apologize but I would appreciate you repeating those comments. We have a Court Reporter on the line so you're --

OPERATOR: After the tone, please state your name.

MR. HILLIARD: --The Foothills Trail Conservancy and I'm on the Board of Upstate Forever by Chair as a matter of fact. I'm on the Board of Natural Land Trust. I'm on the Board of State Land Conservation Fund and I've done you know, lots of environmental work with the Foothills Trail for many, many years so there --

I think there are several issues that you know I'm sure that Duke is going to do well because they did everything very well and very open and very effectively in the original application and the original Bad Creek Project but while I will say -- that while all has worked well to date for the last decades that this is many, many years later and certainly the safety standards, certainly some of the trails standards, certainly some of the other standards have changed and I think --

And matured over the time and we're looking out again for a period of many decades in the future and so I would like to get at least in the record that -- you know, one of the things that you need to work on and be aware of is trail access both during and following the construction

years.

You know, there is some road blockage that's going to happen. There is some trail blockage that needs to happen and I think that needs to be addressed because literally there are hundreds of thousands of users of the Foothills Trail and it's been a great amenity for Duke. It's been a great amenity for upstate South Carolina and even the hikers that come from around the world.

And so we want to make sure that when we close some roads for construction and such things that they remain accessible, the Trail remains accessible.

Second thing, you know, I think parking is getting to be an increasing problem already for the trail and for the other amenities that y'all built, you know as part of the Bad Creek project. You know, already when the weekends come people are overflowing from the Smoky Mountains.

They are literally getting in their cars and in many cases flying into this area to get out of doors and certainly I think as a part of this process and a part of this construction there's going to need to be some real enhancements for all the parking facilities and access, you know, throughout the whole area and certainly around the Foothills trail and the Jocasee gorges and the lakes.

I think we will need some help in building and

maintaining some additional spur trails and trail extensions and connecting trails. I think we will -- I'll ask and I think others you will also find out will ask, we would like to have an enhanced and a widening and a protecting of the Foothills Trail Corridor over sometime beyond the life of the Bad Creek Project and I think that needs to be addressed as a part of this application for extension.

The -- I think you know, we need to really think about the economic impact on the surrounding areas, Walhalla and the Upstate and the other related kind of areas. One of the things that I think should be considered is extending the Foothills Trail toward past the -- you know, really where it ends at this date in Oconee State Park and past -- you know, getting closer to the Town of Walhalla.

I think it would be -- Walhalla is investing heavily and relying heavily on this whole Project and I think that Duke's in a position without spending phenomenal amounts of money at all to make this a much more accessible enhancement area to Walhalla and the Upstate.

Let's see. I think -- I also want to get on your list the Oconee Fund was a fund established for building and protecting green spaces for when the lakes were built and Bad Creek was built was funded by the -- several million dollars as I recall and my understanding now is that fund is substantially depleted and I would hope that you

know some more funds would be made available to Oconee County to continue to protect green spaces and green areas in the Upstate.

Uhh - I think particularly during the construction period again, you're going to have to pay some attention to access to the trail because if the Bad Creek Access to the Foothills Trail is in any way diminished you basically, you know, you've taken away the whole access to the major part of the trail corridor.

Again, as I started out I will say Duke has been and always will be as far as I'm concerned, a great partner and a great business and I'm certainly interested in making sure we continue that way and continue with that reputation in the coming years and decades. Thank you.

OPERATOR: I'm showing no further questions or comments.

MS. MCNAMARA: Okay, thank you so much Mr. Hilliard. I'm going to move it to cultural resources then where we try to look at the affects of Project construction, operation and maintenance activities on historic and archeological resources, traditional and cultural properties and access to exercise traditional practices and Treaty Rights. Are there any questions?

OPERATOR: As a reminder, if you have a question please press *1. Thank you. [Pause]

I'm showing no questions at this time.

MS. MCNAMARA: In the next section Socioeconomics where we will look at the effects of Project construction and operation activities on local roads including traffic, housing, businesses, employment opportunities and government services and the effects of the Project construction and operation activities on human health or the environment in any identified environmental justice communities.

Environmental justice is more further defined in two executive orders that we are complying with. Executive Orders 14008 and 12898. Are there any questions?

OPERATOR: As a reminder, if you have a question please press *1. [Pause]

I'm showing no questions.

MS. MCNAMARA: Okay. The next section is related to the build of the Bad II Complex. They were to assess construction noise levels in the Project area, air quality and traffic of road networks in the Project area. Are there any questions?

OPERATOR: I'm showing no questions at this time.

MS. MCNAMARA: Okay. Back to Neetu then.

MS. DEO: All right. so the last resource that we have is Developmental Resources and we will be analyzing

the effects of proposed or recommended environmental measures on Project generation and economics. Any questions on that?

OPERATOR: As a reminder, if you have a question please press *1. [Pause]

I'm showing no questions.

MS. DEO: Okay. If there are no questions then we will move into the next section which is proposed studies.

It begins on Page 17 and here we will be talking about the initial study proposals from Duke by resource area and again, this is not an exhaustive list based on comments and study requests, the scope and amount of proposed studies may change.

So we'll go first to general. We have Duke's proposed study of three-dimensional computational flow dynamics model to evaluate the effects of water discharge from the complex on shoreline erosion, vertical mixing of dissolved oxygen and water-based recreation in Lake Jocasee. Any questions on that?

OPERATOR: I'm showing no questions.

MS. DEO: Okay. Moving on to geology and resources, we have two proposed studies for this resource area. The first is to identify feasible upland areas within the project boundary and/or property that is owned by Duke

Energy to deposit the spoils from the construction of the complex. And again, this is in reference to the Bad Creek II Complex that Duke is looking into at the moment.

The next study we have is a geotechnical investigation and geological assessment to identify potential effects of the Bad Creek II Complex and inform mitigation measures to maintain geological stability. Any questions on either of those two geo-foil studies?

OPERATOR: I'm showing no questions.

MS. DEO: All right. Adam, I will hand it over to you then for the Fish and Aquatic Resources.

MR. PEER: Okay. Thanks, Neetu. This is Adam Peer again. So I'll be covering the Fish and Aquatic Resource related studies.

So Duke proposes to conduct the water quality study that includes a literature review of available water quality data, water quality standards and print that we may put usage in the Project boundary in Lake Jocasee.

Duke also proposes to conduct an evaluation of potential impacts of excavated material in Upland disposal areas and at the submerged weir on water quality and they also propose to develop a water-quality monitoring plan in consultation with the resource agencies to monitor water quality prior to construction, during construction and after construction.

Duke also proposes to implement updates to its existing desktop entrainment study based on consultation with stakeholders during the relicensing process.

And then finally, Duke proposes to conduct a presence/absence survey for mussels and other protected aquatic species in streams potentially impacted by potential Project construction. Do we have any questions related to those Fish and Aquatic Resource related studies?

OPERATOR: I'm showing no questions.

MS. MCNAMARA: Okay, we're going to skip Sarah because we're on a new terrestrial study Duke proposed and I'm going to pick up with recreation, Rachel McNamara.

There's a proposal to develop and understanding of existing recreation use and needs for future recreation and development at the Project using a mixed method approach that includes backlog research, stakeholder consultations and data collection including spot of continuous visitor counts, aerial photography and user-use survey.

There's also a proposal for recreation to public safety study to evaluate the risk to the public generally and specifically during the construction and operation of Bad II -- Bad Creek II Complex. And then an aesthetic resources study to assess the impacts of construction and operation of the complex of those resources.

Any questions regarding recreation, our subject

OPERATOR: As a reminder, if you'd like to ask a question please press *1. It looks like we have a question. One moment. [Pause]

Miss Wade, your line is now open.

MS. WADE: Hey and thank you. I apologize I'm a little bit new to this discussion. Could you very briefly update me on what the Bad Creek II project is about?

MS. MCNAMARA: Sure. This is Rachel McNamara again. I'm going to defer mostly to Duke so Allan if you want to be prepared to discuss this.

It is a proposal for adding additional capacity at the Bad Creek Project which would include construction of new tunnels between the upper reservoir and lower reservoir and degenerating climate, but Allan I'll let you discuss that.

MR. STUART: Can you hear me, Neetu?

MS. DEO: Yes.

MR. STUART: Yeah, right now Duke is, what we're conducting what we call a feasibility study.

What Neetu outlined is correct. We are looking to add a second powerhouse that would have an independent water intake from Bad Creek Reservoir and generate with water pump back from Lake Jocasee and the proposed mode of operation would not impact existing lake levels that are established under the KT License with respect to Lake

Jocasee but it would allow Duke Energy to take full advantage of the 160-foot storage that's usable storage depth in Bad Creek reservoir.

Right now, we're not committed -- we being Duke is not committed to build it. We're still in the feasibility information developing stage but as part of relicensing we have to go through that as the proposed alternative to address potential environmental impacts so that's why we've been discussing that as part of our pre-application document and FERC has scoped those studies and other information incorporated that into their Scoping Document.

Does that answer your question, ma'am.

MS. WADE: It does and I appreciate that. I guess my question is whether that would be something taking place within the existing facility or would there be a new um -- what do you call it, a new powerhouse cage -- I'm sorry, I'm losing the word right now -- to accommodate this?

MR. STUART: That's a -- now, you're right. It would. The Project would entail building a new underground powerhouse very similar to the existing one.

It would be independent of the existing one, it would be off to the -- I'll say if you were looking up -- if you were sitting in the powerhouse you will be due north of there where the new powerhouse would be along with the

tunnels. The tunnels are currently in the -- that are being developed as a conceptual design.

There would be two smaller tunnels as opposed to one larger that exists for the original project but all the -- you know, most of the water conveyance in the mode of operation and all that would be the same as the existing underground facility powerhouse.

MS. WADE: Thank you for that explanation.

MR. STUART: Yes, ma'am.

OPERATOR: I'm showing no further questions.

MS. MCNAMARA: Let's get into cultural research at this time. Duke has proposed to conduct archeological surveys for all non-sea land forms as well as architectural surveys of any structures at or near the Project that are 40 or more years old. Are there any questions?

OPERATOR: I'm showing no questions.

MS. DEO: All right, we will move into the developmental resource studies done.

The first is -- Duke Energy proposes to complete their Bad Creek II feasibility design study to analyze any potential effects that may result from construction of the Complex and also conduct a transition line citing study for the potential complex.

Any questions on either of those studies?

OPERATOR: I'm showing no questions.

MS. DEO: Okay. So we will segue into a discussion about participation then.

So there will be several comment periods coming up during the relicensing process so don't feel like this is the one and only one and as we gather more information and review more information there will be more opportunities for stakeholders to provide feedback in their input.

So we right know are in the middle of the very first comment period which is for comments on the pre-application document as well as SD-1 as well as study requests. This comment period will end on June 23rd.

Following this comment period stakeholders will also be able to provide feedback during study plan meetings that will occur on or before September 6th of this year.

Comments will also be taken for 90 days after Duke files their proposed study plan and that document will outline what Duke proposes in terms of studies to look into and analyze the first two study seasons.

Following that, Duke has the opportunity to file a revised study plan to respond to any comments and feedback from stakeholders. Following the revised study plan again there will be a comment period and if you would like you can refer to the schedule in Scoping Document No. 1 and all of these deadlines and opportunities are detailed there.

So in order to participate you can send written

comments by mail or file electronically using our FERC webpage. Whether you send comments by mail or use our eLibrary option, please make sure you use the Project number on any filing. Again that's P-2740. It's very important that you include that so that we actually receive your comments.

If you'd like to be notified of changes and updates, issuances and submittals you can e-subscribe to the public record. This will send you email notifications for issuances and filings pertaining to the Project. Instructions on how to e-subscribe are included in the scoping document and can also be found on the FERC webpage www.FERC.gov.

Last but not least, if you want to be added to the Project mailing list to receive paper copies of any proceeding in the relicensing process, you can send a request by email or by regular mail using the instructions that are on our FERC webpage.

So I will open it up now to you all for any questions or comments that you have on any of the information we covered or how to participate.

OPERATOR: If you have a question or comment, please press *1, un-mute your phone and record your name clearly when prompted. One moment while we wait on our first question or comment.

[Pause]

I'm showing no questions at this time.

MS. DEO: Okay, if there aren't any questions, just a reminder to again please pay attention to the deadlines that are included in the schedule in the back of the Scoping Document and as I mentioned, June 23rd is our first comment period deadline and you can provide feedback on Duke's pre-application document as well as the Commission's Scoping Document No. 1 and as well as any study requests that you think are necessary or important to the relicensing process.

And again, you can find all of the instructions on how to file comments, how to e-subscribe, how to be added to the Project mailing list. All of that information is made available on www.FERC.gov.

I'm just going to check one more time if there are any questions and if not then we will close for the night.

OPERATOR: I'm showing no questions.

MS. DEO: All right. Stephen, is there anything that you wanted to add or emphasize.

MR. BOWLER: No. Thank you everyone for attending. I appreciate you taking time out of your evening to join us and to share your thoughts.

We just want to re-emphasize that tonight is the

verbal input and tomorrow is as well, but there's also the written comment opportunity that Neetu described so please, take advantage of one of them if you have questions, comments, study ideas, information that we should know about, issues that we should know about, that's what we're asking for and please bring it to us. Thank you.

MS. DEO: All right. Thank you everybody. We look forward to getting your comments and thank you to Duke for preparing the site visit and giving the stakeholders some more information about the Project.

MR. BOWLER: Neetu, I think a couple of us should hang out for a while in case anybody calls in.

MS. DEO: Okay.

MR. BOWLER: But everybody else can go.

MS. MCNAMARA:

MR. BOWLER: Okay, we're off the record at 8:34 p.m.

(Whereupon, at 8:34 p.m., the scoping meeting was concluded.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

South Carolina Bad Creek Pumped Storage Project

Duke Energy Carolinas, LLC

Docket No.: 2740-053

Place: Virtual

Date: Monday, May 16, 2022

was held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Larry Flowers

Official Reporter

FEDERAL ENERGY REGULATORY COMMISSION

South Carolina Bad Creek Pumped Storage Project

Duke Energy Carolinas, LLC

Project No.: 2740-053

TELEPHONIC SCOPING MEETING

Tuesday, May 17, 2022

10:03 a.m.

P R O C E E D I N G S

MS. DEO: Hi everybody. Thank you for joining us today for the scoping meeting on the relicensing of the Bad Creek Pump Storage Project, Project No. P-2740 of Docket 053. My name is Neetu Deo and I'm going to be the Coordinator and the Engineer on this Project.

Before we get started on FERC process and timeline and how folks can participate, I just want to go over a few housekeeping items. Because the scoping meeting is virtual, it would be very helpful if you guys follow along in Scoping Document No. 1. Everything that we're going to talk about today is also included in Scoping Document No. 1.

Don't feel the need to write everything down or rush to take notes. We will have a Court Reporter on the line, Mr. Larry Flowers who will be transcribing this meeting and the transcript will be made available on the public record through eLibrary.

Mr. Flowers, would you like to introduce yourself and go ahead and initiate the start of the meeting so that we're clear what's on the record?

MR. FLOWERS: Sure. Hello, my name is Larry Flowers and I will be the Court Reporter for today and if we could remember just for speakers to state and spell their names, you know, the callers that are calling in, so that I

can try to make sure that I have as clean a record as possible.

MS. DEO: Thank you. So, in terms of a brief Agenda we will cover FERC jurisdictions, the licensing process and timeline of the process. We'll give a very brief project overview to supplement the site visit that was held at 9:00a.m. this morning. We'll go over information needs and finally how to participate in the relicensing process.

There will be several points during the presentation where we will open for questions. When it's your turn to speak just please state your name and affiliation if you're with any organization or agency and as Larry said, just please spell out your name and your organization and I believe you can request to speak by pressing star seven (*7). Directions will be repeated by the Verizon operator before we reach comment period.

All right. So let's get started with FERC Staff and some brief introductions. Like I said, I'm Neetu Deo. I will be coordinating the relicensing of Bad Creek and also doing the engineering and geology and soils analysis.

We have Adam here who is our Aquatic Specialist and will also be doing analysis for threatened and endangered species.

Sarah Salazar is our Terrestrial Resources

Specialist and will also be covering threatened and endangered wildlife.

Rachael McNamara is our Cultural and Recreational Specialist. We'll be going over those two resources as well as socioeconomics which now includes environmental justice as well as noise and air pollution.

Stephen Bowler is the Chief of the South Branch but he is unable to be on this call but may join later. If you have any questions for him I can certainly relay those.

All right. So getting started. If I'm going too fast or you'd like me to repeat something, you can press *7 to request, to speak through the operator but with respect to jurisdiction.

So it's the Commission's responsibility to review approved and conditioned most non-Federal dams that are involved with hydropower generation and we used four main criteria to determine whether or not FERC has jurisdiction over those projects.

The first is whether the project is located on a navigable waterway. Second is if the project occupies Federal lands. Further, whether the project affects interstate commerce by being connected to the interstate electricity grid or if the project utilizes surplus water from a federal dam.

And our purpose in reviewing and approving these

projects is to balance competing interests so the most obvious example of competing interests that we deal with is balancing the conservation and the protection of environmental resources while also prioritizing energy production and renewable energy development.

So, next I'll go over the ILP. This relicensing will use the Commission's integrated licensing process. The ILP is a little bit different from the traditional licensing process because there is a set schedule meant to expedite the licensing process and it's also stop-loaded so that we get steady requests and comments and information from stakeholders and agencies earlier in the process.

There are two main stages in the ILP process. the first is prefiling. Prefiling begins when a licensee files their PAD and NOI and it ends when the final license application is filed with the Commission. Prefiling usually begins about 5 years before the existing license is about to expire.

Post-filing is the second stage and that begins after the license application has been filed with FERC and it ends if or when FERC issues a new license order. During post-filing, stakeholders are able to file comments and motions to intervene and during this time staff prepares the NEPA document which is basically our environmental analysis.

So in terms of where we are right now, we are

currently in prefiling. Duke Energy has filed their pre-application documents, which is meant to summarize all of the existing information that is available on the project, identify data gaps and study needs and it also sets the federal for the ILP.

So, in terms of prefiling on the FERC side we have initiated tribal consultations, issued Scoping Document No. 1 and we are currently engaging in our scoping process with scoping meetings and site visits.

So, next we will go over scoping. So if you are unfamiliar with the process, scoping is the first step in NEPA analysis. The purpose of scoping is to solicit comments on the pre-application document, identify any additional resource issues that were not caught in the PAD or in our Scoping Document. It's also to gather information and data to help us in our environmental analysis that goes into the NEPA document and it's also to collect study requests from stakeholders and agencies.

So, basically with scoping we want to make sure that the information that we've presented in our Scoping Document is accurate and it covers all of the potential resource effects associated with the project.

So, following scoping we have study planning. Based on the information that's presented in the PAD and the Scoping Document, we invite stakeholders and agencies to

submit study requests. We ask that study requests be as detailed as possible and they follow the seven study criteria that the Commission has laid out.

So I will go over all seven of those criteria but they can be found in Scoping Document No. 1 and they're also available on FERC's web page www.FERC.GOV.

So, we are currently in the first comment period and study request period which ends on June 23rd. That would be the deadline for comments on the PAD and SD-1 and as I mentioned any request for additional studies that we have performed.

So Duke's proposed study plan would then be due on August 8th and it will include their initial proposal for studies to conduct during study seasons 1 and 2 and the deadline for comments on PSP, Proposed Study Plan would be on November 7th.

Before the PSP comment deadline there will also be a study-planning meeting during which stakeholders can participate and provide comments and feedback.

Following the PSP, Duke has the option to file a revised study plan which would incorporate any comments or feedback that are received either in written form or during the study plan meeting. That will be due on December 5th of this year and it will be followed by a comment period that will last until December 20th.

Fifteen days after the end of the RSP comment period, FERC will issue a study plan determination in which we approve modify or reject all of the study requests that we receive during that period.

I know that's a lot of information, it's information overload but don't worry, all of these deadlines and milestones are included in the schedule with Scoping Document No. 1 in the appendices so no need to scramble to write those down or to feel like you have to memorize those.

So following study planning and the permission issuing the approved study plans, the licensee will then conduct the required studies and this usually takes place over a period of 1-2 years.

After each year studies, Duke will be filing a study report and holding a meeting to review information that was gathered. During this time, Staff and Stakeholders will meet to provide comments and feedback to determine the need for changes or modifications to the study plan and this is also another point at which FERC considers new study requests.

So next I'm going to go over some brief facts about the Bad Creek Project. Most of this information was covered during the site visit, but if you were not available or unable to attend the site visit the project is located in Oconee County, South Carolina. The project forms a 363-acre

upper reservoir and it also uses Lake Jocasse the lower reservoir.

Main project facilities include a water surveillance system consisting of an intake shaft, power tunnel and discharge tunnels which are used to move water back and forth between the upper and lower reservoir during power generation and during pumping.

There's an underground powerhouse, which contains four pump turbine units with the total installed capacity of 1400 megawatts. Project power is supplied to the grid by two, 9-mile-long transmission lines and in terms of the existing license, the license is set to expire on July 21, 2027 and if you'll recall that is about five years from now which is why we are beginning pre-filing at this time.

Next, we will be going over a list of recourse issues that we've identified in Scoping Document No. 1, but before we get into that I just want to pause for any questions or comments on the information that I covered so far.

OPERATOR: If you have a question or comment, please dial *1, un-mute your phone and record your name clearly when prompted. Again, please dial *1, un-mute your phone and record your name clearly when prompted. One moment while we wait on our first question or comment.

I'm going no questions or comments at this time.

MS. DEO: All right, thank you. Just bear with me for a moment. Okay, so if you're following along in Scoping Document No. 1. We are on page no. 14, place specific research issues and basically we will go over a list of preliminary environmental issues that Staff has identified to be analyzed and included in our NEPA Document and we will go by resource and I will have our Resource Specialist cover their assigned areas.

So to begin, we will start with Geology and Soils. So based on information in the PAD and other information that's available to us at this time, we have identified effects of Project construction and soil disposal, on soil erosion and sedimentation. That refers primarily to the proposed Bad Creek II Complex Construction that may or may not be pursued by Duke Energy.

Next, we have the effects of Project operation on shoreline erosion along the lower reservoir. We have effects of project construction on soil instability in the project area and effects of seismic activity in the project area on construction of the Bad Creek II Complex and vice versa.

So I'll pause here for any questions on the Geology and Soil resource issues.

OPERATOR: As a reminder, please dial *1 if you

have a question or a comment. I'm showing no questions or comments.

MS. DEO: All right, thank you. Then we'll move along the aquatic resources and Adam Speer will cover this section.

MR. PEER: Thanks Neetu. My name is Adam Peer and I'll be covering the aquatic resource issues that we identified, we identified the effects of construction-related erosion, sedimentation and spoils disposal, on water quality, aquatic habitat and aquatic biota in Lake Jocassee and streams in the Project vicinity.

We also identified the effects on project operation on water levels in Lake Jocassee. We identified the effects of project operation on water quality in Lake Jocassee, including water temperature and dissolved water concentration and vertical mixing.

We also identified the effects of reservoir fluctuations associated with project operation on aquatic habitat and biota in Lake Jocassee. We identified the effects of vertical mixing and dissolved oxygen associated with project operations on fish populations in Lake Jocassee.

We also identified the effects of project operation on aquatic habitat and biota in Howard Creek. Howard Creek is a tributary of Lake Jocassee and we've seen

seepage flows from the two dams from the Bad Creek upper reservoir.

And then finally, we identified the effects of Project induced impingement, entrainment and turgeon mortality on fish populations in Lake Jocasee. Are there any questions associated with aquatic resources that we've identified?

OPERATOR: As a reminder, if you have a question, please dial *1. Looks like we have a question. One moment.

Out first question is from Mr. Starker. Mr. Starker, please state and spell your first and last name before commenting. Thank you.

MR. STARKER: Good morning, everybody. My name is Chris, C-H-R-I-S last name Starker S-T-A-R-K-E-R. I'm with Upstate Forever, Greenville, South Carolina.

OPERATOR: Mr. Starker, you can comment.

MR. STARKER: Thank you. It seems to me that some of the issues that were referenced in 411 Geology and Soils are also aquatic resource issues. Specifically what comes to mind is sedimentation from project operations and so I just wanted to ask if that is something that's going to be looked at in aquatic resources as maybe it's implied and just not detailed in this scoping document and it could come up in other resource areas so I just wanted to bring that up

and ask if that's something that FERC is going to be looking at. Thanks.

MS. DEO: Hi, this is Neetu. Oh, I'm sorry, go ahead Adam.

MR. PEER: Yeah, I was just going to -- just going to comment. Are you referring to the effects of operation on sedimentation?

MR. STARKER: Well, sedimentation will affect water quality, right. so water quality affects aquatic habitat and so it's -- it's mentioned in Geology and Soils but to me is a water quality issue.

MR. PEER: Right and that is -- I mean we sort of hinted at that in looking at the effects of project operation on water quality in Lake Jocasee. And so, you're right. that's something that can effect water quality and that's something that we would be evaluating.

MR. STARKER: And by affecting water quality it would be affecting aquatic habitat, littoral habitat, etc, etc.

MR. PEER: Right, and biota. Correct.

MR. STARKER: All right, great. Thank you.

OPERATOR: I'm showing no further questions.

MS. DEO: All right, thank you. We will move on to terrestrial resources and I'll turn it over to you, Sarah.

MS. SALAZAR: okay, great. Good morning everyone. This is Sarah Salazar and I will be covering the terrestrial resources for us at FERC.

So in SD-1 we identified the effects of the project construction, operation and maintenance activities including maintenance for roads and transmission line rights-of-way and project related recreation on native plant communities, wetlands and the spread and control of non-native invasive plants.

We also identified the affects of existing and repetitive Project transmission lines on raptors and other birds, including electrocution and collision hazards.

We also identified the affects of permanent and temporary wildlife habitat loss due to construction of proposed project features and disposal of spoils and those that would be associated with the Bad Creek II complex including potential loss of habitat that supports foraging and/or nesting raptors and other birds.

We also identified the effects of noise, lightning, vehicular traffic and human presence during project construction, operation and maintenance activities on wildlife including special status wildlife species, especially during sensitive periods such as migrating or breeding.

And last, we identified the affects of project

construction, operation maintenance and project-related recreation on special status species including the Monarch butterflies, which is a Federal -- species and its habitat. And that covers it for the terrestrial resources. Do we have any questions about these?

OPERATOR: As a reminder, if you have a question, please dial *1. Thank you.

I'm showing no questions at this time.

MS. SALAZAR: Great. Thank you.

I will also cover the threatened and endangered species section for us and under that section we have identified the effects of project construction, operation, maintenance and project-related recreation on the endangered persistent vectrillium, coneflower and at the end of that -- as well as the threatened Northern long-eared bat and the small world begonia.

And I'd just like to mention that we generated an official species list using the U.S. Fish and Wildlife Service Group information for planning and conservation database and we have filed the official list on April 12, 2022 on Project Docket on the FERC website and included in this bullet and we will look at it, on our NEPA document is not actually on the official species list. This was included in Duke's past. I just wanted to make a note of that.

Are there any questions about threatened and endangered species?

OPERATOR: As a reminder, if you have a question, please dial *1. It looks like we have a question. One moment. Mr. Chris Starker, your line is open.

MR. STARKER: Hey, thanks. I seen to recall there being other species listed, species of concern maybe earlier in the scoping document. I'm scrolling up now trying to find the page and was wondering why -- oh yeah. It would be bottom of page 10 and going over into the top of page 11.

It includes the golden-winged warbler, Edmond's snake-tail, etc, etc. I'm wondering why maybe we're not considering these other ones here in this threatened and endangered RT species.

And also, my second question, I've got two, is that there's a strong interest in restoring native grasslands, which have been lost over centuries ago and was wondering if that was going to be under consideration as well. It seems to be a good opportunity here. Lots of land and lots of opportunity for restoring some native grassland species and habitat.

MS. SALAZAR: Sure, I can answer your questions for you, Mr. Starker. So the bullets in our scoping documents under threatened and endangered species are

strictly the species that are provided on the Fish and Wildlife Service's Official Species List on the project, which we generate on their website to comply with the Endangered Species Act and the species that are mentioned there.

That's the reason for that particular list and why it's more refined. They're only Federally listed species and you'll notice too that the Canada Monarch butterfly, which shows up on our species list is in our terrestrial resource center, just not listed yet.

There's no federal protection for it under ESA, the endangered species act and so that's sort of the line that we draw for identifying species and not part of our scoping documents. However, it doesn't mean that we won't look at other species of special concern or other special status species in our NEPA document. It will just be under the terrestrial or aquatic resources respectively.

And so, we're still at the early stages of collecting information about this species but we noted on page 10 of the scoping document and I guess it started on page 8 that there are just preliminary studies in environment protection, mitigation and enhancement measures that degrades on the site and it's PAD, and so there are just their preliminary thoughts on the measures that they would implement of the Project and so, we're just making

note of that here.

With regard to the grasslands, I'm not sure but we might not have really information in the record yet about grassland habitat and so if you have such information that you would like to provide for this record that you feel like it's relevant to the area within the project boundary then I would suggest you file it to the record for us by June 23, I believe it would be. Does that help answer your question?

MR. STARKER: Yeah, that's great. Thank you so much.

MS. SALAZAR: Okay, you're welcome.

OPERATOR: I'm showing no further questions.

MS. MCNAMARA: This is Rachel McNamara. We're going to return to Recreation Land Use and Aesthetic Resources and that we propose to look at the effects of proposed Project construction, operation and maintenance on recreational use on the Project-affected area on existing land uses on the Project-affected area.

And on visual resources, for visual resources we will also consider the presence of Project facilities on visual resources. Are there any questions?

OPERATOR: As a reminder, if you have a question, please dial *1. I'm showing no questions at this time.

MS. MCNAMARA: Okay, for cultural resources, we

propose to look at the effects of Project construction, operation and maintenance activities on historic and archeological resources and traditional cultural properties and access to exercise traditional practices and Treaty Rights. Are there any questions regarding cultural resources?

[Silence]

OPERATOR: I'm showing no questions at this time.

MS. MCNAMARA: For socioeconomics, we propose to look at the effects of Project construction and operation activities on local roads including traffic, housing, businesses, employment opportunities and government services and we also propose to look at the effects of Project construction and operation activities on human health or the environment in identified environmental justice communities.

We define Environmental Justice Communities using two Executive Orders on Environmental Justice. Executive Order Nos. 14008 and 12898. Are there any questions?

OPERATOR: Our next question is from Mr. Chris Starker. Your line is now open.

MR. STARKER: Hey, listen, I'm sorry. I pressed *7, instead of *1 so I didn't get my question in on cultural

resources. I apologize.

I have two questions here. One which was I was part of the relicensing for the Kiwi Toxique Project and it seems like there was very minimal input from the Eastern Band of the Cherokee and I don't know if anyone else was involved, any other tribes and so I was wondering if there was an expectation for the same here at all?

And further on that, there's some movement lately to return land to native tribes and I'm just wondering if that is under consideration for this relicensing? My guess is no but I'm just wanted to ask.

MS. MCNAMARA: So we have conducted early notification to the tribes that have historic interest in the Project area which includes the String Band as well as Cherokee Nation and the United Katua Band of the Cherokee Indians there but that's located in Oklahoma.

And also the Catawba Indian Nation and have had a bit of communication but hoping to talk more with them in the future and have them involved to the extent that they would like to be involved in the process going forward.

With specific regard to the lands, I don't have any information about that and some of that would have to occur in discussions between tribes and Duke and may not be entirely related to the relicensing Project. We'll see as we develop more information.

MR. STARKER: Thanks. Am I the only one who's going to ask questions?

MS. MCNAMARA: We're happy to have you ask questions. Anyone on the call, but thank you. Ask as many as you want.

OPERATOR: I'm showing no further questions.

MS. MCNAMARA: Okay, so then for noise, air quality and traffic, this section particularly relates to the construction of the Bad Creek II Complex and we propose to look at the effects on construction noise levels, air quality and traffic and road networks in the Project area. Are there any questions about that?

OPERATOR: As a reminder, if you have a question, please dial *1. I'm showing no questions. [Brief pause] I apologize, we do have one question. One moment.

Our next question is from Mr. Hilliard. Mr. Hillard, please spell your first and last name before commenting. Thank you.

MR. HILLIARD: This is Glenn Hilliard, G-L-E-N-N Hilliard H-I-L-L-I-A-R-D and -- you know, I had a phone issue. I'm really trying to comment or ask a question about Section 41.1.5 Recreation Land Use. Am I too late?

MS. MCNAMARA: No. Go ahead. That's fine.

MR. HILLIARD: Okay, the uh -- you know this is literally a new Project and it occurs to me is that -- you

know, what is set out in the Recreation and Land Use and Aesthetics section is basically a maintenance of the recreation and the land use and the aesthetics that were put in place at the time the trail was -- or the time the Bad Creek Project was constructed.

In today's world, you know, the use of the trail is -- Foothills Trail has expanded exponentially and it's become, you know, I think one of the most popular recreational assets in the entire state and probably in the Southeast. There are issues because of the construction that are going to happen.

There are also issues because of the growth that we ought to be concerned about and I'd like to hear what ya'll are going to do to think about expanding and enhancing parking, you know at the points around the trail and you know, specifically also include in your studies what you're going to do about trail access, during and following the construction period.

There also is going to be a need and should be an investment in this trail that reflects the demands for recreation now in today's world versus what it was 50 years ago and so I would say we ought to be maintaining spur trails, connecting trails and adding those kind of amenities to the existing trail.

And particularly, I think there should be some

additional consideration on enhancing and widening and protecting the Foothills Trail Corridor. It's basically a hundred feet in total and has moved around a good bit and I think that you know really the trail deserves better and the hikers and the users and the rate holders all deserve better.

And this trail ought to be considered something for permanent protection and certainly better protection you know, going forward.

MS. MCNAMARA: Thank you for your comments.

OPERATOR: I'm showing no further comments.

MS. MCNAMARA: I'll turn it back to Neetu.

MS. DEO: All right. So the last issue that we have to cover is Developmental Resources and we will be looking at the effects of proposed or recommended environmental measures on Project generation economics. Any questions on that?

OPERATOR: As a reminder, if you have a question, please dial *1. Looks like we have a question, one moment.

[Pause]

Our next question is from Gerry Yantis. Please state and spell your first and last name before commenting. Your line is now open. Mr. Yantis, please check your mute button.

MR. YANTIS: Sorry about that. So it's Gerry Yantis. GERRY YANTIS. I'm with Advocates Acute Quality and Development.

My question is kind of the scope of the Scoping Document. Is all -- the whole area of review talking about just the -- the impacts from the environmental perspective or do we also get a chance to talk about things like how the facilities are going to become secure?

The whole security architecture around the facility, the people, the data centers. Things like that that all have an impact if something goes wrong that could cause damage down the road. I don't see anything in here about security controls throughout the whole facility and the people.

MS. DEO: Okay, so if you're talking about things like access to the powerhouse, safety measures like that the licensee usually works with our Dam Safety Division on that to make sure everything is secure and then -- Team, please correct me if I'm wrong but I think it's the proposal can be made during relicensing but I think this is something that is ongoing and can take place outside of the relicensing window as well.

MR. BOWLER: The system follows a South Branch fee for division of hydropower licensing -- Stephen with a P-H Bowler B-O-W-L-E-R, the safety issues, security issues

like that are generally handled under Part XII of the Federal Power Act, which is an ongoing dialog between our Dam Safety and Inspections Group and the license group and the licensee so the only thing that can be brought up is the relicensing.

But that's the primary avenue for working out the issues related to those tech safety matters.

MR. YANTIS: Okay. Thank you very much.

OPERATOR: I'm showing no further questions.

MS. DEO: Okay, thank you. So next we will go over proposed studies. We are on page 17 of the Scoping Document if you're following along.

So if you see Table I we've included Duke Energy's initial study proposals for the Bad Creek Project and again, we're in the comment and study request period, so if you see something that you don't believe is covered, you know, this list is not exhaustive and it will be updated after we receive comments and feedbacks.

To begin with, the first general resource issue, Duke is proposing to do a three-dimensional computational slow dynamics model to evaluate the effects of water discharged from the proposed Bad Creek II Complex on shoreline erosion, vertical mixing of dissolved oxygen and water-based recreation in Lake Jocasee. Any questions on that proposed study?

OPERATOR: As a reminder, if you have a question, please dial *1. I'm showing no questions at this time.

MS. DEO: Okay. We will move on to Geology and Soil resources then. The first study proposal we have is to identify feasible upland areas within the project boundary or property owned by Duke Energy to deposit spoils from construction of the proposed Bad Creek II Complex.

And we also have a proposal for a geotechnical investigation and geological assessment to identify potential effects of the proposed Bad Creek II Complex and inform mitigation measures to maintain geological stability in the Project area.

Any questions on the Geo-Soil Studies?

OPERATOR: As a reminder, if you have a question, please dial *1. I'm showing no questions at this time.

MS. DEO: Okay. I'll hand it over to Adam who will cover the Fish and Aquatic Resource Use Studies.

MR. PEER: Hi, this is Adam Peer again and like Neetu said, I'll be covering the Fish and Aquatic resource studies that Duke proposes.

First, Duke proposed to the team that the water quality studies include a literature review of available water quality data, water quality standards and current

designated uses in the Project boundary and Lake Jocasee.

Duke Energy also proposes to conduct an evaluation of potential impacts of estimated material and help them disposal areas and at the submerged -- on water quality and to develop a water quality monitoring plan in consultation with the resource agencies to monitor water quality prior to construction, during construction, and after construction.

Duke also proposes to implement updates to its existing desktop entrainment study, based on consultation with stakeholders during the relicensing process.

And Duke proposes to conduct presence/absence surveys for mussels and other protected aquatic species in streams potentially impacted by potential project construction. Do we have any questions related to those proposed studies?

OPERATOR: As a reminder, if you have a question, please dial *1. It looks like we have a question. One moment.

Our next question is from Mr. Glenn Hilliard. Your line is now open.

MR. HILLIARD: Why would there not be a need to do a temperature test to see what is going to happen to -- not just the water quality but the water temperature and due to having really two of the pumps you know operating almost

theoretically full time?

MR. PEER: This is something that we have not identified as being proposed by Duke. That's -- we'll definitely consider your comments and I recommend that you also provide your comments -- audio comments as well by June 23rd.

OPERATOR: I'm showing no further questions.

MS. MCNAMARA: Okay, we don't have any terrestrial resource studies from the group -- recreational studies so Duke proposes to develop and understanding of existing recreation use indeed for suture recreation development at the project using a mixed methods approach that includes background research, stakeholder consultation and data collection, including spot and/or continuous visitor counts, aerial photography and visitor use surveys.

Duke also proposes to conduct a Recreation and Public Safety Study to evaluate safety with -- to the public generally and boaters specifically during construction operation of the Bad Creek II Complex.

For aesthetic resources, Duke proposes to assess aesthetic resources near the project and evaluate the impact of construction and operation of the Bad Creek II Complex on those resources.

Are there any questions about recreation or aesthetic studies?

OPERATOR: As a reminder, if you have a question, please dial *1. It looks like we have a question, one moment.

The next question is from Mr. Chris Starker. Your line is now open.

MR. STARKER: I thought I heard earlier that a run study was recommended but I don't see it here. Did I just -- am I confused?

MS. MCNAMARA: I think it's just our terminology in the Scoping Document Study 7 is the Recreation Use and Needs Study.

MR. STARKER: Okay. So they did the run study. Okay.

MS. MCNAMARA: Yes.

OPERATOR: I'm showing no further questions

MS. MCNAMARA: Okay, for cultural resources, Duke proposes to conduct archeological surveys for all non-steep land forms, as well as architectural surveys of any structures at or near the Project that are 40 or more years old. Are there any questions about the Cultural Resources Study?

OPERATOR: As a reminder, if you have a question, please dial *1. Looks like we have a question. One moment.

Our next question is from Mr. Chris Starker.

Your line is now open.

MR. STARKER: Yeah, I'm just curious because the Project is already 40 years old so would there be any new structures that have come up? It seems kind of moot, like we would already know about them and have probably already studied them under the original license if I'm not mistaken.

Of course that was 40 years ago. Maybe we didn't study anything back then. I don't know but I just wanted to ask for clarification there.

MS. MCNAMARA: I'll give my understanding and then if Duke has further clarification they can provide structures that are 40 or more years old or become 40 or more years old approach the need for evaluation under the National Historic Preservation Act and so I think this is just ensuring that any structures within the Project area that have changed, have aged into that category are evaluated, if they haven't already been evaluated so that can be both Project features or non-Project features but that are within the Project's area of potential effects.

I'm not entirely sure exactly what is there now. I think Duke probably has a better idea about that than I do.

MR. STARKER: Yeah, just thinking that the Project's 40 years old, so anything that's there now was there when the Project started, unless they're maintain

them, they're probably not eligible for anything.

MS. MCNAMARA: They -- well -- I mean, they may need to be evaluated. Usually project structure is required to be evaluated when they reach 40 years old as does the Project itself may need to be evaluated for national register eligibility.

I don't know, Alan, did you have any further comments on that?

MR. STUART: No. This is Alan Stuart. A-L-A-N S-T-U-A-R-T. No, I think you're spot on. Chris, I think the confusion is coming in partially, and I'll use the Kiwi Toxaway project as an example, we had to do an eligibility determination for both powerhouses at Kiwi Hydro and Jocasee Hydro to determine if they had historical significance to be eligible for listing.

That's kind of what the FERC Staff has been eluding to. We don't have a lot of project structures, you know, at Bad Creek so if you know, it may or may not have any historical significance but nonetheless, when they reach that 40-year lifespan, that's typically the point at which we do the evaluation and then let the State Historic Preservation Office make a determination whether they are or are not historically significant and should be considered for inclusion.

Does that help, Chris?

MR. STARKER: Yeah, yeah -- I guess in the back of my head I'm thinking old Farmer Brown had an old farmstead there somewhere, you know, 50-100 years ago and you know if he did, it's probably not standing anymore. That's what I was -- you know. But I get it now, thank you.

MR. STUART: Yup, no problem. Thank you.

OPERATOR: I'm showing no further questions.

MS. MCNAMARA: Alright. We will move along to Developmental Resources then. So under Developmental Resources, Duke is proposing to complete a Bad Creek II Complex design, feasibility design study to analyze potential effects that may result from the construction of the proposed complex and to also conduct a transmission line siting study for the potential Bad Creek II Complex.

Any questions on those two studies?

OPERATOR: As a reminder, if you have a question, please dial *1. Looks like we have a question. One moment.

Our next questions from Erika Hollis. Ms. Hollis, please state and spell your first and last name before commenting.

MS. HOLLIS: All right. Erika E-R-I-K-A Hollis H-O-L-L-I-S.

My question and I may have missed it. I was curious if there was going to be any study of the

terrestrial vegetation, in particular the effects of the construction on -- habitat and I wasn't entirely clear what study, where that was in the study resources you've provided.

MS. MCNAMARA: So at this time, Duke has not proposed any studies for terrestrial resources at the date of the filing of the PAD. Sarah and Alan, is there anything else you want to add?

MS. SALAZAR: Yeah, that was actually a great segue, thank you Ms. Hollis. I wanted to mention that even though Duke did not propose to do any new terrestrial resourced surveys or studies. The PAD does include some recent terrestrial surveys that might be of interest to you and others on this call and other stakeholders who are interested in those resources.

So I would definitely encourage everyone to review, I believe it's Appendix E is the Natural Resources Assessment which includes the desktop analysis, field recognizance survey information on wetlands and wildlife Federally protected species, other special status species.

And there's also an appendix G, a bat survey study report, which includes habitat surveys, the Toothstick surveys and Mismet surveys.

So I would definitely encourage everyone to go to the FERC website, download a copy of the pre-application

document which we keep calling the PAD, we love our acronyms [laughs] and make sure you download all the parts of it if it's in separate files. I can't remember right now but I think it might be in separate files so definitely download those.

Take a look at those. If you feel we still might have information gaps for terrestrial resources then this is the -- the scoping period is your opportunity to request studies that weren't proposed if you feel like we should have additional terrestrial resource surveys or studies. You would definitely want to file those with your scoping comments by June 23rd and be sure to use the study criteria.

There's 7 criteria in our regulations that you have to sort of elaborate on for each study request in order for us to fully consider it and help justify it for consideration as we go through the study planning phase. I'll let Alan jump in with any further details on the survey that they've already conducted for terrestrial.

MR. STUART: Hi, this is Alan Stuart, spelled A-L-A-N S-T-U-A-R-T. I think you summed it up quite well. We did do that copperhead survey which included assessment of wildlife habitats in the Project boundary and along the transmission line.

I think it looked at delineated wetlands, used

the National Wildlife or National Wetland Inventory Maps obtained from the Fish and Wildlife Service to document those -- those wetlands on site so I would reiterate and encourage folks to read appendix like said E I believe that has that comprehensive report in it and also read the terrestrial section in the PAD.

There's a significant amount of information in that section on vegetative resources in the Project area so you know, like I said, I reiterate what you said and encourage folks to read those very carefully. Thank you.

MS. HOLLIS: Thank you.

MS. DEO: Did that answer your question, Ms. Hollis?

MS. HOLLIS: Yes, thank you very much.

MS. MCNAMARA: You're welcome.

MS. DEO: Okay, if there are no more questions we will cover participation and the relicensing process. So as I mentioned before, there will be several commenting periods during the relicensing process for stakeholders to engage and provide their feedback.

We are currently in the middle of the first comment period, which is for comments on the PAD and Scoping Document No. 1 as well as study requests and the first comment period will end on June 23rd.

The next comment period will occur during the

study plan meetings that will occur on or before September 6th. Comments will also be taken for 90 days after Duke Files their proposed study plan and again, we will receive comments after the revised study plan is filed.

All of these milestones and deadlines are included in Scoping Document No. 1 and in the appendices with the Project schedule. If you want o file written comments by mail or file electronically, you can do so using the FERC web page. We ask that when you file comments or study requests please include the name of the project as well as the project number 2740 so that we receive it in a timely manner.

You can also become e-subscribed to the public record if you would like to receive email notifications of new issuances and filings. You can find instructions on how to e-subscribe on the FERC webpage www.FERC.gov.

And last but not least, if you would like to be added to the project mailing list so that you get physical copies of insurance and filings you can send the request by email or by mail using instructions on the FERC webpage.

So again we are in the middle of that first comment period and we will be taking comments until June 23rd. So if you'd like to participate or share any thoughts or information that you find after this meeting, please just file either electronically or you can file written comments.

So I will open it up for additional questions or comments at this time.

OPERATOR: As a reminder, if you have a question, please dial *1. [Pause] Looks like we have a question. One moment. Our next question is from Mr. Chris Starker. Your line is now open.

Mr. Starker, please check your mute button.

MR. STARKER: Thank you for reminding me. I was just talking up a storm. Section 8 of the Scoping Document on comprehensive plan, that's page no. 21, it says you know, reference a certain section and the Federal Power Authority or Federal Power Act or whatever FPA stands for, to consider State and comprehensive plan and other comprehensive --.

I don't see county comprehensive plans in here and I think that would be very prudent. I mean this Project's entirely in Oconee County and that's one plan, one simple plan that you double check with. I would love to see some consideration for that.

I recognize that Duke's probably just filing their due diligence here and they're required to -- or they're not required to do so and so this is their application but it would seem to me makes sense that FERC would want to see all projects sort of reference those local guides.

MS. MCNAMARA: Mr. Starker, I just want to

comment on that, this is Rachel McNamara. To the 10A-2A of the Federal Power Act is specifically defined comprehensive plans of Federal or State Plans so we're not talking about like locally induced lands or local recreation plans or anything like that.

That doesn't mean we don't want to hear about them or have them filed with us for consideration. They just don't fit under that specific section of the Federal Power Act.

So if there are relevant local or county level plans, regional plans, things that don't meet the criteria so forth in the Federal Power act, we ask that you just file them in the record and in individual proceedings so you would just file them in the record for the Bad Creek relicensing and then we can consider them as we do our NEPA analysis.

So that's just the language in the statute thing and not a lack of interest to look at them.

MR. STARKER: That's what I thought. Thank you so much.

OPERATOR: I'm showing no further questions or comments.

MS. DEO: All right. if there aren't any additional comments or questions, we will wrap it up for today and we look forward to receiving your comments and

feedback for the next month or so.

So I think at this time, everyone except for Alan, Larry and Stephen can be dismissed. Thank you so much for participating in our virtual scoping meeting.

OPERATOR: This concludes today's conference. all participants may disconnect at this time.

Okay, we're back in the speakers' conference. Would you like me to stand by?

MS. DEO: Sure, please.

OPERATOR: Will do.

MS. DEO: Stephen, can you hear me? Yeah, I think we should wait the whole hour.

OPERATOR: This is the conference operator. If you have a comment or question, please dial *1. Again, if you have a comment or question, please dial *1.

MS. DEO: Hi, this is Neetu Deo with FERC. Do we have someone on the line with any questions or comments?

OPERATOR: As a reminder, if you have a question, please dial *1.

All right. This is the conference operator. I went ahead and closed the line. It looks like they didn't have a question.

MS. DEO: Okay, thank you.

OPERATOR: You're welcome.

MR. BOWLER: Larry, if we could go off the

record please.

COURT REPORTER: We are going off the record.

If you could officially close it Stephen.

MR. BOWLER: Okay, please close the meeting as of 11:59 a.m.

(Whereupon, at 11:59 a.m., the meeting concluded.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

South Carolina Bad Creek Pumped Storage Project

Duke Energy Carolinas, LLC

Docket No.: 2740-053

Place: Virtual

Date: Monday, May 16, 2022

was held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Larry Flowers

Official Reporter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

June 8, 2022

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A,
Washington, DC 20426

Re: COMMENTS on Notice of Intent to File License Application; Filing of Pre-Application Document (PAD), Commencement of Pre-filing Process, Request for Comments on the PAD and Scoping Document, and Identification of Issues and Associated Study Requests for Bad Creek Pumped Storage Project (FERC No. 2740), Oconee County, South Carolina. FWS Log No. 2022-0030610

Dear Ms. Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the Federal Energy Regulatory Commission's (Commission) April 22, 2022, Notice of Intent (NOI) to File License Application, Filing of Pre-Application Document (PAD), Commencement of Pre-filing Process, Request for Comments on the PAD and Scoping Document, and Identification of Issues and Associated Study Requests for the above-referenced hydroelectric project. The following comments are submitted in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e) and the Federal Power Act (16 U.S.C. 803(a) and (j)).

The Bad Creek Pumped Storage (Project) is located in Oconee County, South Carolina, about eight miles north of the Town of Salem. The project facilities consist of an upper reservoir, a main dam, a west dam, an east saddle dike, a water conveyance system, an underground powerhouse, access roads, and voltage transformation facilities. The project has a total installed capacity of 1,400 megawatts (MW). The total average annual generation of the project is about 1,884,685 megawatt-hours (MWh). The project does not occupy Federal lands.

By letter dated February 23, 2022, Duke Energy Carolinas (Duke Energy) filed a NOI and PAD for a new license for the Project. The current Project license was issued August 1, 1977, and is set to expire on July 31, 2027. In its PAD filed with the Commission, Duke Energy declared its intent to apply for a New License for the Project using the Integrated Licensing Process (ILP) as defined under FERC Regulations (18 CFR Part 5).

During the relicensing process Duke Energy proposes to analyze the potential to develop a Bad Creek II Complex (Complex). The Complex would consist of a new: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line. The Complex powerhouse would include four new, reversible pump-turbine units with an installed generating capacity between 106 MW and 425

MW, and a starting capacity between 308 MW and 372 MW for pumping. Average annual generation for the project would increase by up to 25,856 MWh.

COMMENTS ON SCOPING DOCUMENT 1

3.2.2 Proposed Environmental Measures

Duke Energy has identified several preliminary studies and environmental protection, mitigation, and enhancement measures (PM&E) in its PAD. We are in agreement with all of the PM&E measures proposed.

Terrestrial Resources and Threatened and Endangered Species

Regarding the second bullet, the Service looks forward to working with Duke Energy to determine the need for pre-construction surveys, and/or conservation measures to protect threatened and endangered (T&E) species and at-risk species (ARS). Several of the ARS are on the Service's National Listing Workplan (https://www.fws.gov/project/national-listing-workplan) to be assessed for listing during the same time frame as the ILP. If any of these species are listed or proposed for listing during that time the Service will notify Duke Energy and work with them to ensure proper protection measures are in place.

Regarding the third bullet and the northern long-eared bat (NLEB), on March 23, 2022, the Service published a proposal to reclassify the NLEB as endangered under the Endangered Species Act of 1973, as amended. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). If the final determination is to reclassify to endangered, that reclassification would go into effect 30 days later, which would be sometime during December 2022. The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species.

The Service does not yet know what impact this proposed up-listing will have on tree clearing and similar activities, but we look forward to working with Duke Energy to minimize impacts. Similarly, there is potential for additional bat species to be listed during the ILP.

4.1. Resource Issues.

The Service agrees with the outline of issues that you propose to include in the Environmental Assessment.

4.1.4 Threatened and Endangered Species

It should be noted that the Service does not have any records of the Indiana bat within Oconee County, South Carolina and we believe this species does not need to be included in the list of T&E species to be analyzed.

5.0 Proposed Studies

The Service agrees with the Duke Energy's proposed studies and have no additional study requests.

COMMENTS ON THE PAD

The Service has reviewed the PAD, with a focus on sections with relevance to our interests and authority. In general, it is a comprehensive document that meets purposes and content requirements set forth in §5.6 of FERC's Regulations (18 C.F.R. §5.6).

The Service appreciates the effort put into the development of the PAD and of Scoping Document 1. We look forward to working with the Commission and its staff, Duke Energy, and others throughout the process to meet our collective goals. If you have any questions, please contact Ms. Melanie Olds at (843) 300-0413 or at melanie_olds@fws.gov, and reference FWS No. 2022-0030610.

Sincerely,

Thomas D. McCoy

Thomas D. McCoy
Field Supervisor

ec: eFile
Alan Stuart, Duke Energy
Elizabeth Miller, SCDNR
John Faustini, USFWS Regional Hydrologist and FERC Hydropower Coordinator

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
June 16, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Via FERC Service

Alan Stuart
Duke Energy Carolinas, LLC
Mail Code EC-12Q
526 S. Church Street
Charlotte, NC 28202

Reference: Staff Comments on the Pre-Application Document and Study Request for the Bad Creek Pumped Storage Project

Dear Mr. Stuart:

We have reviewed the Pre-Application Document (PAD) for the relicensing of Duke Energy Carolinas, LLC's (Duke Energy) Bad Creek Pumped Storage Project No. 2740-053 (Bad Creek Project), filed on February 23, 2022, and participated in the scoping meetings for the project during the week of May 16, 2002.

Based on our review of the PAD and the scoping meetings, we need additional information and clarification on the material presented in the PAD. The additional information (see the attached Schedule A) should be filed with the proposed study plan on or before August 7, 2022. If the requested information is not readily available, the proposed study plan should discuss Duke Energy's plans for gathering the information prior to filing the final license application. We are also requesting a study related to environmental justice (Schedule B).

If you have any questions, please contact Navreet Deo at (202) 502-6304, or navreet.deo@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Attachments: Schedule A
Schedule B

SCHEDULE A
ADDITIONAL INFORMATION REQUESTS

General

1. The PAD includes several maps of the existing project facilities, proposed facilities, and areas of potential affect if Duke Energy Carolinas, LLC (Duke Energy) decides to pursue the Bad Creek II Complex (Complex) as part of its relicensing proposal. To facilitate review of the existing project facilities and resources, as well as the facilities and resources that could be affected by the construction, operation, and maintenance of the Complex, please file the following geographic information system (GIS) data layers shown in the PAD, if available: (1) existing project features layout with callout labels (figure 5.4-12; and figure 2 in Appendix E); (2) proposed Complex features layout with callout labels (figure 5.4-13; and figure 2 in Appendix E); (3) potential spoil locations relative to surface waters with spoil area labels and surface water impact callout labels (figure 6.3-7); (4) the estimated riparian and littoral zones from the desktop analysis, and wetlands from the field assessment with callout labels (figure 6.6-2); (5) protected species habitat polygons and photo location points (figure 6.6-4); and (6) Foothills Trail layer, parking area and connector trail to the Foothills Trail in the Bad Creek Project boundary, other recreational facilities in the project vicinity, and the state and federal land layers (figure 6.8-1).

Project Facilities and Operation

2. Section 5.4 of the PAD provides a description of existing project facilities. However, for some project features we need additional detail (i.e., composition, dimension, etc.) to gain a more complete understanding of project facilities and operation. To assist us in our analysis, please provide: (1) the composition, method of repair, and frequency of repair, of the Bad Creek Project dam (main dam) flashboards; (2) the length (feet) of the Bad Creek Upper Reservoir (upper reservoir) intake channel; (3) the length and composition of the upper reservoir dewatering dam; (4) the width (feet) of each of the two, sluice gates located in the upper reservoir dewatering dam, as well as a description of the gates' operation, uses, and frequency of use; (5) the total number, dimensions (i.e., length and height)), and clear bar spacing (inches) of the trash rack structure(s) attached to the steel lift gates in the lower reservoir (Lake Jocassee)[1] inlet/outlet structure; (6) the dimensions (i.e., length and diameter) and composition of the manifold tunnel as part of the larger water conveyance system; (7) the number, length, composition, and uses of, the secondary penstocks; (8) the dimensions (i.e., height

[1] The Keowee-Toxaway Relicensing Agreement includes operating provisions and protection, mitigation, and enhancement measures associated with the Keowee-Toxaway Hydroelectric Project No. 2503 (Keowee-Toxaway Project). Lake Jocassee, the Bad Creek Project's lower reservoir, is part of the Keowee-Toxaway Project.

and width) of each of the four draft tube gates; and (9) the number, length, and voltage (V) of the project generator lead(s).

3. Section 5.4.5 of the PAD describes an existing, submerged weir that is not part of the licensed project facilities. However, the PAD states that the weir helps minimize the effects of project operation on the natural stratification of Lake Jocassee and cold-water fish habitats by preventing warm water discharged by the project from mixing with cool water in the lower layers of the lake. So that we have a full understanding of project facilities and operation, please clarify: (1) the composition and dimensions (feet) of the weir; (2) if the weir is used for normal project operation; and (3) if the weir is enclosed by the existing project boundary, or will be enclosed within the project boundary, as part of Duke Energy's relicensing proposal.

4. Section 5.4.12 of the PAD states that the total maximum hydraulic capacity of the four, reversible pump-turbine units is 19,760 cubic feet per second (cfs), when the project operates in generation mode. So that we can have a full understanding of any differences between pumping and generating, please clarify: (1) the total maximum hydraulic capacity of the units when operating in pumping mode; and (2) provide the minimum and maximum hydraulic capacity of each of the pump-turbine units in both generation and pumping modes.

5. Section 5.6 of the PAD describes potential changes to project facilities and operation that would result from the current proposal to construct and operate a second powerhouse as part of the new Complex. The proposal includes four new, variable-speed pump-turbine units, which would increase both the generating and pumping capacity of the project. The Complex would also include a new water conveyance system consisting of additional inlet/outlet structures for both the upper and lower reservoirs.

The PAD also states that while the existing license authorizes operation of the upper reservoir within a 160-foot fluctuation band (between 2,310 feet mean sea level (msl) and 2,150 feet msl), as of January 1995 the upper reservoir surface elevation is maintained within a 60-foot band (between 2,310 feet msl and 2,250 feet msl).

Please clarify whether operation of the proposed Complex features, specifically use of the additional pump-turbine units, would result in any changes to the upper reservoir water surface fluctuation band.

Fisheries and Aquatic Resources

6. Section 6.3.7 of the PAD provides information about existing water quality monitoring data associated with the project. However, the PAD does not indicate whether any water quality monitoring has been conducted in Howard Creek or at the

project discharge structure. So that we have a full understanding of all aquatic resource monitoring conducted at the project, please describe any water quality monitoring that has occurred in Howard Creek or at the project discharge structure during the current license term, and if so, please file the data in Microsoft Excel, or a similar format.

7. Section 7.1.2.2 of the PAD indicates that operation of the proposed Complex would not result in additional water level rise in Lake Jocassee compared to existing operation. However, the same section does not indicate whether the Complex would result in additional lowering of the water level in Lake Jocassee. So that we have a full understanding of proposed project operation, please describe whether the Complex would result in lower water levels in Lake Jocassee compared to existing operation, and if so, please estimate the magnitude of any additional changes in water level.

Terrestrial Resources and Threatened and Endangered Species

8. Section 6.1.3 of the PAD describes the land uses within the Bad Creek Project boundary based on the U.S. Geological Survey's National Land Cover Database. Table 6.1-3 and figure 6.1-3 show land uses at the upper reservoir (excluding the full transmission line corridor), including 3.7 percent of land categorized as "cultivated crops" which appear to be located immediately adjacent to the main dam. However, in other project figures, such as 5.4-1 and 5.4-2, this same area appears to be rock and/or barren land that is part of the dam, surrounded by forested land. In addition, table 6.1-3 and figure 6.1-3 show 2.0 percent of land within the project boundary (excluding the full transmission line corridor) categorized as "hay/pasture" in various pockets surrounding the shoreline of the reservoir and the transformer yard and switchyard. However, in other figures in the PAD, these areas appear to be maintained as lawn areas or part of earthen dams. Please clarify the land uses immediately adjacent to the main dam and confirm whether any cultivated crops or hay/pasture areas occur within the project boundary.

9. Section 6.5.3 of the PAD indicates that Duke Energy maintains vegetation: (1) in project access areas on an as needed basis; (2) in the existing transmission line corridor on a regular basis; and (3) on the faces of the project dams in accordance with the FERC-approved Dam Safety Surveillance and Monitoring Plan. The PAD does not provide any other detail about vegetation management at the project. To facilitate review of existing project operation and maintenance activities that affect terrestrial resources, please provide a detailed description of the management of native and non-native invasive[2]

[2] Section 6.5.2.2 of the PAD lists invasive species of concern in South Carolina and specifies that non-native invasive plants, such as Japanese honeysuckle, Japanese knotweed, Japanese stiltgrass, multiflora rose, princess tree/royal paulownia, and tree-of-heaven, were observed during Duke Energy's 2021 field surveys of the existing project transmission line corridor.

vegetation (i.e., any manual, mechanical, chemical, and/or biological) that occurs along project access roads, within the transmission line corridor right-of-way, the area surrounding upper reservoir, and adjacent to other project facilities. If herbicides are used to control vegetation within the project boundary, please provide the location(s), schedule(s), and method(s) of application (e.g., foliar and stump/stem/vine).

10. Section 6.7.1.3.4 of the PAD discusses the potential for monarch butterflies and their habitats to occur within the project boundary. The PAD indicates that during Duke Energy's reconnaissance field surveys, suitable habitat for the monarch butterfly, including milkweeds (Asclepias spp.) and a variety of other flowering plants for nectar, as well as nighttime roosting trees such as willows and pines were observed within the forested areas in the maintained right-of-way. This section of the PAD also includes general statements about vegetation management practices, such as mowing only from November 1st through April 1st (i.e., outside the monarch's breeding and migration period), that could alleviate potential effects to this species from proposed actions at the project. In addition, it states that Duke Energy is an active partner in the "Monarch Candidate Conservation Agreement with Assurances program" (Monarch Program). However, there is no description of any current vegetation management and other practices that Duke Energy implements to benefit monarchs. Please provide a detailed description of the Monarch Program, Duke Energy's role in this program as it relates to management and operation of the Bad Creek Project, and any measures that are currently implemented to protect monarchs at the project.

11. Section 6.5.2 of the PAD provides information about wildlife, including a reference to observations of over 170 species of birds (i.e., eBird volunteer birding database, 2021), in the project vicinity. However, the PAD does not include information about any avian interactions that may have been observed with the project transmission line or switchyard (e.g., nest building, perching, electrocutions, collisions, and any outages related to such interactions). Please provide any available data regarding observed/documented avian interactions with the existing project transmission lines and switchyard.

In addition, so that we may understand the potential for avian interactions with the transmission lines and the switchyard, please include information about the configuration and maintenance of the project transmission lines and switchyard as they relate to avian protection. Please indicate whether the existing project transmission line poles and conductors are consistent with the Avian Power Line Interaction Committee (APLIC) and the U.S. Fish and Wildlife Service (FWS) guidelines to minimize adverse interactions (i.e., potential avian electrocutions and collisions) (APLIC, 2006 and 2012; and APLIC and FWS, 2005). Please provide detailed descriptions, figures, and/or diagrams of the design of the project transmission lines and any existing avian protection devices installed on them. If any avian protection measures are currently proposed for the existing or new transmission lines associated with the Complex, please provide the

specifications and location(s) of these measures and a description of their consistency with APLIC guidelines, if applicable. If Duke Energy has an Avian Protection Plan for the Bad Creek Project, or for all of its hydropower projects that include transmission lines, please file a copy of the current plan.

12. Section 6.6.3 and the Natural Resource Assessment in Appendix E of the PAD discuss the potential effects of constructing the proposed Complex infrastructure and of disposing spoils in wetlands and surface waterbodies in the project area (e.g., dredging, filling, clearing, and de-watering). The PAD indicates that approximately 4 million cubic yards of spoil material for the Complex infrastructure would need to be deposited at on-site spoil locations and at the existing submerged weir in Lake Jocassee. Table 6.6-7 provides a preliminary assessment of potential spoil locations and the estimated impacts to wetlands and surface waters. This table indicates that there are five locations that Duke Energy prefers for spoil disposal (i.e., areas A, B, F, G, and I) and four other locations with the potential for spoil disposal (i.e., C, D, E, and H). However, the PAD does not describe the criteria used to assess the potential spoil disposal areas or provide an explanation of why areas A, B, F, G, and I were selected as preferred locations as opposed to areas C, D, E, H, or other, off-site potential spoil disposal areas. Please file a detailed description of how the potential spoil disposal areas are being identified, sized, assessed, and selected as Duke Energy's preferred locations for this purpose. Please update table 6.6-7 to include a comparison of the estimated acreage of forested uplands and wetlands that would be removed, filled, or otherwise affected at each potential spoil disposal area.

13. Sections 6.7.1.1.1 and 6.7.1.1.2 of the PAD describe the potential for the Indiana bat and northern long-eared bat and their winter and summer habitats to occur within the project boundary. The PAD indicates that one small cave/den was identified in the project boundary that could be used as winter hibernacula for these species. We are unable to find any other information about this cave/den in the PAD, including in the 2021 Bat Survey Report in Appendix G of the PAD. To facilitate review of the existing information about bats and their habitats in the project boundary, please: (1) provide a written description of the cave/den including a general location within the project boundary,[3] size, and the estimated proximity to the existing and proposed project facilities, as well as current project operation and maintenance activities; (2) clarify whether the cave/den was surveyed during Duke Energy's 2021 field surveys; and (3) describe any bats or signs of bats that were observed, if applicable.

This section of the PAD also indicates that large trees with peeling bark and snags with cavities or crevices suitable for summer roosting habitat and potential foraging

[3] In the interest of protecting potential habitat in the cave/den, please do not file the precise location.

habitat for Indiana and northern long-eared bats were abundant within the project boundary. There are general statements about the benefits of limiting tree removal to the period when these species are inactive (i.e., November 15th through March 31st), and a general proposal to coordinate with FWS prior to any tree clearing activities. However, it is not clear what, if any, practices Duke Energy currently implements to benefit Indiana and northern long-eared bats. It also is not clear if Duke Energy currently consults FWS prior to tree clearing activities, or if that is strictly a proposal for relicensing with or without the Complex. Please provide a description of any measures that are currently implemented to protect Indiana and northern long-eared bats and/or other bat species at the project, if any. In addition, please note that if the Complex is ultimately proposed as part of the relicensing process, additional information will be needed in the license application regarding the number of trees that would be removed or disturbed during project construction, operation, and maintenance.

Recreation, Land Use, and Aesthetics

14. Section 6.8 of the PAD describes the non-project Foothills Trail, which is managed through off-license agreements with the Foothills Trail Conservancy. During scoping meetings for the project, several individuals commented on the need to maintain or improve access to the Foothills Trail as part of the relicensing of the Bad Creek Project. Please clarify whether or not Duke Energy intends to evaluate improvements to the Foothills Trail (including additional parking areas or trailheads) as part of the project's relicensing.

15. During scoping meetings, several individuals commented about potential effects of construction of the Bad Creek II Complex on access to the Foothills Trail. Please describe how construction of the Complex would affect access to or use of access roads, parking areas, or trailheads associated with the Foothills Trail. Please also discuss construction-relate effects to the trail itself and trail users, including changes in quality of the recreation experience during construction. Provide a discussion of the timing and duration of any effects in relation to the recreation season and the trail's peak use periods.

Noise, Air Quality, and Traffic

16. Section 5.6 of the PAD describes Duke Energy's preliminary proposal for construction of the Complex and the PAD provides some description of anticipated effects of construction of the Complex on environmental resources. So that we have a full understanding of the potential effects of construction of the Complex on environmental and other resources, please provide a description of the anticipated effects of construction on noise (including frequency, duration, and level in decibels), air quality (including airborne debris and dust, as well as heavy vehicle emissions), and traffic (including proposed routes for heavy equipment used for construction or spoil disposal,

temporary or permanent road closures, and parking or laydown areas for vehicles or equipment).

Literature Cited

APLIC (Avian Power Line Interaction Committee). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.

APLIC. 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute and APLIC. Washington, D.C.

APLIC and FWS (U.S. Fish and Wildlife Service). 2005. Avian Protection Plan Guidelines. Available at: https://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf. Accessed January 24, 2022.

SCHEDULE B
ADDITIONAL STUDY REQUEST

To assist Commission staff with its analysis under the National Environmental Policy Act (NEPA), we recommend that the Duke Energy Carolinas, LLC conduct an Environmental Justice Study (EJ Study) for the Bad Creek Pumped Storage Project (Bad Creek Project). Pursuant to section 5.9 of the Commission's regulations we address the seven study request criteria below.

Environmental Justice Study

Goals and Objectives

§5.9(b)(1) Describe the goals and objectives of each study proposal and the information to be obtained.

The proposed EJ Study has five objectives: (1) to identify presence of environmental justice communities that may be affected by the relicensing of the Bad Creek Project, including the construction of the Complex, and identify outreach strategies to engage the identified environmental justice communities in the relicensing process, if present; (2) to identify the presence of non-English speaking populations that may be affected by the project and identify outreach strategies to engage non-English speaking populations in the relicensing process, if present; (3) to discuss effects of relicensing the project on any identified environmental justice communities and identify any effects that are disproportionately high and adverse; (4) to identify mitigation measures to avoid or minimize project effects on environmental-justice communities; and (5) to identify sensitive receptor locations within the project area and identify potential effects and measures taken to avoid or minimize the effects to such locations, if they are present.

Relevant Resource Management Goals and Public Interest Considerations

§5.9(b)(2) — If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

Not applicable.

§5.9(b)(3) — If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad,*[1] and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*,[2] as amended, require federal agencies to consider if impacts on human health or the environment would be disproportionately high and adverse for environmental justice communities in the surrounding community resulting from the programs, policies, or activities of federal agencies.

Further, Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

Existing Information and Need for Additional Information

§5.9(b)(4) Describe existing information concerning the subject of the study proposal, and the need for additional information.

The information necessary to conduct an identification of environmental justice communities near the project is available through the U.S. Census Bureau's American Community Survey; however, such information must be aggregated and compared in order to make determinations about the presence of environmental justice communities within the project area. The nature of effects of the project on any communities present would need to be determined through consultation with the communities, and are dependent on the applicant's relicensing proposal.

Project Nexus

§5.9(b)(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities. Examples of resource impacts may include, but are not necessarily limited to, project-related effects on: erosion

---

[1] 86 Fed. Reg. 7,619-7,633 (January 27, 2021).

[2] 59 Fed Reg. 7,629-7,633 (February 16, 1994).

or sedimentation of private properties; groundwater or other drinking water sources; subsistence fishing, hunting, or plant gathering; access for recreation; housing or industries of importance to environmental justice communities; and construction-or operation-related air quality, noise, and traffic.

Proposed Methodology

§5.9(b)(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

Below, we provide the methodology that Commission staff has adopted for collecting environmental justice data for hydroelectric projects. This methodology has been successfully employed on a number of projects in the licensing process and is consistent with guidance from the Environmental Protection Agency's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016).[3] Please prepare an Environmental Justice Study Report that provides the following:

a) A table of racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic scope of analysis. For the project, the geographic scope of analysis is all areas within 1 mile of the project boundary, and within 5 miles around the proposed construction of the Complex. The table should include the following information from the U.S. Census Bureau's most recently available *American Community Survey* 5-Year Estimates for each state, county, and block group (wholly or partially) within the geographic scope of analysis:

    i. Total population;

    ii. Total population of each racial and ethnic group (i.e., White Alone Not Hispanic, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, two or more races, Hispanic or Latino origin [of any race]) (count for each group);

[3] Available online at https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

iii. Minority population including individuals of Hispanic or Latino origin as a percentage of total population;[4] and

iv. Total population below poverty level as a percentage.[5]

The data should be collected from the most recent *American Community Survey* files available, using table #B03002 for race and ethnicity data and table #B17017 for low-income households. A template table is provided below.

b) Identification of environmental justice populations by block group, using the data obtained in response to part a above, by applying the following methods included in EPA's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016).

i. To identify environmental justice communities based on the presence of minority populations, use the "50-percent" and the "meaningfully greater" analysis methods. To use the "50-percent" analysis method, determine whether the total percent minority population of any block group in the affected area exceeds 50-percent. To use the "meaningfully greater" analysis, determine whether any affected block group affected is 10-percent greater than the minority population percent in the county using the following process:

1. Calculate the percent minority in the reference population (county);

2. To the reference population's percent minority, add 10-percent (i.e., multiply the percent minority in the reference population by 1.1); and

3. This new percentage is the threshold that a block group's percent minority would need to exceed to qualify as an environmental justice community under the meaningfully greater analysis method.

---

[4] To calculate the percent total minority population, subtract the percentage of "White Alone Not Hispanic" from 100 percent for any given area.

[5] To calculate percentage of total population below poverty level, divide the total households below the poverty level by the total number of households and multiply by 100.

ii. To identify environmental justice communities based on the presence of low-income populations, use the "low-income threshold criteria" method. To use the "low-income threshold criteria," the percent of the population below the poverty level in the identified block group must be equal to or greater than that of the reference population (county).

c) A map showing the project boundary and location(s) of any proposed project-related construction in relation to any identified environmental justice communities within the geographic scope. Denote on the map if the block group is identified as an environmental justice community based on the presence of minority population, low-income population, or both.

d) A discussion of anticipated project-related effects on any environmental justice communities for all resources where there is a potential nexus between the effect and the environmental justice community. For any identified effects, please also describe whether or not any of the effects would be disproportionately high and adverse.

e) If environmental justice communities are present, please provide a description of your public outreach efforts regarding your project, including:

i. a summary of any outreach to environmental justice communities conducted prior to filing the application (include the date, time, and location of any public meetings beyond those required by the regulations);

ii. a summary of comments received from members of environmental justice communities or organizations representing the communities;

iii. a description of information provided to environmental justice communities; and

iv. planned future outreach activities and methods specific to working with the identified communities.

f) A description of any mitigation measures proposed to avoid and/or minimize project effects on environmental justice communities.

g) Identification of any non-English speaking groups, within the geographic scope of analysis, that would be affected by the project (regardless of whether the group is part of an identified environmental justice community). Please describe your previous or planned efforts to identify and communicate with these non-English speaking groups, and identify and describe any measures that you propose to avoid and minimize any project-related effects non-English speaking groups.

h) If new construction is proposed, identification of sensitive receptor locations (e.g., schools, day care centers, hospitals, etc.) within the geographic scope of analysis. Show these locations on the map generated in step c. Provide a table that includes their distances from project facilities and any project-related effects on these locations, including measures taken to avoid or minimize project-related effects.

This study should be conducted in consultation with other relicensing stakeholders who express interest. When you file your final study report with the Commission, please include documentation of any consultation you conducted with entities that expressed interest in environmental justice, copies of their comments, and an explanation of how you have addressed their comments in your final response.

Environmental Justice Data Table Template

	RACE AND ETHNICITY DATA										LOW-INCOME DATA
Geography	**Total Population (count)**	**White Alone Not Hispanic (count)**	**African American (count)**	**Native American/ Alaska Native (count)**	**Asian (count)**	**Native Hawaiian & Other Pacific Islander (count)**	**Some Other Race (count)**	**Two or More Races (count)**	**Hispanic or Latino (count)**	**Total Minority (%)**	**Below Poverty Level (%)**
State											
County or Parish											
Census Tract X, Block Group X											

Level of Effort and Cost

§5.9(b)(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The estimated cost of all efforts to complete this study is $50,000.

phil mitchell, salem, SC.
Request addition of study to encompass “Emergency Preparedness” during construction.
Justification :
Remote location with currently located remote emergency services available to the area. Usage of explosives and major underground work increases the inherent risks and therefore the likelihood of needing this study.

ISSUES :
One project access road, Bad Creek Road, with NO other road egress or exit to 21 home sites. If a life safety emergency , such as fire or complications due to excavation (project involves excavation and thousands of feet of underground work) occurs which prevents road usage then home owners are trapped. Suggest a temporary rough cut secondary access road with possible later usage for recreation.

Project should study impact / benefit of adding an emergency services boat and dock to address fire and life safety during construction and operation due to the remote nature and potential hazards.

Project should study impact / benefit of supporting the addition of another, closer, Fire House on Highway 130 / 281 coming from the Toxaway , NC side of the Bad Creek project to address response time, due to remote location and likelihood of the need for emergency, such as fire and life safety issues.

Study should include issues with emergency communications plans with home owners (due to only one access road in and out).

Friends of Lake Keowee Society

Dedicated to the preservation and enhancement of Lake Keowee and its watershed through advocacy, conservation and education.

4065 Keowee School Road
Seneca, SC 29672

O: (864)-882-3655
www.keoweefolks.org

Email: keoweefolks@charter.net

June 20, 2022

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A,
Washington, DC 20426

RE: Comments on the Bad Creek Pumped Storage Project (FERC No. 2740), Oconee County, South Carolina Notice of Intent (NOI) to File License Application; the Pre-Application Document (PAD), request for comments on the PAD and Scoping Document, and Associated Study Requests for the Bad Creek Pumped Storage Complex II Project.

Dear Ms. Bose:

The Friends of Lake Keowee Society has reviewed the pertinent documents pertaining to the Bad Creek Pumped Storage Project (FERC No. 2740) dated April 22, 2022, which include the Notice of Intent (NOI), the Pre-Application Document (PAD), the Request for Comments on the PAD and Scoping Document, and Identification of Issues and Associated Study Requests for a new license using the Integrated Licensing Process (ILP) for the Bad Creek II Pump Storage project.

At this time, we have no issues or concerns with the proposed relicensing of the Bad Creek Pumped Storage Project or with the ILP for a new license for the Bad Creek Pumped Storage Complex II. The studies identified for the environmental assessment for the Bad Creek Pumped Storage Complex II appear to cover the areas of major concern for FOLKS and our members. We look forward to working with the study groups, FERC, Duke Energy, and others throughout the process to meet our collective goals of supplying clean and green energy to the grid.

Best regards,

Dale Wilde - President, FOLK

Foothills Trail Conservancy
PO Box 3041
Greenville, SC 29602
www.foothillstrail.org

June 23, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: Foothills Trail Conservancy's Comments on Duke Energy's Bad Creek Pumped Storage Project (P-2740-053) Submittals (SD1, NOI, and PAD)

The Honorable Ms. Bose,

Since 1974, the Foothills Trail Conservancy (FTC) nonprofit organization has been at the forefront of collaborative efforts to create, maintain, protect, and expand the Foothills Trail – a preeminent long-distance hiking trail in the Carolinas. With a part-time Executive Director and all-volunteer Board of Directors, FTC continues to lead efforts to construct and maintain the walking path and related appurtenances on many sections of the Trail.

The Foothills Trail is a 77-mile hiking-only National Recreation Trail that showcases the beauty and diversity of the Blue Ridge Region in North and South Carolina. In addition to the 77-miles that form the mainstem or "spine", over 30 miles of existing spur trails connect to and expand access to and from the Foothills Trail (the Trail). The Trail leads hikers through the Blue Ridge Escarpment, one of the most ecologically diverse places in the world; past numerous waterfalls, incredible vistas, rare plants, abundant wildlife, through multiple state parks, across Sassafras Mountain (the highest mountain in SC) -- and includes unparalleled access to the Chattooga River, a nationally-designated Wild & Scenic River, and the Jocassee Gorges Management Area, which was included in National Geographic magazine's "50 of the Last Great Places – Destinations of a Lifetime".

Located within a region experiencing incredible population growth (mid-way between Atlanta and Charlotte, and about an hour drive from Greenville, SC and Asheville, NC), the Trail system provides important recreational and educational opportunities to tens of thousands of nearby residents and draws visitors from around the world. Many people are relocating to North Carolina and South Carolina, making them some of the fastest growing states in the nation.[1] As people continue to discover this spectacular corner of the world, we're also seeing the demand for outdoor recreation skyrocket. NC and SC State Parks within this region have experienced significant surges in visitor use,[2] pushing some to implement a parking reservation system and to turn users away during busy weekends.[3]

---

[1] https://www.census.gov/library/visualizations/2021/comm/how-does-your-state-compare.html

[2] North Carolina State Parks Report Record 22.8 Million Visitors in 2021. https://www.ncdcr.gov/news/press-releases/2022/01/25/north-carolina-state-parks-report-record-228-million-visitors-2021

[3] https://southcarolinaparks.com/jones-gap

Creation of the existing Trail was a tremendous accomplishment that involved decades of collaborative efforts among federal and state governments, utilities, nonprofit organizations, private landowners, and numerous dedicated individuals. In addition to FTC and Duke Energy, numerous partner organizations assisted in making the Trail a reality. Due to the unusual nature of the Bad Creek Pumped Storage Project - with no recreational access to the Reservoir allowed - the Recreation component of the Original License was provided entirely by construction and maintenance of the 43-mile center section of the nearby Foothills Trail. Duke Energy (Duke) continues to be a critical partner in the sustained existence of this important regional and national recreational resource.

Examples of additional partners include the SC Department of Parks, Recreation & Tourism, SC Department of Natural Resources, NC Division of Parks and Recreation, NC Wildlife Resources Commission, and USDA Forest Service (Andrew Pickens and Nantahala Districts), Oconee and Pickens Counties, Naturaland Trust, Conserving Carolina, and many others. Additionally, FTC has coordinated countless volunteer efforts to assist in construction and maintenance activities – for example, over 2,200 volunteer hours in 2021 alone!

Continued support, enhancement, and expansion of the Trail should be the priority solution for meeting recreational needs for the proposed New License - and more recreation should be added if the proposed Complex construction occurs. A variety of factors must be considered to ensure the continuation of this unmatched resource, from permanent protection of an expanded Trail corridor to maintain Trail experience and allow flexibility as needed; to comprehensive assessment of future needs, current conditions, and both previous and anticipated costs. Future conditions include impacts from potential changing land use, impacts of climate change on recreational needs in the Trail area, needs for expanded/improved access, parking, camping sites, and/or appurtenances (e.g., pit toilets, bear proof lockers). Current conditions include an inventory of and map showing land ownership of all parcels the Trail traverses, legal agreements related to trail infrastructure (e.g., lease agreements), and a detailed inventory of trail-related infrastructure that is Duke's responsibility to maintain. Additional information needs include construction costs, maintenance costs, current condition, and projected maintenance schedule. Our community has provided a significant match to Duke's investment in recreational resources through thousands of volunteer hours each year and through assistance with Trail improvements. FTC values the ongoing cooperative partnership with Duke and looks forward to our continued shared dedication to the Foothills Trail.

We appreciate the opportunity to participate as a stakeholder in the relicensing process for the Bad Creek Pumped Storage Project (the Project), including the proposed construction of the 1,400-MW Bad Creek II Power Complex (the Complex) that would double capacity of this facility. We look forward to continued collaboration with Duke, as well as additional stakeholders and the Federal Energy Regulatory Commission (FERC) to ensure that the new license adequately provides for the recreational and natural resource protection needs of the region.

To broadly summarize, FTC's priority interests are repairing, enhancing, expanding, and permanently protecting Duke's 43-mile section of the Trail, to ensure the exceptional experience provided by the entire Foothills Trail continues for current and future generations.

Although the Trail provides opportunities to recreate within an exceptional landscape, its future is at risk from potential land development, loss of legal access to the corridor, degraded quality due to improper maintenance or overuse, and climate change.

We applaud Duke's interest in continued support of the Trail and respectfully request inclusion of expanded assessments and additional measures as part of the Relicensing, as well as for the construction of the proposed Complex.

Foothills Trail Conservancy is pleased to offer the following detailed comments and recommendations on Duke's Scoping Document 1 (SD1) and the Pre-Application Document (PAD).

Sincerely,

Andrew Gleason
Foothills Trail Conservancy Board Chairman

COMMENT 1: <u>Project infrastructure and capacity seems to have changed over time.</u> Clear and consistent information regarding infrastructure size and Project capacity changes over time should be provided. The current discrepancies between Scoping Document 1 (SD1), Pre-Application Document (PAD), and the Original License should be corrected or more fully explained if conditions have been modified since the approval of the Original License.

1a) This information, including completed and ongoing modifications, could be summarized in a table to provide FERC and stakeholders a clear understanding of infrastructure details. Specific examples of inconsistent information or confusing presentation are provided below.

Bad Creek Reservoir Size is listed as:

- 318-acre with storage capacity of 33,323 acre-feet (Original License),
- 367-acre with storage capacity of 33,900 acre-feet (NOI),
- 363-acre with storage capacity of 35,513 acre-feet (PAD 1.1 and 5.4.1),
- 318-acre with storage capacity of 33,323 acre-feet (PAD 6.3.1.1).

Bad Creek installed capacity is listed as:

- 1,000 MW at Bad Creek (Original License),
- 1,400 MW at Bad Creek plus 1,400 MW from proposed new Complex for authorized installed capacity of 2,800 MW (NOI),
- 2,200 MW combined capacity of Bad Creek and Jocassee, with another 280 MW planned to come online by 2023 with completion of ongoing upgrades to the pump-turbine units at Bad Creek (PAD 1.2),
- 1,400 MW proposed new Complex adjacent to existing Bad Creek Powerhouse (PAD).

1b) In cases where impacts are larger than approved in the Original License, an explanation should be provided including additional mitigation measures that have been implemented. For example, stakeholders can deduce that the current ongoing upgrades to the pump-turbine units at Bad Creek will increase installed capacity by 400MW - or 40 percent - beyond that authorized by the Original License. However, it is unclear if potential increased impacts from this construction and upgrades have been evaluated. The documents should be revised to fully discuss impacts from the increased capacity provided by the upgrades currently being installed, including any expanded erosion prevention and recreational mitigation measures being taken to address impacts that are beyond that expected in the Original License.

Comment 1 requests revisions/clarifications to: NOI, PAD: 1.1, 1.2, 5.4.1, 6.3.1.1, 7.1.1.1.

COMMENT 2: <u>Requirements of separate FERC-licenced projects should be kept separate.</u> Recreation provided under a separate FERC License should not count toward the recreational opportunities provided by the Bad Creek License.

Several sections of the PAD include discussion about the Keowee-Toxaway (KT) Project; however, this information is not necessarily relevant as the Bad Creek Pumped Storage Project (P-2740) operates under a separate FERC License from the KT Project (P-2503). In several instances the information provided confuses the conversation as it is unclear how the KT Relicensing Agreement relates to the Bad Creek original Project construction or ongoing Project operation.

While the KT Relicensing Agreement includes critical information related to the KT Project, it should not be relevant to meeting the requirements for the separate and distinct impacts from the Bad Creek Project. Discussions during the KT Relicensing did not consider inclusion of mitigation measures for the Bad Creek Project; hence, requirements of the KT License should not be considered mitigation for Bad Creek. Specific examples are included below.

2a) PAD Section 1.6 (Licensing Background) states both that the Bad Creek Fishery Resources Work Plan was formerly the Keowee-Toxaway Fishery Resources Work Plan and that several activities included in Bad Creek studies were later transferred to the KT Project. Clarification should be provided on related requirements of each Original License and specific activities that were transferred between Licenses.

This section also indicates that Duke and SCDNR collaborated on the development of MOUs (each decade) to establish a framework to help maintain the high quality of fisheries of Lakes Jocassee and Keowee, and that these plans include focus on recreation. Specific recreational benefits provided from these MOUs – that are in addition to those required by the Keowee Toxaway License - should be clearly explained and Duke should provide a copy of each MOU and a summary list of activities successfully completed.

2b) PAD Section 6.8.3.1 (2013 Recreation Use and Needs Study) discusses a study completed in 2013. However, this study did not consider usage of nor the recreational needs provided by the Foothills Trail or the 43-mile section of the Trail that Duke was required to construct and maintain in order to fulfill the Recreation requirements of the Bad Creek Original License. Rather, the 2013 RUN Study evaluated lake access and boating facilities as part of the separate KT Relicensing Project.

Comment 2 suggests revisions/clarifications to PAD 1.2, 1.6, 6.8.3.1, 7.1.6.1.

COMMENT 3: <u>Recreation requirements of the Original License should be accurately and comprehensively discussed.</u> Due to the unusual nature of this project, with no recreational access to the Reservoir allowed, the Recreation component of the Original License was provided entirely by constructing and maintaining the 43-mile center section of the nearby Foothills Trail. A full description of the Trail (including reference to Exhibit R) should be included in discussions regarding protection, mitigation, and enhancement (PM&E) measures and comprehensive information about the Trail infrastructure, construction, and maintenance should be provided.

3a) SD1 3.1.1 and PAD Section 6.8.1 incorrectly state that the Foothills Trail is managed or maintained by the Foothills Trail Conservancy. While FTC maintains and assists with some portions of the Trail, these document sections should be revised to accurately reflect that Duke continues to be responsible for Trail operations and maintenance within the 43-mile section of Trail built to satisfy recreational requirements of the Original License.

In May 1980, Duke submitted "A Plan for Development and Management of the Foothills Trail and A Supplement to the Bad Creek Pumped Storage Project Exhibit R" (Exhibit R) that described ongoing operational, educational, and maintenance needs that would be provided by Duke. These include, but are not limited to:

- Maintaining stream crossing structures, signs, latrines, gates and footpaths within Duke's section of the trail,
- Employing a full-time professional with responsibilities for maintenance and supervision of the Trail and associated facilities,
- Removing trash from access points on a regular basis
- Cleaning up litter along the trail,
- Coordinating with law enforcement,
- Assisting with development of a trail guidebook and offering them at the Visitor Center,
- Educating people on trail-use guidelines by offering a slide show at Keowee-Toxaway Visitor Center and other locations,
- Displaying trail information at the Visitor Center (Including the Trail on the topographic model of the Keowee-Toxaway Project area).

3b) Numerous document sections inaccurately indicate that there is no recreation provided within the Project Boundary. Although most of the Trail is outside of the proposed Project Boundary, public access is currently provided within and adjoining the proposed Project Boundary. The public utilizes Bad Creek Road to access a public parking lot, Foothills Trail kiosk, and a spur trail providing access to the Foothills Trail and to the Lower Whitewater Falls scenic viewpoint. Each of these infrastructure components are shown on the Project Boundary map and should be labeled appropriately.

3c) Wording throughout some sections indicates that recreation was not met "in" the Project Boundary and could be misunderstood to mean that there was no recreation required "for" the Project. Wording should be clarified and additional explanation of the Trail should be added where appropriate.

3d) Several sections mention major PM&E measures required for the original Project construction and list Exhibit S (Environmental Study Plans), Duke and SC Department of Natural Resources (SCDNR) MOU and 10-Year Work Plans, and the Keowee-Toxaway Project Relicensing Agreement FERC No 2503 (KT Project). These sections should include reference to the Bad Creek Project license Exhibit R ("A Plan for Development and Management of the Foothills Trail and A Supplement to the Bad Creek Pumped Storage Project"), which specifies Duke's recreational requirements under the Original License. (SD1; PAD 1.1, 1.6, 6, 6.4.6)

Comment 3 requests revisions/clarifications to SD1, NOI, and PAD 1.1, 1.6, 5.2, 6, 6.4.6, 6.8.1, 6.8.3, 6.8.5, 7.

COMMENT 4: <u>Provide a summary of completed recreation-related projects.</u> Duke should provide comprehensive information regarding fulfillment of the Original License Exhibit R; including a map and complete inventory of infrastructure and appurtenances, construction and maintenance costs, and current conditions of these features throughout the 43-mile section of Trail.

4a) Requested information regarding Duke's 43-mile section includes, but is not limited to:

- Summary of recreation-related requirements from the Original License and actions taken to meet those requirements, including specific measurables.
- Status and durability of trail-related agreements with landowners.

- Copies of all trail-related legal agreements (lease agreements, etc.).
- Comprehensive inventory for all structures (e.g., parking lots, bridges, stairs, campsites), including, but not limited to structure name, structure material, year constructed, cost of installation, expected lifespan, assessment of current condition, and maintenance records (including costs).
- Associated costs, including past land/easement procurement, trail and infrastructure construction, and trail and infrastructure repairs and maintenance.
- Schedule of anticipated maintenance needs and costs.
- Potential need for acquisition of land and/or easements to ensure existence of Trail corridor in perpetuity for future generations, including projected costs.
- Detailed map(s) of Duke's 43-mile Trail section should be added that includes, at a minimum, the following information: parcel boundaries, current property owner(s), access locations (from water and land), spur trails, land use, structures (e.g., parking lots, bridges, stairs, campsites), streams/wetlands, areas of concern (e.g., erosion, overused parking/campsites), and points of interest.

4b) The history of compliance, including inspection reports should be included. For example, in 2000, FERC conducted an Environmental and Public Use Inspection (EPUI), which covered twenty-four miles of trail and identified a range of maintenance deficiencies that included trees across the trail, footbridges in need of repair, smaller bridges that had been washed out, loose handrails, missing footing steps, soil erosion, etc.

4c) Erosion throughout the trail corridor is a serious concern. Within the last six years, the Trail has experienced several landslides that required rebuilding portions of the Trail. Records of erosion-related problems, best management practices (BMPs), maintenance, and repairs should be included.

4d) Decline of native vegetation would significantly degrade the Trail. An evaluation should be conducted throughout the Trail corridor documenting the health of native vegetation, distribution of invasive species, and impact of diseases. For example, the current condition of Hemlock trees should be assessed, trees with a chance of surviving the Hemlock wooly adelgid should be treated, and non-surviving trees should be replaced. An inventory and map of hemlock trees should be included, noting current condition and anticipated actions.

Comment 4 requests revisions/clarifications to SD1, NOI, and PAD 1.1, 1.6, 5.2, 6, 6.4.6, 6.8.1, 6.8.3, 6.8.5, 7, 7.1.6.

COMMENT 5: <u>Federal and state protections apply to Waters of the US regardless of modification, land ownership, or use of water</u>. As both Waters of the US (WOTUS) and Waters of the State (WoS), the Bad Creek Reservoir and streams/wetlands present within the proposed Project Boundary are subject to federal and state regulations. Wording throughout the documents should be corrected to indicate that regulations, such as water quality standards, do apply. Additionally, monitoring should be conducted to evaluate existing impacts and assess potential future impacts.

The Bad Creek Reservoir was formed by damming Bad Creek and West Bad Creek, which were previously identified as Outstanding Resource Waters (figure 1). Converting streams to open

water (e.g., ponds, lakes, reservoirs) does not remove their qualifications as waters of the U.S. or waters of S.C and regulatory designations continue to apply.

5a) Section 1.5 (Other Major Regulatory Approvals) discusses various regulations related to impacts to waterways and states that new construction will require permits and authorizations from the U.S. Army Corps of Engineers (USACE). This wording could be revised to provide a clearer explanation that activities below the Ordinary High Water Mark (OHWM) are regulated by the USACE and the SC Department of Health and Environmental Control (SCDHEC).

5b) Sections 6.1.3.2 (Water Use) and 6.3.7.1 (Bad Creek Reservoir) incorrectly state that the waters within the Project area are not included in state water quality standards nor water classifications. Waterbodies within Duke's proposed Project Boundary are considered jurisdictional WOTUS and WoS and, as such, are assigned water classifications, must meet applicable water quality standards, and are protected by anti-degradation rules. SCDHEC Regulation 61-68 Water Classifications and Standards clearly states that the regulations "establish the State's official classified water uses for all waters of the State…"[4]

Furthermore, the SCDHEC Watershed Atlas (https://gis.dhec.sc.gov/watersheds/) identifies waters within the proposed Project Boundary with the following classifications (figure 1): streams flooded by Bad Creek Reservoir as Outstanding Resource Waters (ORW), the headwaters of Howard Creek as ORW becoming Trout Natural (TN) below the confluence with flow from Bad Creek Reservoir, unnamed stream 1 and impoundment as ORW, and unnamed stream 2 as Trout, Put, Grow, and Take (TPGT).[5]

Section 6.1.3.2 is titled "Water Use"; however, it does not include any discussion of actual water uses, but rather discusses Water Classifications. As such, the section heading should be revised to "Water Classifications and Standards".[6]

Sections 6.3.6 and 6.3.7.1 should be revised to recognize that Bed Creek Reservoir *is* subject to state classification designation and associated standards. As such, water quality monitoring should be conducted to ensure compliance with applicable water quality standards. Modifications or mitigation measures should be implemented, if needed, to address any potential degradation of water quality conditions from ongoing or proposed Project operations.

5c) Section 6.3.4 (Existing and Proposed Uses of Project Waters) and 7.1.2 (Water Resources) state that Bad Creek Reservoir waters are used only for Project operations and that there are no other existing or proposed uses for these waters. However, Section 6.1.1 of the PAD indicates that the Bad Creek Reservoir provides seepage flows from the Main Dam and the West Dam of approximately 5.0 cfs combined. According to the flow data provided by Duke in this section, the flow of Howard's Creek at USGS gauge 02184475 – downstream from Bad Creek Reservoir – ranges from 7.4 cfs (1996) to 12.9 cfs (1990). Further evaluating these data indicates that the Bad Creek Reservoir seepage provides 39 to 80 percent of the flow in Howard Creek. These seepage flows are critical to the continued health of Howard Creek, which is

[4] SCDHEC Regulation 61-68 Water Classifications and Standards https://live-sc-dhec.pantheonsite.io/sites/default/files/media/document/R.61-68.pdf

[5] SC Watershed Atlas [accessed 03 Jun 2022] https://gis.dhec.sc.gov/watersheds/

[6] SCDHEC Regulation 61-68 Water Classifications and Standards https://live-sc-dhec.pantheonsite.io/sites/default/files/media/document/R.61-68.pdf

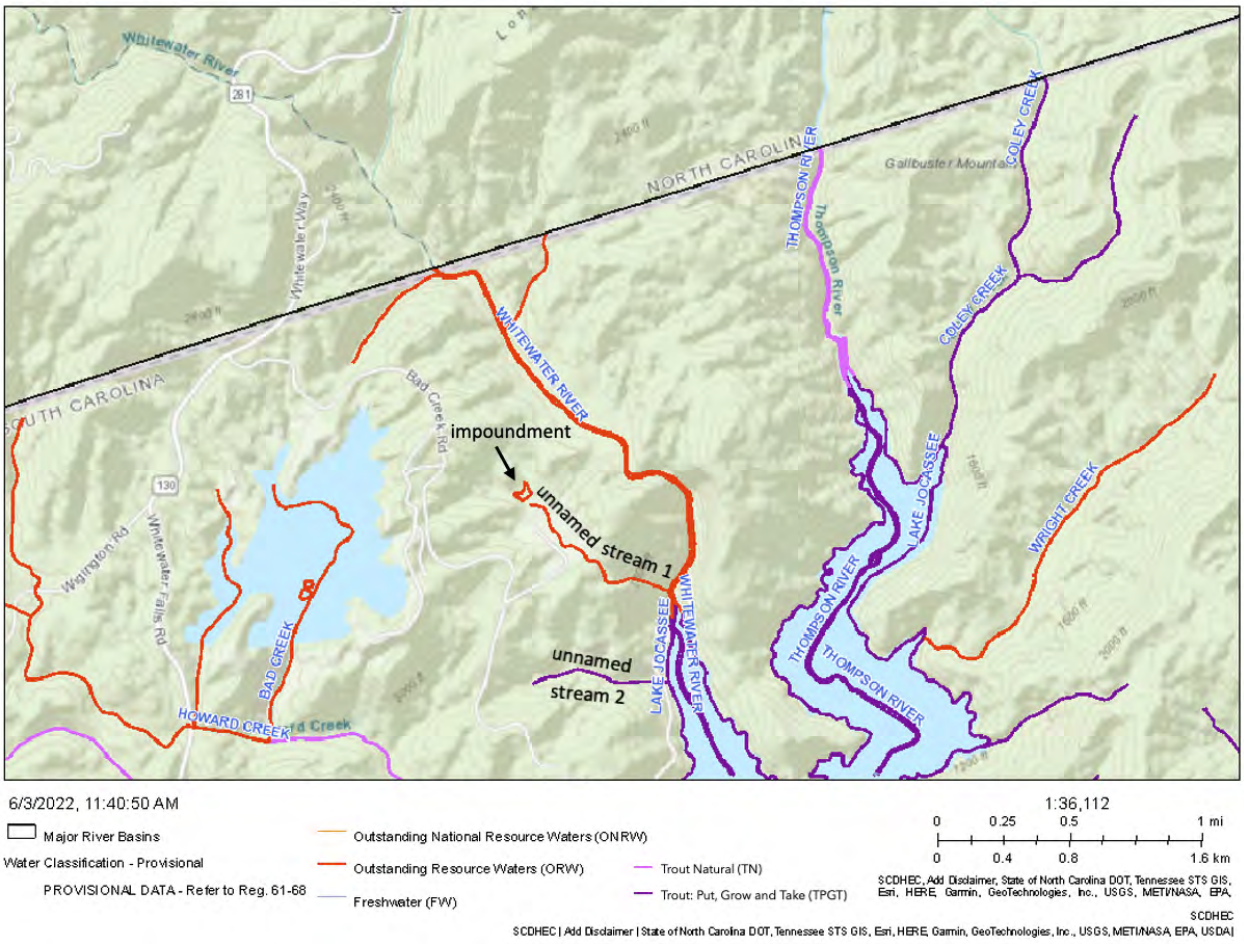
currently designated as an ORW (upstream and along Reservoir) and TN (downstream from Reservoir).

5d) Sections 6.3.8 (Gradient for Downstream Reaches Directly Affected by the Project) and 6.3.9 (Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations) should be expanded to include Howard Creek, as it receives a substantial portion of flow from Bad Creek Reservoir and the additional unnamed tributaries to Lake Jocassee located within the Project Boundary. Additional discussion should be included regarding potential impact of continued and modified operations as well as PM&E.

5e) Section 7.1.2.1 (Potential Issues – Existing Project) notes that there are "no known potential adverse effects"; however, PAD Section 6.3.7.1 indicates that there is currently no monitoring, making it impossible to evaluate if there are any existing adverse effects. Additionally, conditions could be further impacted by the completion of the currently ongoing upgrades that will increase capacity from the 1,000 MW, that was mitigated under the Original License, to 1,400 MW. Duke should initiate a water quality monitoring program at the Bad Creek Reservoir to evaluate current impacts and, if needed, propose PM&E.

Comment 5 requests revisions/clarifications to PAD 1.5, 6.1.3.2, 6.3.4, 6.3.6, 6.3.7.1, 6.3.8, 6.3.9, 7.1.2, 7.1.2.1.

Figure 1 SCDHEC Watershed Atlas



COMMENT 6: Natural resources located within the Project Boundary continue to be protected under regulations; current conditions should be fully evaluated and discussed.

6a) PAD Section 7.1.3 (Fish and Aquatic Resources) should provide information regarding current status of fish and aquatic resources in waterways within the Project Boundary. Damming a stream does not remove all potential for fish or aquatic species to exist. In fact, the "world's most prestigious professional bass tournament" – the Bassmaster Classic – has been held multiple years on Lake Hartwell,[7] which is located in the chain of lakes downstream from the Bad Creek Reservoir. Fish and other aquatic resources should be evaluated, and potential impacts and PM&E should be determined.

6b) PAD Section 7.1.4.1 ([Wildlife and Botanical Resources] Potential Issues – Existing Project) outlines protection of upland habitat and shoreline management around Lake Jocassee and on the faces of the dams; however, it should be expanded to include a discussion of vegetation and shoreline management around the Bad Creek Reservoir as well. Additional discussion should also be included regarding vegetation management techniques along the transmission line corridor, with emphasis on strategies for reducing impacts to water resources and preventing the introduction and spread of invasive species.

Additionally, the condition of vegetation throughout the corridor of Duke's 43-mile section of Trail is a serious concern. The evaluation should be expanded throughout the Trail corridor documenting the health of native vegetation, distribution of invasive species, and impact of diseases. For example, the current condition of Hemlock trees should be assessed, trees with a chance of surviving the Hemlock wooly adelgid should be treated, and non-surviving trees should be replaced. An inventory and map of hemlock trees should be included, noting current condition and anticipated actions.

6c) PAD Sections 7.1.5 (Wetlands and Riparian Habitat) and 7.1.5.1 (Potential Issues – Existing Project) – a map indicating location, size, and condition of all jurisdictional waters within the Project Boundary should be included. This section notes that continued operations are not expected to impact wetland, riparian, or littoral habitat, yet the ongoing vegetation maintenance along the transmission line likely involves mowing and/or application of pesticides. These activities can impact these sensitive ecosystems by removing or destabilizing habitat or plant communities; activities can also degrade water quality and increase erosion if appropriate vegetation is not maintained.

Comment 6 requests revisions/clarifications to PAD 7.1.3, 7.1.4, 7.1.4.1, 7.1.5, 7.1.5.1.

COMMENT 7: Current conditions should be evaluated throughout the Trail corridor. A comprehensive evaluation of existing resources and potential impacts of current and ongoing operations, including of current upgrades, to Project-related recreation (i.e., the 43-mile section of Trail and appurtenances constructed and maintained by Duke) should be included. Specific sections are noted below.

7a) SD1 Section 3.2.2 (page 9) should include a discussion of potential threats to Aquatic Resources throughout the Trail corridor. These could include upland soil erosion (potentially caused as a result of a storm, wildfire, or by trail use). Current conditions within the Trail

[7] https://andersonscliving.com/good-to-know/2022-bassmaster-classic-coming-to-lake-hartwell/

corridor should be included in PAD Section 6.2.3 (Reservoir Shoreline and Stream Banks) regarding stream banks and PAD Section 7.1.1.1 (Geology and Soils Potential Issues – Existing Project) regarding any slope instability or erosion.

Without proper controls, stormwater runoff can accelerate erosion, contribute to streambank instability, increase pollutant loading, and degrade the quality of receiving water bodies. Erosion throughout the Trail corridor is a serious concern. Within the last six years, the Trail has experienced several landslides that required rebuilding portions of the Trail. Increased intensity of storm events and our changing climate will continue to amplify these problems. Best management practices (BMPs) that have been installed, such as water bars, may need repair or additional measures may be needed to address these problems throughout the Trail corridor.

Additionally, erosion and vehicle-related spills can occur in parking lots and at access points. For example, recent vandalism at a Trail access parking lot included drilling a hole in a vehicle's gas tank - and resulted in gasoline draining directly to a nearby stream. (See WYFF: Thieves, vandals strike Foothills Trail parking lot, leaving hikers stranded, woman says 5/30/22). Ensuring BMPs are appropriately constructed and maintained is especially important as we see increasing Trail usage and heightened intensity of storm events.

Also, regarding water quality impacts, there are limited restroom facilities currently available to Trail users - with all located at Trail access parking lots. None of the backcountry, designated campsites have restroom facilities. As noted by the US Department of Agriculture Forest Service (USFS), heavy usage of backcountry trails can result in environmental degradation associated with human waste disposal.[8] The increasing popularity of the Trail may support the need for pit toilets to reduce potential for human waste to contaminate aquatic resources.

7b) SD1 Section 3.2.2 (page 10) Terrestrial Resources and Threatened and Endangered Species and PAD 6.5.4 ([Wildlife/Botanical] Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations). Throughout the Trail corridor, these resources are at an increased threat from spread of invasive species and introduction of diseases, which are associated with both land disturbance and climate change. Invasive species can cause economic and ecological harm and their spread would significantly degrade the ecological integrity and recreational experience of the Trail corridor. Invasive species spread rapidly, outcompete valuable native species, and once established they can be difficult and costly to control. Regular assessments of invasive species throughout the Trail corridor would allow prevention and quick response, helping protect the long-term integrity of the Trail.

Additionally, decline of native vegetation due to diseases or insects would significantly degrade the Trail. An evaluation should be conducted throughout the Trail corridor documenting the health of native vegetation, distribution of problematic insects, and impact of diseases. For example, the current condition of Hemlock trees should be assessed, significant trees with a strong chance of surviving the Hemlock wooly adelgid should be treated, and consideration should be given to preventing erosion and accelerating forest recovery in areas with significant hemlock losses. An inventory and map of hemlock groves should be included, noting current condition and anticipated actions. Climate change is an important consideration for wildlife and botanical resources and should be considered throughout the life of the proposed new license.

[8] https://www.fs.fed.us/t-d/pubs/html/95231202/95231202.html

PAD Section 6.5.2.2 (Invasive Species) should also include a map indicating locations of invasive species throughout the Project-related areas, especially in relation to sensitive species, pristine ecosystems, and the Foothills Trail. Additional information should be provided outlining Duke's efforts and plans to control, eradicate, and prevent movement of invasive species throughout these areas.

7c) The following PAD sections should include a thorough discussion of and maps identifying resources within the Trail corridor: 5.2 (Project Location and Maps), 6.1.5 (Tributary Rivers and Streams), 6.2.1 (Geologic Features), 6.2.4 (Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations), 6.3.1 (Drainage Area), 6.3.7 (Existing Water Quality Data), 6.3.8 (Gradient for Downstream Reaches Directly Affected by the Project), 6.3.10.2 (Impacts to Project Streams), 6.5 (Wildlife and Botanical Resources), 6.5.1 (Terrestrial Habitats), 6.5.3 (Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations), 6.6 (Wetlands Riparian, and Littoral Habitat), 6.7 (Rare, Threatened, and Endangered Species), 6.7.1.2 (Migratory Bird Treaty Act of 1918), 6.7.1.3 (At Risk Species), 6.7.2 (State-listed Threatened, Endangered, and Candidate Species), 6.7.3 (Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations), 6.9 (Aesthetic Resources), and 7.1.1.1 (Geology and Soils Potential Issues – Existing Project).

Climate change is an important consideration for natural resources within the Trail corridor and should be considered throughout the life of the proposed new license. Of particular note is the consideration of wildlife corridors, which will be necessary for species migration due to climate change and should be considered and included in PM&E measures.

Regarding Geologic Features, much of this information can be obtained from the Geology Guide to the Foothills Trail: 77 miles of trail, 1.2 billion years of geology (SCDNR; Morrow, Robert H., Ranson, William A., Arrington, Tanner).

Comment 7 requests revisions/clarifications to SD1 3.2.2 (Aquatic Resources, Terrestrial Resources and Threatened and Endangered Species); and PAD 6.1.5, 6.2.1, 6.2.3, 6.2.4, 6.3.1, 6.3.7, 6.3.8, 6.3.10.2, 6.5, 6.5.1, 6.5.2.2, 6.5.3, 6.6, 6.7, 6.7.1.2, 6.7.1.3, 6.7.2, 6.7.3, 6.9, 7.1.6.3, 7.1.1.1.

COMMENT 8: <u>Proposed PM&E should be clear and consistent.</u> Discrepancies between SD1 and the PAD create confusion on Duke's future intent regarding the Trail; these documents should be clear and consistent. With no consideration of recreation at the Reservoir and recreational access on Lake Jocassee provided by the separate KT License, the Foothills Trail should be the focus of recreational requirements of the New License.

Please note, FTC comments regarding a comprehensive RUN study are included in Comment #9.

8a) The SD1 indicates that Duke does not propose to include the Foothills Trail in the New License, and it diminishes the role of the Trail in discussion throughout various sections. Specifically, SD1 Section 3.1.1 (page 6) states "Duke Energy does not propose to include the Foothills Trail as a project recreation facility under the new license."

The 43-mile section of Trail represents the preponderance of the recreation provided as part of the Original License; it fills a range of recreational needs that would be nearly impossible to

replace. The Trail is an important and unique recreational and educational resource that improves the quality of life throughout the region.

Continued support of the Foothills Trail is a critical component of the New License and expansion of the recreational provisions should be considered to account for the population growth, increased demand for outdoor recreational needs, and expansion of project operations from the ongoing upgrades.

8b) SD1 Section 3.2.2 (page 11) Recreation, Land Use, and Aesthetics outlines minimal considerations, with two of the three bullets only applicable if construction of the proposed Complex occurs. This section should be expanded to a full recreational use and needs (RUN) study that considers current and future recreational needs for the license renewal, including additional measures to be included if construction of the Complex is pursued. Full comments regarding the RUN study are discussed in Comment #9.

8c) SD1 Section 5.0 (page 18) Proposed Studies #8 Recreation and Public Safety study is currently limited to construction and operation of the Complex, or new facilities. The study should be expanded to consider public safety concerns along the Trail, including the need for enhanced safety measures at parking lots and access points. See WYFF: Thieves, vandals strike Foothills Trail parking lot, leaving hikers stranded, woman says 5/30/22).

Comment 8 requests revisions/clarifications to SD1 3.3.1, 3.2.2, 5.0; and PAD 5.2, 6.8.3, 6.8.3.1, 6.8.5, 7.1.6.1.

COMMENT 9: <u>The RUN Study should be expanded.</u> The proposed Recreational Use and Needs (RUN) Study should be comprehensive and specifically for recreation related to the Bad Creek Project.

A comprehensive Recreational Use and Needs (RUN) Study should be conducted to evaluate the need for expansion and enhancement of trail facilities to meet the current population, which has already grown significantly since the Original License in 1977. Additionally, the RUN should evaluate needs through 2077, the potential end of the New License period.

A previous comment outlines the inappropriateness of using the outdated and unrelated 2013 RUN Study completed to evaluate water-based recreation needs associated with the Keowee-Toxaway Relicensing (FERC Project No. P-2503) and requests revisions of PAD 6.8.3.1 (2013 Recreation Use and Needs Study).

9a) PAD Section 7.1.6.3 (Proposed Studies) outlines the proposed new RUN Study and notes that it would focus on the Foothills Trail, Canebreak access point (note corrected spelling is "Canebrake"), and the Laurel Creek Foothills Trail access points and parking areas. We appreciate the proposal for a RUN Study focused on the recreational requirements of the Bad Creek Project and request the focus area be expanded to include all land and water access points and all spur trails along the 43-mile section of Trail. Of particular importance is the land access location within the Bad Creek Project Boundary.

Additionally, the study should be expanded to evaluate if the current recreational opportunities are meeting demands, and if not – why. Simply counting existing trail users will not identify deficiencies that may be keeping people from using the Trail. For example, a recent spree of vandalism to vehicles at parking lots at Trail access points may discourage people from utilizing

any parking lots for hiking in the area, even if they are active hikers with interest in the Trail. (See WYFF: Thieves, vandals strike Foothills Trail parking lot, leaving hikers stranded, woman says 5/30/22). Study methods and focus areas should be expanded to improve accuracy of estimation of recreational needs.

Many nearby State Parks, featuring similar terrain and hiking challenges, have experienced significant surges in visitor use[9] and at times cannot accommodate demand. The heavy demand has even pushed one Park to implement a parking reservation system and turn people away during busy weekends.[10] If evaluation shows lower demand for Trail resources than State Parks, a comparison of features offered would inform the conversation on future needs for this Project.

Based on FTC members' expertise and experience, we request evaluation for the following additions or upgrades: expansion of the Trail and construction of additional spur trails to connect to additional points of interest (e.g., Walhalla, Stumphouse, Lake Toxaway, Panthertown Valley); improved access/parking (safety, etc.), additional and improved campsites (e.g., flatter areas to accommodate tents, pit toilets, bear proof lockers), etc.

FTC anticipates safety becoming an increasing concern. With expanding development, shrinking bear habitat, and more people on our trails, it's no surprise that bear encounters are increasing in our area.[11] Backpackers are often the most vulnerable to dangerous bear encounters. Properly hanging a food bag is an art (especially after a long day of hiking), and black bears are becoming increasingly skilled at gaining access to food bags. Food-conditioned bears are often bolder with human encounters, sometimes becoming aggressive, and often leading to the bear being euthanized. (See https://www.usatoday.com/story/news/nation/2022/06/14/bear-euthanized-scratching-woman-child-national-park/7626099001/) Some National Parks and long-distance trails in bear territory provide bear proof lockers at designated campsites to simplify proper food storage and enhance safety for humans and bears. This option should be considered for campsites throughout the Trail as a preventive safety measure.

9b) SD1 Sections 3.2.2 (Recreation, Land Use, and Aesthetics) and 5.0 (Proposed Studies #7 Recreation) should be revised to be consistent with the RUN Study outlined in the PAD, as expanded per revisions requested by FTC.

9c) PAD Section 6.1.3.1 (Land Cover) states that the primary reason the Bad Creek Reservoir and Lake Jocassee have no or minor residential development, respectively, is that Duke partnered with state agencies to designate a significant amount of the land adjoining Lake Jocassee for public recreation and resource conservation. However, a significant portion of Duke's 43-mile section of the Foothills Trail, required by the Original License, is located on property that Duke may intend for development. Duke transferred land ownership of a 6,694.8-acre parcel (Oconee County Parcel ID 016-00-01-013), which houses an important stretch of the Foothills Trail, several times throughout the Original License period. Online records show

[9] North Carolina State Parks Report Record 22.8 Million Visitors in 2021. https://www.ncdcr.gov/news/press-releases/2022/01/25/north-carolina-state-parks-report-record-228-million-visitors-2021

[10] https://southcarolinaparks.com/jones-gap

[11] https://www.outsideonline.com/outdoor-adventure/environment/bears-north-carolina-encounters/

transfer of this parcel on 7/8/2008 from Crescent Resources Inc to Duke Ventures LLC for a sales price of $29,215,248; then an additional transfer on 7/9/2009 from Duke Ventures LLC to Duke Venture Real Estate LLC for $0.[12] Development of this parcel would drastically change Land Cover within this watershed, while also degrading the quality of the Foothills Trail. Widening the Trail corridor should be closely evaluated to ensure protection of the natural resources and user experience along the Trail.

9d) The RUN Study should evaluate the potential impact if land use surrounding the Trail corridor was modified and discussion in PAD Section 6.8.5 (Non-Recreational Land Use and Management) should be expanded. Currently, the land surrounding the Trail corridor is nearly entirely undeveloped and provides hikers with a wilderness-like experience. As such, information should be provided on potential non-recreational land use and management of all land parcels that Duke's 43-mile section crosses. Duke should provide information on how the recreational quality and benefits of the Foothills Trail will be preserved – and expanded to meet growing recreational needs – throughout the new License period.

Additionally, expansion of the Trail corridor width will be of particular importance if land use changes occur throughout this region. Currently, the large areas of undeveloped land are providing critical habitat and supporting the resiliency of species. If surrounding lands are developed, the Trail corridor could provide the only connection between critical habitats. Considering the anticipated acceleration of species migration due to climate change, the Trail corridor could become vital to supporting genetic diversity - or even the survival of - some species. The USDA's *Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways Manual* (2008)[13] recommends minimum widths for corridors to support various species - invertebrates can utilize the narrowest corridors (100-200 feet) and large predator mammals need the largest corridors (330 feet to ≥3 miles). The Manual also notes that as "the length of the corridor increases, so should the width." Consideration must be given to the increased importance of the Trail corridor should the surrounding land develop within the next 50 years.

9e) PAD Section 7.1.6.1 (Potential Issues – Existing Project) offers to continue maintaining this 43-mile section of trail and two lake access locations for the New License. Our region's population has skyrocketed since the Original License was approved in 1977 and the demand for outdoor recreation has increased significantly. Considering this, improved and expanded recreational resources are necessary.

The FTC welcomes the opportunity to participate in future discussions regarding an updated Recreational Management Plan (RMP), including enhanced and expanded facilities, possibilities for permanent land agreements to secure the Trail's continued existence, and the anticipated ongoing maintenance needs.

---

[12] Oconee County Property Records [accessed 03 Jun 2022] https://qpublic.schneidercorp.com/Application.aspx?AppID=1030&LayerID=21692&PageTypeID=4&PageID=9258&KeyValue=016-00-01-013

[13] https://www.csu.edu/cerc/researchreports/documents/ConservationBuffersDesignGuidelinesForBuffersCorridorsGreenways2008B.pdf

Comment 9 requests revisions/clarifications to SD1 3.2.2, 3.3.1, 5.0; and PAD 5.2,6.1.3.1, 6.8.3, 6.8.3.1, 6.8.5, 7.1.6.1, and 7.1.6.3.

COMMENT 10: Expanded information should be included in some sections to provide a more accurate, updated, and comprehensive understanding of conditions.

10a) PAD Sections 6.11 (Socioeconomic Resources) and 6.11.1 (Population) provide information limited to Oconee County, in which the Bad Creek Project is located. However, the existing Project serves a much larger area. In fact, the Original License noted that the "additional peaking capacity of the proposed project will also be of benefit to the entire Virginia-Carolina (VACAR) Subregion of the Southern Electric Reliability Council (SERC).." (page 4). Also, PAD Section 1.2, indicates that population and household growth in the Carolinas is exceeding the national average. South Carolina is identified as the fifth fastest growing state in the nation, spurred by relocation of people from other states.[14]

These sections should be expanded to provide a comprehensive evaluation of the population and socioeconomics in the area serviced by the existing Project, the additional population that would be served by the proposed expansion, and the population (including future projections) of the Upstate region – the Greenville-Spartanburg-Anderson, SC Combined Statistical Area.

10b) PAD Section 6.1.2 (Climate) includes climate data limited to averages through 2010 and does not include more current data from the last 12 years. The climate evaluation should include current and comprehensive data. In addition to averages, maximums and minimums should be included for temperatures and rainfall. Including more current data may show significant differences in climate conditions. For example, a new record annual rainfall for the state was set in 2018, just 3 miles from the Bad Creek Project.[15] This new record of 123.45" is significantly different from the maximum of 100" annual precipitation noted in the PAD. This section should also include a discussion of changing climate conditions and projected future conditions. This should include, but not be limited to, discussion of increasing nighttime temperatures, seasonal precipitation patterns, annual rainfall, and drought.

The impacts of climate change should also be evaluated and discussed in the following PAD sections: 6.3.9 ([Water Resources] Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations), 6.7.3 ([Rare, Threatened, and Endangered Species] Known or Potential Adverse Effects and Proposed PM&E Measures: Existing Operations), and 6.7.4 ([Rare, Threatened, and Endangered Species] Known or Potential Adverse Effects and Proposed PM&E Measures: Bad Creek II Complex).

In relation to climate change, wildlife habitats, migration corridors, and species resiliency and survival are of particular interest and should be considered through 2077 - the potential life of the proposed new license. Wildlife corridors, which may be necessary for species migration due to climate change, should be considered and PM&E measures should be identified for both

[14] Post and Courier (12/21/2021) https://www.postandcourier.com/news/us-sees-slowest-population-growth-on-record-but-sc-among-fastest-growing-states/article_7873e424-6274-11ec-81ba-9793bea986ef.html

[15] SCDNR: https://www.dnr.sc.gov/news/2019/may/may2_recordrainfall.php

relicensing of Existing operations and additional considerations if the proposed Complex expansion moves forward.

Widening the Trail corridor width will become increasingly important as climate change impacts this ecologically diverse region. Currently, the large areas of undeveloped land are providing critical habitat and supporting the resiliency of species. If surrounding lands are developed, the Trail corridor could provide the only connection between critical habitats. Considering the accelerated need for species migration due to climate change, the Trail corridor could become vital to supporting genetic diversity - and even the survival of - some species. The USDA's *Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways Manual* (2008)[16] recommends minimum widths for corridors to support various species - invertebrates can utilize the narrowest corridors (100-200 feet) and large predator mammals need the largest corridors (330 feet to ≥3 miles). The Manual also notes that as "the length of the corridor increases, so should the width." Consideration must be given to the increased importance of the Trail corridor should the surrounding land develop within the next 50 years.

10c) PAD Section 7.1.1.1 (Geology and Soils Potential Issues – Existing Project) outlines geology and soils-related issues from the "existing" project, but additional information should be included. For example, it notes that there "is active slope movement in the Project" and that these areas are monitored but does not provide information on severity or locations of this activity. Additionally, it is important to recognize that Duke is currently modifying operations and equipment to increase capacity at Bad Creek by 40% beyond the capacity in the original license. It is unclear if the increased impacts from the current expansion activities have been evaluated. This section should be revised to fully discuss impacts from the increased capacity provided by the upgrades currently being installed, including any expanded erosion prevention and recreational mitigation measures being taken to address the current impacts that are beyond that expected in the Original License.

Comment 10 requests revisions/clarifications to PAD 6.1.2, 6.3.9, 6.7.3, 6.7.4, 6.8.3.1, 6.11, 6.11.1, and 7.1.1.1.

COMMENT 11: <u>Construction of the Complex should require additional evaluation and PM&E measures.</u> The proposed Bad Creek Complex II Expansion would double the already upgraded capacity of the Bad Creek Project. A complete analysis of permanent and temporary construction impacts and potential introduction/expansion of invasive species should be thoroughly evaluated and additional PM&E, including expanded recreational requirements, should be required.

11a) PAD Section 6 (Description of the Existing Environment and Resource Impacts) should include more detailed evaluation of potential impacts and PM&E measures for the construction and operation of the proposed Complex II and should propose consideration of current and future recreational needs.

16 https://www.csu.edu/cerc/researchreports/documents/ConservationBuffersDesignGuidelinesForBuffersCorridorsGreenways2008B.pdf

11b) PAD Section 6.3.10 (Known of Potential Adverse Effects and Proposed PM&E Measures: Bad Creek II Complex) includes limited discussion as it does not acknowledge water uses beyond the Project. As noted in earlier comments, Howard Creek receives a substantial portion of flow from the Bad Creek Reservoir and a discussion regarding potential impact of continued and modified operations as well as PM&E. Impacts of climate change should also be evaluated and discussed.

11c) PAD Section 6.3.10.2 (Impacts to Project Streams) should include the estimated amount of impact (linear footage of streams, acreage of wetlands or open water), classification and condition of proposed impacted resources, and duration of impacts (e.g., during construction or permanent). This section should also discuss potential impacts to the streams along the 43-mile section of the Foothills Trail, including spur trails and access locations, that is Duke's responsibility to construct and maintain under the Original License. Additional discussion should be included if construction or operation of the Complex could directly impact the Foothills Trail, either temporarily or permanently.

11d) Additional discussion regarding the "Known or Potential Adverse Impacts and Proposed PM&E Measures for Bad Creek II Complex" should be included for the following PAD sections:

- 6.4.7 [Fish and Aquatic Resources], 6.5.4 [Wildlife and Botanical Resources], and 6.7.4 [Rare, Threatened, and Endangered Species] – land disturbance is often a gateway for introduction of additional invasive species, introduction of diseases, and expansion of existing invasive species populations. Each of these require thoughtful planning and control measures to prevent, limit, or mitigate potential impacts. Climate change is an important consideration for wildlife and botanical resources and should be considered throughout the life of the proposed new license. Potential wildlife corridors, which may be necessary for species migration due to climate change, should be investigated.
- 7.1.4 (Wildlife and Botanical Resources) - Proposed environmental measures should be expanded to ensure impacts are avoided and minimized wherever possible, as well as include efforts to enhance these species either within or outside of the Project Boundary.

11e) PAD Section 7.1.2.2 ([Water Resources] Potential Issues – Bad Creek II Complex) indicates that the operation of the proposed Bad Creek II Complex has the potential to impact water surface elevations of Lake Jocassee. Further information should be provided regarding specifics of anticipated changes in water levels, for how long, and at what time(s) of day/night.

This section also indicates that increased sediment loading to the Whitewater River arm of Lake Jocassee is expected during construction. In addition to SCDHEC permit(s), the addition of fill to a WOTUS and WoS may require a permit from the USACE. Extra care should be taken to prevent and minimize erosion to avoid degradation of the high-quality downstream waters, which are classified as Outstanding Resource Waters, Trout Natural, and Trout: Put, Grow and Take.

Additionally, this section states that disposal of the overburden from construction activities is expected to include addition of fill to streams and wetlands within the project area. As noted previously in these comments, the waters in this area have uncommonly high-water quality and are designated as Outstanding Resource Waters, Trout Natural, and Trout Put, Grow and Take

waters – SC's most protective designations. Alternative disposal locations should be utilized to avoid filling such high-quality waterways.

11f) PAD Section 7.1.5.2 ([Wetlands and Riparian Habitat] Potential Issues – Bad Creek II Complex) notes that approximately 4 million cubic yards of spoil material will need to be disposed of and indicates that to do so within the Project Boundary will involve permanent impacts to water resources. Considering the unique habitat for many At-Risk species within this area, Duke should evaluate alternate locations for disposal of spoil material.

Duke Energy does not propose any PM&E measures be included in the New License as compensatory mitigation will be required if waters of the U.S. are impacted. We understand this process is separate from FERC's relicensing and urge Duke to consider permittee-sponsored mitigation to ensure protection and enhancement of waters and habitats similar to the unique and high-quality habitat provided in the Project area.

11g) PAD Section 7.1.6.2 ([Recreation and Land Use] Potential Issues – Bad Creek II Complex) indicates that temporary impacts from construction of the Bad Creek II Complex will include prohibiting public access within the Project Boundary for five years. This section should be revised to clearly indicate what parking lots and access points will be impacted. As noted previously, a popular parking lot and access point to hiking trails are located within the Project Boundary. Both the Lower Whitewater Falls Trail and the Bad Creek Spur Trail are located partially within the Project Boundary.

The FTC welcomes the opportunity to participate in additional discussions regarding these potential temporary – but long-term – impacts and possible mitigation strategies.

11h) PAD Section 7.1.7 (Aesthetic Resources) outlines the visible Project elements and should be expanded to include visual conditions and impact along the Trail. For example, the Bad Creek Reservoir and transmission lines are visible from locations along the Foothills Trail and additional viewpoints throughout the area. These locations should be identified and potential issues from the existing project or proposed Complex should be evaluated for additional consideration.

Comment 11 requests revisions/clarifications to PAD 6, 6.3.10, 6.3.10.2, 6.4.7, 6.5.4, 6.7.4, 7.1.2.2, 7.1.4, 7.1.4.2, 7.1.5, 7.1.5.2, 7.1.6.2, and 7.1.7.

COMMENT 12: The proposed Project Boundary should be expanded to include all Project-related infrastructure.

12a) Throughout the documents (e.g., Section 6.8.5; Appendix C), the Project Boundary Map should be clearly labeled and expanded to include the weir in Lake Jocassee that was installed to reduce impacts from the Bad Creek reservoir discharge. The weir is described in Section 5.4.5 (Submerged Weir in Lower Reservoir).

12b) In several places throughout the documents, Duke notes that no public recreation is provided within the proposed Project Area. However, public access is currently provided in and adjoining the proposed Project Boundary. The public utilizes Bad Creek Road to access a public parking lot, Foothills Trail kiosk, and a spur trail providing access to the Foothills Trail and to the Lower Whitewater Falls. Each of these infrastructure components are shown on the map and should be labeled appropriately.

12c) Additionally, recreational areas that are provided to meet FERC License Agreements are regularly included within the Project Boundaries; as such, the entirety of Duke's 43-mile section of the Foothills Trail should be included within the Project Boundary and related maps.

Comment 12 requests revisions/clarifications to PAD 5.4.5, 6.8.5, 7.1.6, 7.1.6.1, 7.1.7; and Appendix C.

COMMENT 13: Specific minor revision requests are listed below.
13a) The Foothills Trail Conservancy contact information should be updated in the Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List (included in NOI and PAD Appendix A), to the following:

Andrew Gleason
Chairman, Board of Directors
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Dr. Bill Ranson
Member, Board of Directors
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

Glenn Hilliard
Founder and Advisor
Foothills Trail Conservancy
glenn@hilliardgroup.com

13b) SD1 Section 8.0 (page 21-23) should include the most current version of Comprehensive Plans; for example, the list includes the SC State Comprehensive Outdoor Recreation Plan (SCORP) from 2008, but the SCORP was updated in 2019 and is available online https://p.widencdn.net/bzuwqi/2019-South-Carolina-SCORP-FINAL.

13c) PAD Section 4.4.1 (Maintenance of Public Website) – Duke commits to maintaining a public Project website during the course of the licensing process. To assist stakeholders and the general public with understanding Duke's compliance with the Licensing Agreements, we recommend maintaining this website (including compliance reports) into the future.

13d) PAD Section 6.8.1.1 (FERC-Approved Recreation Facilities at the Project) states that "Prior to the construction of the Project, the first portion of the Foothills Trail was built linking Table Rock State Park to Oconee State Park." This wording is confusing and could be misunderstood that the first portion of the Trail connected Table Rock State Park to Oconee State Park. In fact, Table Rock State Park and Oconee State Park represent the current end points – and the section between is the entire 77-mile Foothills Trail, including the 43-mile central section Duke constructed and continues to maintain. This section should be clarified to accurately describe the initial section built prior to construction of the Bad Creek Project.

Comment 13 requests revisions/clarifications to NOI; SD1 8.0; PAD 4.4.1, 6.8.1.1; and PAD Appendix A.

South Carolina Department of
Natural Resources

1000 Assembly Street
PO Box 167
Columbia, SC 29202
843-953-3881 Office
millere@dnr.sc.gov

Robert H. Boyles, Jr.
Director

Lorianne Riggin
Director, Office of
Environmental Programs

June 23, 2022

Electronic Transmission

Hon. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

REFERENCE: Comments on the Pre-Application Document, Scoping Document 1, and Study Requests for Bad Creek Pumped Storage Project (P-2740-053).

Dear Secretary Bose:

The South Carolina Department of Natural Resources (SCDNR) has reviewed the Pre-Application Document (PAD) prepared by Duke Energy Carolinas, LLC (Licensee) and Scoping Document 1 (SD1) prepared by the Federal Energy Regulatory Commission (Commission or FERC) for the proposed relicensing of the Bad Creek Pumped Storage Project, FERC Project No. 2740 (Project). The Licensee has chosen to utilize the Commission's Integrated Licensing Process (ILP) to relicense the Project.

This letter is provided in response to the Commission's notice of April 22, 2022, solicitation for public comments on the PAD, SD1, and identification of issues and study requests related to the proposed relicensing of the Project. The SCDNR submits these comments, opinions, and recommendations in accordance with provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. Sec. 661-667); the Federal Power Act (16 U.S.C. Sec. 791 et seq.); the National Environmental Policy Act (42 U.S.C. Sec. 4321 et seq.); and the Electric Consumers Protection Act of 1986 (Pub. L. No. 99-495, 100 Stat. 1243).

Project Description

The Project is located in Oconee County, South Carolina, approximately eight miles north of the Town of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee, licensed as part of the Licensee's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503), serves as the lower reservoir. The Project is located on a headwater tributary of the

Savannah River. The Project facilities consist of an upper reservoir, a main dam, a west dam, an east saddle dike, a water conveyance system, an underground powerhouse, access roads, and voltage transformation facilities. The Project has a total installed capacity of 1,400 megawatts (MW). The total average annual generation of the Project is about 1,884,685 megawatt-hours (MWh). The Project is operated under the terms of the Project's original license, set to expire on July 31, 2027.

The Licensee has proposed to assess the feasibility to develop a Bad Creek II Complex (Complex) during the pre-filing period of the ILP's relicensing process. The Complex would consist of the following new facilities or structures: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line. The Complex powerhouse would include four, new reversible pump-turbine units with an installed generating capacity between 106 MW and 425 MW, and a starting capacity between 308 MW and 372 MW for pumping. Average annual generation for the Project would increase by up to 25,856 MWh. With the new pump-turbine units, generating and pumping capacity would increase due to a combination of an increase in flow and improvement in the hydraulic design of the generation runners. The overall cycle capacity would increase by an estimated 80 percent when all four units are in operation.

SCDNR Responsibilities and Objectives

The SCDNR is the state agency charged by state law with the management, protection, and enhancement of wildlife, fisheries, and marine resources in South Carolina. The SCDNR is responsible for formulating comprehensive policies for water resources through a State Water Plan to address issues affecting water supply, water quality, navigation, hydroelectric power, outdoor recreation, fish and wildlife needs, and other water resource interests. The SCDNR is also charged with the statewide responsibilities for regulating watercraft operation and associated recreation on state waters, conducting geological surveys and mapping, promoting soil and water conservation, management of invasive aquatic plants, flood mitigation, drought response planning and coordination, and the state scenic rivers program. The SCDNR's mission is to serve as the principal advocate for and steward of South Carolina's natural resources. The SCDNR authorities and responsibilities are described in Titles 48, 49, and 50, South Carolina Code of Laws (1976), as amended.

The SCDNR's interests and management objective for the Bad Creek Pumped Storage Project include the protection, enhancement, and restoration of natural resources and their associated values. Specific objectives are to:

- Ensure the FERC license recognizes that the waters and land surrounding the Bad Creek Reservoir, Lake Jocassee, and Savannah River are important public trust resources, and that the Project is managed to achieve public benefits.

- Maintain and/or enhance the water quality conditions to meet state standards and current use classifications that protect and provide for fish and wildlife habitat, contact recreation, and public water supply.

- Ensure the implementation of appropriate water management and downstream flows to be consistent with the South Carolina Water Plan to protect water quality, provide for reasonable navigation, protect fish and wildlife resources, and meet present and future water supply demands (municipal, industrial, agricultural).

- Protect and enhance fish and wildlife populations and their habitat by:
    1. Minimizing entrainment mortality for fish;
    2. Developing shoreline management plans to protect and enhance shoreline and littoral habitats for aquatic species, as well as environmentally sensitive areas and natural communities of concern from future development and shoreline erosion;
    3. Implementing long-term monitoring strategies to ensure protection of key aquatic species and to appraise restoration and enhancement efforts;
    4. Reducing negative effects to stream fish populations caused by habitat fragmentation resulting from the dams and lakes and monitoring the viability of key conservation species potentially impacted by fragmentation, such as rare, threatened, and endangered (RTE) species and species of conservation concern identified in the State Wildlife Action Plan; and
    5. Minimizing the spread of exotic, invasive species; and increasing the acreage of protected natural areas.
- Protect and enhance public opportunities for fishing, hunting, wildlife viewing, boating, and other outdoor recreation by:
    1. Expanding and improving existing areas and facilities to meet user needs;
    2. Developing, based on user needs and capacity, new locations for recreation areas/facilities;
    3. Increasing land areas designated for outdoor recreation and wildlife conservation;
    4. Designing and implementing management plans for facilities to minimize crowding and safety problems.
    5. Ensuring facilities comply with the Americans with Disabilities Act Standards for Accessible Design;
    6. Improving safety and law enforcement among recreational users; and
    7. Protecting aesthetic values within the Project area.

- Protect any significant historic, cultural, or archaeological resources from human and natural impacts.

Comments on PAD

The SCDNR understands the purpose of the PAD is to provide the Commission, federal and state agencies, and other interested stakeholders with background information related to Project facilities and other aspects of the Project, such as engineering, operational, economic, and

environmental considerations. The PAD is also intended to define pertinent Project issues and potential study needs. Under FERC regulations, the Licensee is required to complete the PAD using existing, relevant, and reasonably available information that is pertinent to the Project. The SCDNR provides the following comments in response to solicitation for public comment.

Section 5.4.4 Lower Reservoir Inlet/Outlet Structure

This section describes the Project's existing lower reservoir inlet/outlet structure and references steel trash racks. The SCDNR requests information regarding the dimensions and bar spacing of the existing trash rack structure to better understand the Project's impact on aquatic species.

Section 5.4.5 Submerged Weir in Lower Reservoir

This section describes a submerged weir located 550 meters downstream of the Project inlet/outlet structure on the lower reservoir. According to the PAD, the weir's location in the Whitewater River cove serves to dissipate the energy of the discharged water and minimize the effects of warm water from Bad Creek's upper reservoir warm water, by preventing the water from mixing with the lower cool-water layers of Lake Jocassee. The weir was constructed out of nearly half a million cubic yards of rock excavated during the construction of the Project. The SCDNR requests further information regarding 1) the dimensions of the weir (feet), 2) how the Licensee inspects the weir to ensure the weir continues to function as designed, 3) the frequency of inspections, and 4) information on any maintenance that has occurred. Section 6.3.10.2 states that spoil from the proposed construction of the Complex will be added to the downstream slope of the weir. The SCDNR requests further information regarding why the spoil should be added to the weir and how the Licensee selected the downstream slope of the weir. Additionally, since the submerged weir is located 40-50 feet below the water surface, how will the Licensee ensure the correct placement of the spoil and avoid excess turbidity and aquatic habitat degradation during deployment?

Section 5.5.1 Current and Proposed Operations

This section notes that the Licensee currently operates the Project on a "daily cycle" mode, defined as alternating between generating and pumping on a daily basis, with the reservoir typically maintained in the upper 50 to 60 ft at elevations of 2,310 and 2,250 ft msl (compared to a maximum drawdown of 160 ft). However, the PAD does not discuss how the Licensee intends to operate the Project during a subsequent license term with the addition of the proposed Complex. The SCDNR requests further information with regards to the Licensee's proposed operations at the Project including the frequency and magnitude of drawing down and refilling the Bad Creek's upper reservoir.

Section 5.6.2 Proposed Project Facilities

This section discusses the design specifications of the Licensee's proposed Complex. The details included in the upper reservoir's inlet/outlet configuration includes a coarse opening trash rack at each tunnel inlet. However, further specifications of the trash racks, including the bar spacing is not included. Additionally, no such trash rack feature was included in the proposed lower

reservoir's inlet/outlet structure configuration. The SCDNR requests the additional information to better understand the Project's effects on aquatic species.

Section 6.1.3.2 Water Use & Table 6.1-5

Table 6.1-5 should include the following waterbodies within the Lake Jocassee Watershed:

Name	**State**	**Description**	**Surface Water Classification**
Coley Creek	SC	The portion of the creek in SC	TPGT
Devils Hole Creek	SC	The entire creek tributary to Lake Jocassee	TPGT
Howard Creek	SC	The portion below Bad Creek to Lake Jocassee	TN
Jackie's Branch	SC	The entire creek tributary to Lake Jocassee	TN
Mill Creek	SC	The entire creek tributary to Lake Jocassee	TPGT

Section 6.1.5 Tributary Rivers and Streams

This section should include Howard Creek, which includes Limber Pole and Corbin Creeks, as a contributing significant tributary draining directly to Lake Jocassee.

Section 6.3.10.1 Impact on Water Exchange Between the Upper and Lower Reservoirs

This section notes that previous analyses have shown that if the entire Bad Creek Reservoir active storage volume was released, then the impact on Lake Jocassee would be a 4-ft increase in water level. The SCDNR notes that the subsequent refilling of the full volume of Bad Creek Reservoir would decrease the elevation of Lake Jocassee by four feet. Additionally, this section notes that the combined capacity of Bad Creek and the Complex would allow the Licensee to reduce the drawdown time from 23 hours to 11 hours and reduce the pumping refill time from 26 hours to 13. Therefore, the additional capabilities of the Complex will allow for twice the amount of water exchange, increasing the likelihood of negative impacts to aquatic species, recreation, water quality, and shoreline erosion rate in the lower reservoir.

Section 6.3.10.3 Spoil Locations & Figure 6.3-7

This section identifies the potential spoil disposal sites to be utilized during the construction of the proposed Complex. The SCDNR notes that the fill impacts appear to be in and around streams. Headwater and wetland systems provide an important link between upland watersheds and downstream aquatic environments. The SCDNR requests further information regarding the alternatives analysis associated with the selection of the areas identified as preferred and

potential spoil locations. Additionally, please describe the types of environmental impacts associated with the various alternatives and any avoidance and minimization measures taken. Additionally, the SCDNR recommends that revegetation on spoil piles should be native species appropriate for the ecoregion and should exclude plant species found on the exotic pest plant council list: https://www.se-eppc.org/southcarolina/SCEPPC_LIST2014finalOct.pdf. The SCDNR prefers the use of native warm season grasses and/or other native forbs that would be beneficial for wildlife and pollinators for stabilization for the spoil areas. Native warm season grass species suggestions include switchgrass (*Panicum virgatum*), indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*). A list of beneficial pollinator plant species, such as milkweed (Asclepias spp.), for the southeast may be found at www.xerces.org/pollinators-southeast-region/ or by visiting http://www.pollinator.org/guides. The SCDNR strongly discourages the use of Sericea Lespedeza (*Lespedeza cuneata*) due to its invasive nature and lack of benefit to wildlife[1].

Section 6.4.2 Environmental Studies and Agreements under the Work Plans

The SCDNR finds value in continuing to monitor and mitigate for fish entrainment impacts, especially to forage species, at the Project. The additional pumping cycles at the proposed Complex site will increase the rate of entrainment and impingement of aquatic species throughout the term of a subsequent license.

Section 6.7.1 Federally Listed Threatened, Endangered, and Candidate Species

The SCDNR recommends including the federally endangered gray bat (*Myotis grisescens*) in the Project's list of federally listed threatened, endangered, and candidate species. Further, the SCDNR recommends the gray bat be included in the acoustic KPro analysis and results table, in addition to files being reviewed by a qualified biologist to evaluate potential presence. Though gray bat calls have little overlap with other *Myotis* species, they can overlap with calls of Tri-colored bats – the most common species detected in the Bad Creek 2021 Bat Survey Report. Gray bat records exist in Transylvania County, North Carolina, located less than a mile north of the Project. The closest gray bat records are the SCDNR validated gray bat calls detected at a bridge approximately nine miles from the Project in 2020, and at a site approximately 15 miles northeast of the Bad Creek Reservoir (personal communication with NC bat biologist). Due to these records and the gray bat's ability to extend their range 27 km (16.8 mi) (LaVal et al. 1977) from roost sites to forage, there is a chance the gray bat could be located within the Project Area.

[1] Native to eastern Asia, Sericea Lespedeza is considered a noxious, invasive plant pest, earning a "severe threat" designation by the South Carolina Exotic Pest Plant Council. A study of a reclaimed mine in Virginia found that northern bobwhite (*Colinus virginianus*) populations were limited due to poor habitat quality resulting from the monoculture plantings of Sericea Lespedeza and Tall Fescue (*Festuca arundinacea*) (Stauffer 2011). At a former surface mine site in Kentucky (now Peabody Wildlife Management Area), a 2015 study demonstrated that areas dominated by Sericea Lespedeza were not preferred habitat for bobwhite (Unger et al.), as it is not a preferred food for bobwhite (Ellis 1961), nor does it contain enough nutritional value to support a bobwhite population (Newlon et al. 1964).

Appendix E Natural Resources Assessments

The SCDNR notes that three State Listed Species occur in the Project Area and should be included in the Natural Resources Assessment Report. Please note take of state listed species is prohibited under S.C. Code of Laws §50-15-30.

Species name	**State Status**
Eastern Small-footed Bat (*Myotis leibii*)	State Threatened
Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*)	State Endangered
Bald Eagle (*Haliaeetus leucocephalus*)	State Threatened

Section 6.0 Summary of Potential Environmental Impacts and Agency Coordination

This section, including related Tables 8 and 10 and Figures 12 and13, identify the Licensee's preferred spoil sites. However, it is unclear to the SCDNR how the Licensee selected and prioritized the potential spoil sites, as previously mentioned. The SCDNR requests further information with regards to how the Licensee intends to select a site or sites for deposition of construction spoil, as well as what avoidance and minimization measures were considered.

Appendix F Desktop Entrainment Analysis

The SCDNR notes that the estimated percentage (12%) of entrainment of the threadfin shad population in Lake Jocassee is a high rate that should continue to be monitored. Threadfin shad are an important prey species for most sportfish in Lake Jocassee. The Project's entrainment study conducted in the first three years of Project operations (1991-1993) (Barwick et al. 1994) found that entrainment rates increased when the water elevations in Lake Jocassee were below 334 meters for a total of 30 days annually. Further, the increased rates resulted in a stable or slightly declining population of threadfin shad. The SCDNR's interests with this issue are to understand the effects of entrainment on fish populations and to evaluate methods to avoid and minimize these impacts. The SCDNR recommends the findings from Barwick et al. 1994 should be included in the Project's PAD.

Appendix G 2021 Bat Survey Report

Section 4.1 Records Review

The SCDNR notes that caution in interpretation is also appropriate for the following species that can share significant overlap in call type:

- Northern long-eared bat versus Eastern small-footed bat
- Eastern red bat versus Seminole bat

The SCDNR disagrees with the following statement: "While no federally listed northern long-eared bats were found near the Project site, the recent discovery of the summer presence of pregnant females in the South Carolina Coastal Plain may indicate a migratory presence in more upland regions of the state." The lack of captures in the middle of the state, despite SCDNR's netting efforts since 2016, suggests spatially disjunct populations in South Carolina (Blue Ridge versus Coastal Plain population) similar to the disjunct populations known to occur in North Carolina. In 2013, prior to white-nose syndrome (WNS) being detected in South Carolina, northern long-eared bats were present and breeding in Oconee, Pickens, and Greenville counties. However, extirpation from the Blue Ridge ecoregion due to WNS mortality seems likely.

Section 4.2 Habitat Surveys

For emergence bat call surveys, the SCDNR recommends that the Licensee should utilize the same bat detector recorder type used during other acoustic surveys (e.g., SM3BAT or Echometer Touch 2), for improved quality call collection, identification, and consistency.

Comments on Scoping Document 1

Section 1.0 Introduction

This section should note that the Project is located on a headwater tributary to the Savannah River.

Section 5.0 Proposed Studies

The SCDNR accepts all twelve initial study proposals by the Licensee.

Section 9.0 Mailing Lists

The SCDNR requests the following individuals be added to FERC's official mailing list for the Bad Creek Pumped Storage Project:

Ms. Lorianne Riggin
South Carolina Department of Natural Resources
PO Box 167
1000 Assembly Street
Columbia, South Carolina 29202

Ms. Elizabeth Miller
South Carolina Department of Natural Resources
PO Box 12559
217 Fort Johnson Road
Charleston, South Carolina 29422-2559

Study Requests

The SCDNR finds the initial list of study proposals from the Licensee to be thorough and adequate to assess the potential impacts to natural resources affected by Project operations. The

SCDNR plans to continue to be an active participant in study plan review for each of the proposals.

The SCDNR appreciates the opportunity to review and provide comments and recommendations regarding the PAD and SD1 for the Bad Creek Pumped Storage Project. If you have any questions or need additional information, please do not hesitate to contact me by phone at 843-953-3881 or email at millere@dnr.sc.gov.

Sincerely,

Elizabeth C. Miller
FERC Coordinator, SCDNR

cc: Alan Stuart, Duke Energy
Melanie Olds, USFWS
Chuck Hightower, SCDHEC
Derrick Miller, USFS

Reference:

Barwick, D.H., T.C. Folsom, L.E. Miller, and S.S. Howie. 1994. Assessment of Fish Entrainment at the Bad Creek Pumped Storage Station. Duke Power Company. Huntersville, NC.

LaVal, R. K., R. L. Clawson, M. L. LaVal, and W. Caire. 1977. Foraging behavior and nocturnal activity patterns of Missouri bats, with emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis*. Journal of Mammalogy 58:592–599.

UPSTATE FOREVER

Protecting Land & Water | Advocacy | Balanced Growth

ELECTRONICALLY FILED

June 23, 2022

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Alan Stuart
Duke Energy Carolina, LLC
Mail Code EC012Q
526 Church Street
Charlotte, NC 28202

Re: **Bad Creek Pumped Storage Project (FERC No. 2740-053)**
Comments on Preliminary Application Document and Scoping Document 1

Dear Secretary Bose and Mr. Stuart:

Upstate Forever is a nonprofit organization that works to balance growth with the protection of our natural resources by working on conservation, water quality, and sustainable development issues in the Upstate region of South Carolina. Our mission is to protect critical lands, waters, and the unique character of the Upstate of South Carolina, including the Upper Savannah Watershed where many of our members live, work, and recreate. Over the past two decades, we have successfully partnered with public and private landowners, local, state and federal governments, utilities, non-governmental agencies, and other stakeholders to protect the natural assets that make the Upstate special, such as our farmlands, forests, natural areas, rivers, and clean air.

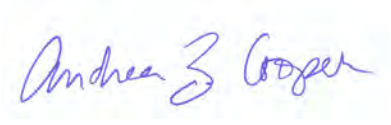
On February 23, 2002, Duke Energy ("Duke") filed a Notice of Intent and Pre-Application document for its Bad Creek Pumped Storage Project (FERC No. 2740, "Project"). The existing FERC license for the Bad Creek Project expires on July 31, 2027. The Project is the first in a series of impoundments in the Savannah River Basin that include Lake Jocassee, Lake Keowee, Lake Hartwell, Lake Russell, and Lake Thurmond. Located near the Town of Salem in northern

Oconee County, the Project utilizes a reservoir created by impounding Bad Creek and West Bad Creek, tributaries of Howard Creek and Lake Jocassee, in the Whitewater River Watershed (HUC 0305010101-05) in the uppermost headwaters of the Savannah River Basin.

Water in the Bad Creek reservoir originates primarily by pumping water from the lower reservoir (Lake Jocassee) through the Bad Creek Complex and into the upper (main) reservoir. During periods of high energy demand power is generated using the water stored in the main reservoir, then refilled from the lower reservoir when demand is low. Duke is currently evaluating the technical and economic feasibility of installing the Bad Creek II Complex ("Complex"), which would increase the power generation capacity – from 1,400 Megawatts (MW) to 2,800 MW – and pumped storage return of the Project by installing an additional conveyance system and powerhouse. The evaluation also includes the potential need for additional transmission lines. The second complex would allow Duke to generate power using either system while simultaneously maintaining, upgrading, or repairing the other complex as needed. If Duke Energy decides not to pursue a second complex in its final licensing proposal, Duke plans to continue to operate the Project under the conditions of the existing license.

From 2010-2014, Upstate Forever participated in the relicensing of the Keowee-Toxaway Hydroelectric Project (FERC No. 2503), which culminated in the successful renewal of the FERC license for that project. Through the ILP relicensing process, we collaborated with Duke Energy and other stakeholders to develop protection, mitigation, and enhancement measures as well as environmental and recreation resource enhancements for the region. Following the completion of the relicensing process, Upstate Forever has served on the grant review committee for the Keowee-Toxaway Habitat Enhancement Program and participated as a stakeholder with the Lake Keowee Source Water Protection Team. We are pleased to participate as a stakeholder for the relicensing of the Bad Creek Project. Our primary interests in this Project are related to water quality and quantity, fish and wildlife habitat, recreation resources and opportunities, and land conservation. We look forward to working with Duke Energy and other stakeholders to ensure that the new license provides for the protection, restoration, and mitigation of the natural resources within the Upper Savannah Watershed. We have completed a review of the Preliminary Application Document (PAD) and Scoping Document 1 (SD1) and are pleased to offer the following comments and additional study requests.

Sincerely,



Andrea Cooper
Executive Director

5.4.1 EXISTING PROJECT FACILITIES – UPPER RESERVOIR AND DAM

This section describes the project facilities including reservoirs and dams. The final paragraph refers to stream augmentation facilities, which consisted of a "system of intakes, pipes, and sluice gates" to augment flows to Howard Creek. However, the stream augmentation system is not currently used. Howard Creek is a tributary of Lake Jocassee, classified as Outstanding Resource Waters (ORW) by the SC Department of Health and Environmental Control (SCDHEC), and receives anywhere from 40% to 80% of its flow from Bad Creek and West Bad Creek by way of seepage from the Main Dam and West Main Dam. Please elaborate the purpose and need for the stream augmentation on Howard Creek, and further explain why the system is no longer in use.

6.1.2 CLIMATE

This section of the PAD provides climate data for two 30-year periods from 1971-2000 and 1981-2010, and appears to be sourced from a recent (2021) SCDNR study. Although more recent and more descriptive data is probably available, it is not included here. The Upstate has seen a dramatic increase in the frequency and intensity of extreme weather events not only over the past several decades but in just the past few years, including high intensity rainfall, flash flooding, and prolonged periods of drought. If possible, please update this section to include climate data that captures recent extreme weather events. We would like to see more descriptive data through 2020 such as maximum and minimum rainfall amounts, number of days with or without rain, longest period without rainfall, number of days above average, severe weather events, and any other descriptive data.

6.1.3.1 MAJOR LAND AND WATER USES – LAND COVER

Section 6.1.3 of the PAD describes major land and water uses within the Project boundary using the U.S. Geological Survey's National Land Cover Database. Both Table 6.1-3 and Figure 6.1-3 include areas categorized as "cultivated crops" (3.7% of Project boundary) or "hay/pasture" (10.1% of Project boundary), neither of which would be consistent with typical land management practices around a high priority dam, nor do they appear to agree with the images of the Main Dam in Figure 5.4-2 and the West Dam in Figure 5.4-3. Please confirm whether any cultivated crops or areas of hay or pasture do indeed exist within the project boundary, or clarify the land uses immediately adjacent to the Main Dam and West Dam.

6.2.5.2 SHORELINES AND STREAM BANKS

Section 6.2.5.2 of the PAD describes the modeling framework used to evaluate the potential operational impacts of the proposed Bad Creek II Complex in the Whitewater River arm of Lake Jocassee, including potential shoreline erosion. Results of the computational flow dynamics

(CFD) model indicate that the addition of the Complex is unlikely to increase the shoreline erosion potential of the Lake Keowee shoreline. Please update this section of the PAD with more information regarding the modeling results, including graphic depictions of peak velocities, discharge points, and shoreline impacts.

6.3.7 EXISTING WATER QUALITY DATA

This section of the PAD provides a summary of existing water quality data collected for waters within the Project Boundary and vicinity but is limited to the upper reservoir (6.3.7.1 Bad Creek Reservoir) and lower reservoir (6.3.7.2 Lake Jocassee). No water quality data is included for either Howard Creek, which receives seepage flows from the Main Dam and West Dam and is a tributary of Lake Jocassee, or Whitewater River, which is the receiving water from daily Project operations and the location of a submerged weir designed to minimize the effects of Project operations on lake stratification, protect cold-water fish habitat, and dissipate energy from discharged water. Similarly, no water quality data is provided for Bad Creek or West Bad Creek, which according to Section 6.3.1 of the PAD are only "partially to mostly submerged."

In addition, neither the upper reservoir nor its tributaries have historically been monitored for water quality, which is an erroneous oversight providing no baseline water quality data for waters in the Project vicinity. Flow data is provided for Howard Creek in Table 6.1-1 but only for a brief period from 1989 to 1996. According to the current implementation of the Waters of the US (WOTUS)[1], Pre-2015 Regulatory Definition and Practice, the Bad Creek Reservoir is included under WOTUS and Waters of the State (WoS) protections because it was formed by the impoundment of two free-flowing rivers or streams, Bad Creek and West Bad Creek, and as such regulatory designations do apply. More information is needed for these Project-related water resources to better understand the Project's impact on existing watershed health. Please provide a rationale for excluding these significant water resources in the Whitewater River Watershed and include measures for updating and collecting water quality data in the PAD and proposed studies for relicensing.

6.3.7.2.2 WATER QUALITY MONITORING

Duke Energy proposes to develop a Water Quality Monitoring Plan in consultation with agencies for Project construction (pre-, during, and post-construction) and operations, including monitoring locations, methods, and reporting criteria for major parameters such as DO, temperature, pH, specific conductance, and turbidity. Duke should include nutrients (nitrogen and phosphorus) to the list of parameters they monitor as land use practices can contribute to increased nutrient levels in surface waters. The Upstate is seeing an increasing trend with rising nutrient levels in reservoirs, which can lead to harmful algal blooms, and ultimately result in lost recreation opportunities, decreased property values, and poor water quality that is expensive for water utilities to treat. Because the nearby Lake Keowee is a popular recreation

[1] https://www.federalregister.gov/documents/2021/12/07/2021-25601/revised-definition-of-waters-of-the-united-states

destination and drinking water source for over 250,000 people in the Upstate, this should be of considerable importance. Furthermore, in continuation with our concerns regarding the absence of water quality data for Project-related waters, please include a plan for establishing and monitoring water quality data for Bad Creek, West Bad Creek, Howard Creek, and White River.

6.5.2.2 INVASIVE SPECIES

Section 6.5.2.2 of the PAD lists numerous invasive species observed during field surveys conducted throughout the transmission line corridors in 2021. However, there is no indication of field surveys conducted in other Project areas, including access areas or on the faces of the project dams. Many of these species already are or will soon be extremely problematic for land management if left unattended. Furthermore, the PAD does not provide any other detail about current or proposed vegetation management at the project and should include information describing management activities for native and non-native invasive species in the Project boundary and vicinity.

6.6.1.1.1 WETLANDS, RIPARIAN, AND LITTORAL HABITAT – RELATIVELY PERMANENT WATERS WITH SEASONAL FLOW

This section appears to be mis-titled. Based on context of the section paragraph, this section should instead be titled as "Relatively Permanent Waters with *Perennial* Flow."

6.6.3 KNOWN OR POTENTIAL ADVERSE EFFECTS AND PROPOSED PM&E MEASURES: BAD CREEK II COMPLEX

The PAD estimates approximately 4 million cubic yards of spoil material will need to be disposed as a result of constructing the proposed new Complex. That is the equivalent to approximately 250,000 dump trucks. Both Section 6.6.3 and the Natural Resource Assessment in Appendix E discuss the potential for disposing spoils in wetlands and surface waters, including dredging, filling, clearing, and de-watering. However, there is no discussion in this section of transporting the spoil material off site for alternative uses or disposal. In addition, Table 6.6-7 of this section lists potential spoil locations and the estimated impacts to wetlands and surface waters, including preferred spoil locations (denoted by an asterisk *). However, the PAD does not discuss the criteria used to assess the potential spoil disposal areas, nor does it provide an explanation of why some areas are preferred over others. The Clean Water Act requires consideration for avoiding and minimizing impacts before a Section 404 permit can be obtained for placing fill in waters of the US, and before a water quality certification can be awarded by the State. Off-site transport should be included in the criteria and considered the only option unless other disposal methods can be justified. Please update this section to include a comprehensive discussion of these criteria with the addition of off-site removal, including how the potential spoil disposal areas are being identified, sized, assessed, and selected as Duke Energy's preferred locations for this purpose off-site removal.

During construction of Complex II, it is anticipated that several trucks and other large equipment will be transported over roads to access the Project. This additional traffic will increase turbidity levels in stormwater runoff in both reservoirs as well as the tributary streams. Duke should include a discussion of the type and number of BMPs (e.g., vegetation, matting, silt fencing) proposed to prevent runoff from negatively impacting water quality. Furthermore, Duke should include plans for stabilizing soils at construction sites and staging areas during and after construction activities making sure to use only native vegetation in the project vicinity to stabilize and re-establish habitats.

6.8 RECREATION AND LAND USE

Section 6.8 of the PAD provides a thorough description of recreation facilities and opportunities in the Project vicinity, including the Foothills Trail and other nearby recreation resources. Notably, there is considerable emphasis on off-Project recreation areas likely due to the restricted nature of the upper reservoir. Because there is no access to the Bad Creek reservoir for recreation purposes, fulfillment of the Recreation component (Exhibit R) of the original license was provided through the creation and management of a 43-mile central section of the Foothills Trail. Exhibit R included public access and parking, trail kiosks and directional signs, additional spur trails, and stream crossings as well as continual maintenance and operational activities for limited recreation uses, primarily hiking. For this section of the PAD Duke should provide a comprehensive summary of its fulfilment of Exhibit R requirements under the original license, including a history of any modifications to Exhibit R that may have occurred during the license term.

Unfortunately, language in both the PAD and Scoping Document 1 creates confusion regarding Duke's long-term plans for continued management of the Foothills Trail. Specifically, Section 7.1.6.1 of the PAD states, "The segment of the Foothills Trail and two undeveloped access areas on non-Project lands that were developed per the Original License will continue to be maintained by Duke Energy in the New License term as a non-Project facility and potentially under a separate agreement with regional stakeholders." Meanwhile, SD1 states that "Duke Energy does not propose to include the Foothills Trail as a project recreation facility under the new license." These two documents should be reconciled to clarify Duke's intentions and the fate of the Trail.

The Foothills Trail system provides important recreational and educational opportunities to both Upstate residents and visitors from around the world. However, the Upstate is experiencing unprecedented and accelerating population growth and is expected to continue growing for decades to come. By 2040, our region's population is projected to reach nearly 1,750,000 – an increase of 64% since 1990.[2] Already our natural resources are stretched thin, and the current pandemic has revealed how fragile and overburdened our public recreation areas have become. Continued support of the Foothills Trail is a critical component of the New

[2] https://www.upstateforever.org/files/files/2017.7.20_SOF_FINAL_Report.pdf

License and expansion of the recreation provisions should be considered to account for the population growth, increased demand for outdoor recreational needs, and expansion of project operations from the ongoing upgrades. Ensuring that recreation opportunities centered on the Foothills Trail continue to provide quality recreation opportunities in perpetuity and that the Foothills Trail can continue to grow to meet additional demand should be paramount in this licensing. Such consideration should include all or some of the following:

1. An endowment given to the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system;
2. Fee-simple donations of land to be included in the Foothills Trail system, or to State resource agencies for various purposes, including recreation, habitat management, and water quality protection;
3. Conservation easements on lands owned by Duke Energy, which would protect the Foothills Trail corridor, or allows for other recreation opportunities (a conservation easement would limit specific land development practices but could allow for recreation uses and even Project related activities), including the 6,700-ac tract surrounding the Project;
4. Expand the Foothills Trail system to connect with other trail systems, including the Palmetto Trail at Stumphouse Tunnel, the Panthertown trail system, the Tuskegee National Forest trail system, the Art Loeb Trail in Pisgah National Forest, and the Appalachian Trail; and
5. Providing a financial contribution to the Oconee County Conservation Bank, which would then be used to protect additional lands in the County beyond the Project boundary.

We encourage Duke to update this section of the PAD to include the options above, which are vital tools for creating, protecting, and managing open space for public recreation uses outside the Project boundary.

Throughout the PAD, much consideration is given for the Keowee-Toxaway Hydroelectric Project (FERC No. 2503). However, the Keowee-Toxaway Project operates under a separate and distinct license from the Bad Creek Pumped Storage Facility. It is often confusing how one project relates to the other, and sometimes reads as if requirements under one license are used to offset obligations under the other. While both projects are indeed impacted by the other, and may influence operations at other projects (e.g., Oconee Nuclear Station), the relicensing processes, including studies, commitments, obligations, and other agreements are specific to those projects. Specifically, there is an impression that some recreation opportunities lost from the exclusivity of the Bad Creek project were remedied on Lake Jocassee, which may or may not have been negotiated during the relicensing of the Keowee-Toxaway project. During the Keowee-Toxaway relicensing, stakeholders were not able to consider lost recreation opportunities of the Bad Creek project. The same is true for fishery resources and work plans conducted in coordination with SCDNR through the Keowee-Toxaway relicensing, as well as the Recreation, Use, and Needs Study (RUN Study) conducted in 2013, which failed to consider the recreation opportunities provided by the Foothills Trail. In

summary, these projects are clearly complementary and inextricably linked, but do not necessarily satisfy individual license requirements.

While water-based recreation such as boating and swimming at the Bad Creek reservoir are understandably overlooked due to fluctuating water levels and public safety concerns, management components related to traditional recreation activities such as fly-fishing and birdwatching should have been considered under the original license and should be addressed in the current licensing. Therefore, due to the lack of water-based recreation opportunities available for this Project, the RUN Study should consider alternatives to water-based recreation opportunities in off-Project areas. Furthermore, a thorough RUN Study should be included as part of the general licensing requirements and completed regardless of whether Duke decides to pursue the additional Complex II.

Similarly, with the increased strain on public recreation areas resulting in overuse and overcrowded experiences, the RUN Study should evaluate the need for expanded facilities, spur trails, connectivity, camping, and other attributes, including public safety concerns throughout the Foothills Trail system. Vandalism and wild animal encounters have increased in Upstate recreation areas, including the Foothills Trail system. Public safety needs to assessed along the trail corridor, and at access and parking areas, observation areas, and any other facilities associated with the trail system. Lastly, the RUN Study should be re-evaluated periodically, and a new study conducted at least every ten years throughout the next license term.

Finally, the original license refers to the Bad Creek Pumped Storage Project as the preferred alternative to a proposed Long Spur Ridge project, which was also under consideration as a similar pumped storage facility. The creation of future projects in the vicinity of the existing Project, including the Limber Pole Creek Project and the Coley Creek Project, should be considered particularly given that obligations for recreation are satisfied beyond the project boundary. These two projects would be situated on an expansive 6,700-acre tract owned by Duke Ventures Real Estate, LLC, a subsidiary of Duke Energy. While Duke Energy may not consider these as viable projects at this time, things may change dramatically over the course of the next license term, which may result in drastic changes in land use and development in the Project vicinity. We believe protection of this tract in particular (Oconee County parcel #016-00-01-013) is key to ensuring long-term high-quality habitat and recreation resources for the Upstate, and for ensuring abundant high-quality water resources for the region. If developed, this tract would have permanent and devastating impacts to water quality in the Whitewater River Watershed and would diminish all the proactive accomplishments that our resource agencies and conservation community have achieved over the past 50 years. (See the “Water Quality Sensitivity in the Bad Creek Project Vicinity” map appended at Attachment 1.)

7.1.1 GEOLOGY AND SOILS

This section of the PAD provides a brief description of soil classifications in the Project vicinity. However, it does not include an analysis of Prime Soils or Soils of Statewide Importance. Duke should consult with USDA/NRCS to provide a summary of soils that have the best combination

of physical and chemical characteristics for producing food, feed, fiber, forage, and oilseed crops, and is available for such use, and develop a plan for protecting those areas during the next licensing term. The Oconee County Conservation Bank has provided grant funding for projects that permanently protect lands with Prime or Important Soils with conservation easements held by Upstate Forever or Oconee County's Soil and Water Conservation District.

8.0 COMPREHENSIVE PLANS

This section should include the most recent future land use maps and comprehensive plans available for the project area in both Transylvania and Jackson counties of North Carolina, and Oconee County, South Carolina. Oconee County recently adopted its "Unified 2020 Comprehensive Plan"[3] on March 3, 2020. From October 2018 through December 2019, Oconee County engaged its local citizens through numerous public meetings, newspaper inserts highlighting the elements of the plan, and a survey for public input. Because the character and density of land that abuts the Project will not be determined solely by Duke Energy, management of the Project as well as the lands in the Project vicinity should consider the vision for the future expressed by Oconee County residents and captured in their plan.

GENERAL COMMENTS

- **CLIMATE CHANGE**

The PAD includes no discussion of climate change and how it may affect various aspects of the Project, including operations and management of Project resources. Climate change is an important consideration for wildlife and botanical resources, recreation, water quality and water quantity, and land planning, use, and policy. It should be included for consideration in each section of the PAD, as well as every proposed study in this licensing process, and continue to inform Project management and operation decisions throughout the life of the proposed new license. In addition, how will climate change considerations be reflected in the design and operations of Duke's current and proposed hydroelectric facilities?

As previously discussed, SC has seen a dramatic increase in the frequency and intensity of extreme weather events over the past several decades, including flooding and drought. These extreme conditions will continue to have implications on the operations and management of these facilities and the natural resources. This should include, but not be limited to, discussion of increasing nighttime temperatures, changing seasonal precipitation patterns, increased frequency in extreme weather events, and increased periods of drought. Wildlife corridors, which may be necessary for species migration due to climate change, should be considered and PM&E measures identified for both relicensing of existing operations.

- **SEPARATE LICENSES WITH SPECIFIC REQUIREMENTS**

[3] https://oconeesc.com/documents/planning-zoning/comprehensive-plan/unified-2020-comprehensive-plan.pdf

Throughout the PAD, much consideration is given for the Keowee-Toxaway Hydroelectric Project (FERC No. 2503). However, the Keowee-Toxaway Project operates under a separate and distinct license from the Bad Creek Pumped Storage Facility. It is often confusing how one project relates to the other, and sometimes reads as if requirements under one license are used to offset obligations under the other. While both projects are indeed impacted by the other, and may influence operations at other projects (e.g., Oconee Nuclear Station), there are resources and obligations singular to each project. As already mentioned, there is an impression that some recreation opportunities lost from the exclusivity of the Bad Creek project were remedied on Lake Jocassee, which may or may not have been negotiated during the relicensing of the Keowee-Toxaway project. During the Keowee-Toxaway relicensing, stakeholders were not able to consider lost recreation opportunities of the Bad Creek project. The same is true for fishery resources and work plans conducted in coordination with SCDNR through the Keowee-Toxaway relicensing, as well as the Recreation, Use, and Needs Study (RUN Study) conducted in 2013, which failed to consider the recreation opportunities provided by the Foothills Trail. In summary, these projects are clearly complementary and inextricably linked, but do not necessarily satisfy individual license requirements.

3.1.2 EXISTING PROJECT OPERATION

Throughout SD1 and the PAD, the Project is presented as an isolated pumped storage project seemingly without influence or relationship to other facilities or project operations. However, most of the volume in the upper reservoir originates from Lake Jocassee, which also plays a major role in the operations of both the Keowee-Toxaway Hydroelectric Project (FERC No. 2503) and the Oconee Nuclear Plant. All three projects depend on water levels in Jocassee to provide abundant water to safely generate power for Duke Energy customers. This section of the Scoping Document and the PAD should include a description of how the water level in Lake Jocassee affects these projects, including an extreme low inflow scenario where operations of Bad Creek may need to be curtailed or ceased to maintain operations at other projects.

Furthermore, the Project presently operates within the upper 50 to 60 feet of full pond level. However, the existing license authorizes a 160-foot maximum drawdown. Currently, the Project is undergoing pump-turbine upgrades, and Duke has proposed the construction and operation of a second powerhouse as part of this relicensing. Both the upgrades and the new Complex will increase the range within which Project operations will impact water levels, creating larger and more rapid fluctuations in both the Bad Creek reservoir and Lake Jocassee. Therefore, the increased operating band may also affect a variety of environmental parameters, including but not limited to water quality, shoreline habitat, and fish entrainment.

3.2.2 PROPOSED ENVIRONMENTAL MEASURES

Under the Aquatic Resources portion of this section, we believe the Fisheries MOU and 10-Year Work Plans for fishery resources that Duke has completed in partnership with SCDNR should be included. Activities included in the 10-Year Work Plans were designed to develop and enhance management strategies for fish in these areas and included fisheries surveys and inventories, water quality and aquatic habitat evaluations, fish stocking, recreation, and shoreline impacts. Duke Energy entered an MOU with SCDNR for the long-term management and maintenance of high-quality fishery resources in Lake Keowee and Lake Jocassee *as well as their tributary streams*. While the current MOU is in effect through 2027 and intended to mitigate for fish entrainment, we don't currently know what contribution the proposed Complex will have on entrainment. Therefore, we believe that Duke should extend the MOU and workplans through the term of the new license.

4.1.2 RESOURCE ISSUES – AQUATIC RESOURCES

We support all the issues identified in this section. However, we have particular concerns that no water quality data has been collected for the Bad Creek Reservoir and associated tributaries making it impossible to determine if the current or proposed operations have or will have any negative impacts on water quality. (See our previous comment regarding Section 6.3.7.2.2 of the PAD on Water Quality Monitoring.)

Furthermore, we have concerns regarding the effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in the Bad Creek reservoir, Lake Jocassee, and surrounding tributaries. Four million cubic yards of debris is expected from the construction of Complex II, which is the equivalent of at least 250,000 dump trucks. The resulting construction activity will heavily impact roads in the watershed and create additional runoff and turbidity in nearby streams and reservoirs. In addition, Duke has proposed to dispose of spoils in several nearby locations, including wetlands, forested uplands, tributaries, and the weir. Most of the waters in the Project vicinity are characterized as extremely high-quality streams with designations including Outstanding Resource Waters, Trout Natural, and Trout Put, Grow and Take, which our State's most protective water classifications. ***Filling wetlands and tributaries is not an acceptable option***.

It is also not clear how the spoil locations were selected or why no consideration was given to transporting materials off site. Upland disposal of construction debris that results in impacts to streams or wetlands, as well as placement of rock spoils at the submerged weir, will require an Individual Permit from the USACE as well as a Water Quality Certification from SCDHEC under the authorities of Sections 404 and 401 of the Clean Water Act. Further, as part of the Mitigation Rule, it is a requirement for Duke Energy to consider all steps to *avoid and minimize* impacts to water resources before undertaking activities that negatively impact waters. Duke Energy expects to initiate this parallel regulatory process in conjunction with the relicensing process. However, to avoid impacts to water resources, we strongly recommend that spoils be transported off site rather than used to fill wetlands and streams. (See our previous comments regarding Section 6.6.3 of the PAD on Known or Potential Adverse Effects and Proposed PM&E Measure: Bad Creek II Complex.)

4.1.3 RESOURCE ISSUES – TERRESTRIAL RESOURCES

In addition to assessing the effects of project construction, operation, and maintenance activities on ecological communities and protected terrestrial species, we believe that the effects on *potential* habitat should also be assessed. Furthermore, we believe this should be expanded to include the effects of non-native, invasive, and noxious species on ecological communities and potential habitat areas as well. Habitat and corridor protection is one of the most critical needs for the protection and preservation of species. Assessing the direct impact of the Project on target species is only one component to ensuring that the species have the greatest chance of survival. Rather, the assessment should explicitly examine the amount of available habitat and habitat needs for healthy, diverse, and viable populations of the target species. The assessment should examine past habitat availability, current habitat availability, and determine trends for habitat loss or creation through the term of the new license based on the identified trends. This information can then be used to identify target values for habitat protection and restoration in and near the Project. Lastly, the impacts of climate change should also be evaluated and discussed. Wildlife habitat corridors may be necessary for species migration due to climate change and should be of particular interest throughout the life of the proposed new license.

4.1.4 RESOURCE ISSUES – THREATENED AND ENDANGERED SPECIES

Upstate Forever has the same comments and concerns regarding the effects of project construction, operation, maintenance, and project-related recreation on RT&E species as we do on Section 4.1.3 above, including climate related impacts. In addition, both this section and Section 4.1.3 should consider Project impacts on species not included in this section of SD1. The US Fish and Wildlife Service provided a "List of Threatened, Endangered, Candidate, and Proposed Species Generated by ECOS-IPaC Website on Aprill 11, 2022," (List) which is available on the FERC's eLibrary for this docket. The List includes ten (10) migratory bird species considered Birds of Conservation Concern (BCC), which warrant special attention in the project vicinity. These birds are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

4.1.5 RESOURCE ISSUES – RECREATION, LAND USE, AND AESTHETICS

As previously mentioned, language in both the PAD and Scoping Document 1 creates confusion regarding Duke's long-term plans for continued management of the Foothills Trail. Specifically, Section 7.1.6.1 of the PAD states, "The segment of the Foothills Trail and two undeveloped access areas on non-Project lands that were developed per the Original License will continue to be maintained by Duke Energy in the New License term as a non-Project facility and potentially under a separate agreement with regional stakeholders." Meanwhile, SD1 states that "Duke Energy does not propose to include the Foothills Trail as a project recreation facility under the new license." These two documents should be reconciled to clarify Duke's intentions and the fate of the Trail.

We support all the issues identified in this section. In addition, we believe that land use should be further reviewed in the context of shoreline habitat around the upper reservoir. Because there is no public access to the Bad Creek Reservoir shoreline, permitting policies addressed through a Shoreline Management Plan and Shoreline Management Guidelines are unnecessary. However, due to limited interference from human activities, much of the shoreline around the upper reservoir can and should be managed to provide prime riparian and littoral habitat. The impacts of climate change should also be evaluated and discussed.

Furthermore, because there is no recreational access to the Bad Creek reservoir, the recreation component (Exhibit R) of the original license was provided through the creation and management of a 43-mile section of the Foothills Trail. Exhibit R included public access and parking, trail kiosks and directional signs, additional spur trails, and stream crossings as well as continual maintenance and operational activities for limited recreation uses, primarily hiking. However, while water-based recreation such as canoeing and swimming are understandably overlooked due to fluctuating water levels and public safety concerns, management components related to traditional recreation activities such as fly-fishing and birdwatching should have been considered and should be addressed in the current licensing.

The Foothills Trail system provides important recreational and educational opportunities to both Upstate residents and visitors from around the world. Meanwhile, the Upstate is experiencing unprecedented and accelerating population growth and is expected to continue

growing for decades to come. Already our natural resources are stretched thin, and the current pandemic has revealed how fragile and overburdened our public recreation areas have become. Continued support of the Foothills Trail is a critical component of the New License and expansion of the recreation provisions should be considered to account for the population growth, increased demand for outdoor recreational needs, and expansion of project operations from the ongoing upgrades. Ensuring that recreation opportunities centered on the Foothills Trail continue to provide quality recreation opportunities in perpetuity and that the Foothills Trail can continue to grow to meet additional demand should be paramount in this licensing. Such consideration should include all of the following:

1. An endowment given to the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system;
2. Fee-simple donations of land to be included in the Foothills Trail system, or to State resource agencies for various purposes, including recreation, habitat management, and water quality protection;
3. Conservation easements on lands owned by Duke Energy, which would protect the Foothills Trail corridor, or allows for other recreation opportunities (a conservation easement would limit specific land development practices but could allow for recreation uses and even Project related activities), including the 6,700-ac tract surrounding the Project;
4. Expand the Foothills Trail system to connect with other trail systems, including the Palmetto Trail at Stumphouse Tunnel, the Panthertown trail system, the Tuskegee National Forest trail system, the Art Loeb Trail in Pisgah National Forest, and the Appalachian Trail; and
5. Providing a financial contribution to the Oconee County Conservation Bank, which would then be used to protect additional lands in the County beyond the Project boundary.

The original license also refers to the Bad Creek Pumped Storage Project as the preferred alternative to a proposed Long Spur Ridge project, which was also under consideration as a similar pumped storage facility. The creation of future projects in the vicinity of the existing Project, including the Limber Pole Creek Project and the Coley Creek Project, should be considered particularly given that obligations for recreation are satisfied beyond the project boundary. These two projects would be situated on an expansive 6,700-acre tract owned by Duke Ventures Real Estate, LLC, a subsidiary of Duke Energy. While Duke Energy may not consider these as viable projects at this time, things may change dramatically over the course of the next license term, which may result in drastic changes in land use and development in the Project vicinity. We believe protection of this tract in particular (Oconee County parcel #016-00-01-013) is key to ensuring long-term high-quality habitat and recreation resources for the Upstate, and for ensuring abundant high-quality water resources for the region. If developed, this tract would have permanent and devastating impacts to water quality in the Whitewater River Watershed and would diminish all the proactive accomplishments that our resource agencies and conservation community have achieved over the past 50 years.

(See the "Water Quality Sensitivity in the Bad Creek Project Vicinity" map appended at Attachment 1, and our previous comments on Section 6.8 of the PAD regarding Recreation and Land Use.)

1.0 PROPOSED STUDIES

The proposed Fish and Aquatic Resources studies are limited in scope and should be expanded to include the Bad Creek Reservoir and associated tributaries, or Duke should include an additional study to collect water quality data for Project-related streams. Currently no water quality data exists for Bad Creek Reservoir and the surrounding streams making it impossible to assess current and future water quality conditions in these locations. (See our previous comment regarding Section 6.3.7.2.2 of the PAD on Water Quality Monitoring, and Section 4.1.2 of SD1 regarding Resource Issues – Aquatic Resources.)

8.0 COMPREHENSIVE PLANS

As previously mentioned in our comment on Section 8.0 of the PAD, this section should include the most recent future land use maps and comprehensive plans available for the project area in both Transylvania and Jackson counties of North Carolina, and Oconee County, South Carolina. Oconee County recently adopted its "Unified 2020 Comprehensive Plan"[4] on March 3, 2020. From October 2018 through December 2019, Oconee County engaged its local citizens through numerous public meetings, newspaper inserts highlighting the elements of the plan, and a survey for public input. Because the character and density of land that abuts the Project will not be determined solely by Duke Energy, management of the Project as well as the lands in the Project vicinity should consider the vision for the future expressed by Oconee County residents and captured in their plan.

[4] https://oconeesc.com/documents/planning-zoning/comprehensive-plan/unified-2020-comprehensive-plan.pdf

ADDITIONAL STUDY PLAN REQUEST

Environmental Justice Study

In comments submitted to FERC on June 16, 2022, Stephen Bowler, South Branch Chief of the Division of Hydropower Licensing for FERC included a request for an Environmental Justice Study (see "Staff Comments on the Pre-Application Document and Study Request for the Bad Creek Pumped Storage Project"). Upstate Forever supports this study request and believes it would provide important information related to how the Bad Creek Project relicensing, operations, and proposed construction activities might affect underserved communities ("environmental justice communities") in the Project vicinity. The proposed Environmental Justice Study has five objectives:

(1) to identify presence of environmental justice communities that may be affected by the relicensing of the Bad Creek Project, including the construction of the Complex, and identify outreach strategies to engage the identified environmental justice communities in the relicensing process, if present;

(2) to identify the presence of non-English speaking populations that may be affected by the project and identify outreach strategies to engage non-English speaking populations in the relicensing process, if present;

(3) to discuss effects of relicensing the project on any identified environmental justice communities and identify any effects that are disproportionately high and adverse;

(4) to identify mitigation measures to avoid or minimize project effects on environmental-justice communities; and

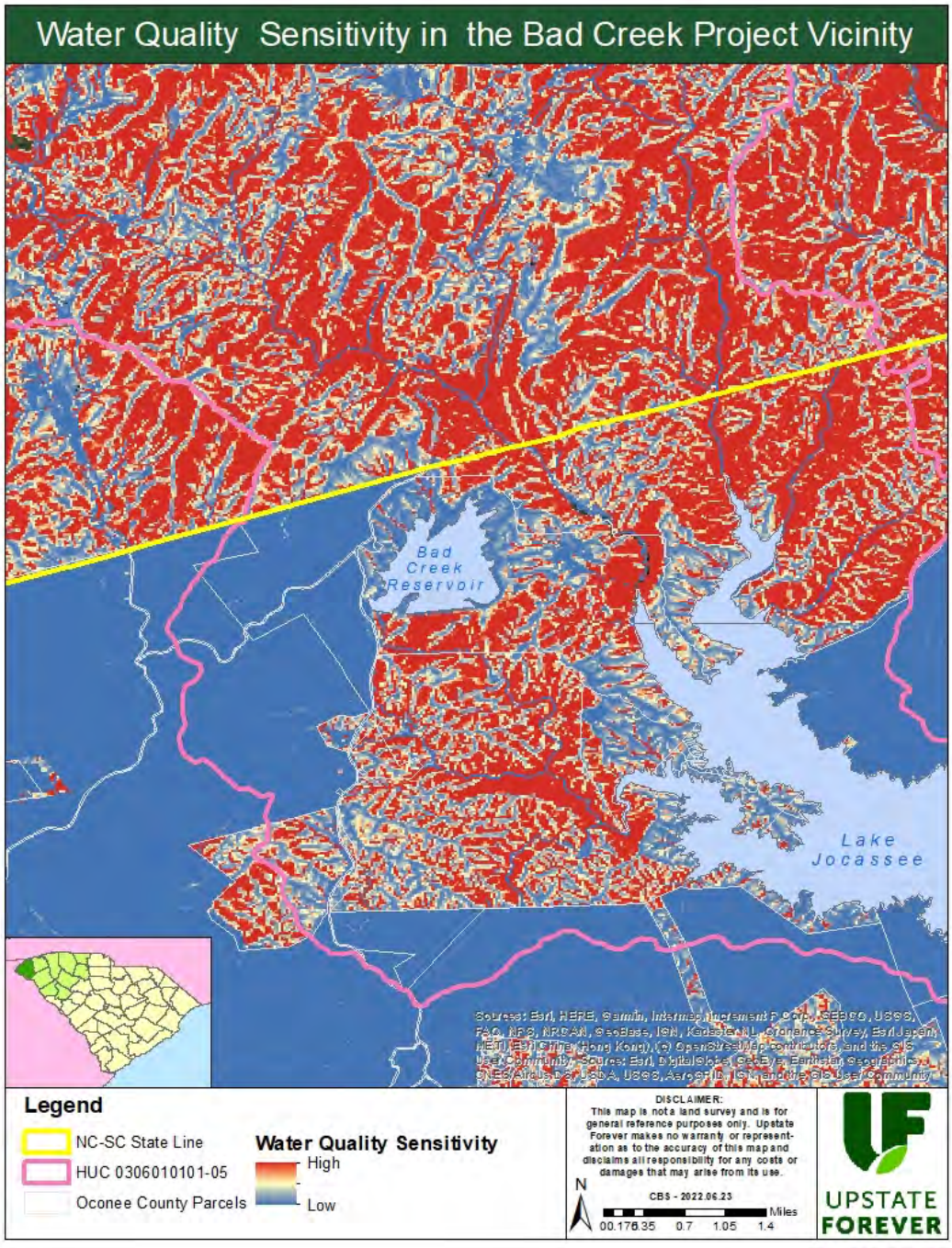
(5) to identify sensitive receptor locations within the project area and identify potential effects and measures taken to avoid or minimize the effects to such locations, if they are present.

Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities. Examples of resource impacts may include, but are not necessarily limited to, project-related effects on: erosion or sedimentation of private properties; groundwater or other drinking water sources; subsistence fishing, hunting, or plant gathering; access for recreation; housing or industries of importance to environmental justice communities; and construction-or operation-related air quality, noise, and traffic.

ATTACHMENT 1

Water Quality Sensitivity in the Bad Creek Vicinity

This map shows the sensitivity of *unprotected* tracts of land in terms of impacts to water quality if developed. Areas in *red* show a *high sensitivity*, which means that water quality would be severely impacted by development. Note that almost all the unprotected land in the Project vicinity is highly sensitive and water quality would be greatly diminished if developed.



Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Aquatics)

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:12 AM
To: gcyantis2@yahoo.com; Elizabeth Miller <MillerE@dnr.sc.gov>; jhains@g.clemson.edu; ehollis@upstateforever.org; amedeemd@dhec.sc.gov
Cc: Abney, Michael A <Michael.Abney@duke-energy.com>; Wahl, Nick <Nick.Wahl@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Aquatics)

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Aquatics Resource Team Members:

Thank you for agreeing to participate on the Aquatics Resource Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Cultural Resources)

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:10 AM
To: Elizabeth Miller <MillerE@dnr.sc.gov>; adoug41@att.net; cstarker@upstateforever.org; amedeemd@dhec.sc.gov
Cc: Churchill, Christy <Christy.Churchill@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Cultural Resources)

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Cultural Resources Team Members:

Thank you for agreeing to participate on the Cultural Resources Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Recreation and Aesthetics)

Importance: High

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:23 AM
To: adoug41@att.net; suewilliams130@gmail.com; dwilde@keoweefolks.org; andrewandwilla@hotmail.com; Elizabeth Miller <MillerE@dnr.sc.gov>; cstarker@upstateforever.org; charris@scprt.com; amedeemd@dhec.sc.gov
Cc: Bennett, Jennifer Wright <Jennifer.Bennett@duke-energy.com>; 'Kelly.Kirven@KleinschmidtGroup.com' <Kelly.Kirven@KleinschmidtGroup.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Recreation and Aesthetics)
Importance: High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Recreation and Aesthetics Resource Team Members:

Thank you for agreeing to participate on the Recreation and Aesthetics Resource Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Wildlife and Botanical)

Importance: High

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:20 AM
To: adoug41@att.net; suewilliams130@gmail.com; dwilde@keoweefolks.org; bill.ranson@retiree.furman.edu; Elizabeth Miller <MillerE@dnr.sc.gov>; cstarker@upstateforever.org; wes.cooler@mac.com; amedeemd@dhec.sc.gov
Cc: Abney, Michael A <Michael.Abney@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Wildlife and Botanical)
Importance: High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Wildlife and Botanical Resource Team Members:

Thank you for agreeing to participate on the Wildlife and Botanical Resource Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Water Quality)

Importance: High

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:17 AM
To: ehollis@upstateforever.org; gcyantis2@yahoo.com; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; amedeemd@dhec.sc.gov
Cc: Raber, Maverick James <Maverick.Raber@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Water Quality)
Importance: High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Water Quality Resource Team Members:

Thank you for agreeing to participate on the Water Quality Resource Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

I will send out a meeting agenda to you prior to our Resource Team meeting. We will provide an overview of the draft study plan elements during the meeting.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Salazar, Maggie

Subject: FW: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Operations)

Importance: High

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, June 24, 2022 6:15 AM
To: Elizabeth Miller <MillerE@dnr.sc.gov>; jhains@g.clemson.edu; James Keane <jtk7140@me.com>; charris@scprt.com; amedeemd@dhec.sc.gov
Cc: Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>
Subject: Bad Creek Relicensing -- Study Plan Development and Stakeholder Resource Teams Meetings (Operations)
Importance: High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Operations Resource Team Members:

Thank you for agreeing to participate on the Operations Resource Team for relicensing of the Bad Creek Hydroelectric Project. As Alan Stuart mentioned during the Relicensing Stakeholder Kick-off Meeting on May 31, Duke Energy has formed six (6) resource teams to develop study plans necessary for the relicensing of Bad Creek I Complex and the new license application for the potential Bad Creek II Complex (i.e., Aquatics, Cultural Resources, Recreation & Aesthetics, Water Quality, Operations, and Wildlife & Botanical). Duke Energy received an additional study request from FERC on June 16, 2022 to perform an Environmental Justice Study. We will include this study in the Operations Resource Team in case you are interested in this study plan.

I (John Crutchfield) will serve as the Technical Coordinator for each Resource Management Team to set meeting dates and ensure we develop the study plans in a timely fashion for FERC submittal. Duke Energy looks forward to working with each of you during the relicensing process.

A first step in the Integrated Licensing Process (ILP) is to develop necessary study plans for the relicensing application and submit those to FERC by August 7. Duke is currently drafting study plan elements for review and discussion with Resource Teams during meetings the week of July 18-22.

I will be sending a Doodle Poll to Resource Team members for potential time and meeting dates to begin this study plan development process. Please respond to this Doodle Poll by Friday, July 1 COB. This initial meeting will be virtual via Microsoft Teams. Given the tight deadline that Duke Energy has to submit the study plans, please be flexible and try to clear your schedule the week of July 18-22 to make the meeting. This will help us meet the tight time schedule.

We anticipate this study plan meeting to last 3 hours. The Doodle Poll will have 3 hour meeting blocks from Monday, July 18 through Friday, July 22. I will try to schedule the Resource Team meeting that fits participants schedules but please note we have 6 resource teams meeting that week so there may have to be some juggling of schedules to accommodate all meetings. We will conclude the meeting early if we finish before the allotted time.

If you have any questions regarding the study plan development and Resource Team meeting, please let Alan Stuart and me know.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Re: EPA comments on Notice of Intent to File License Application; Filing of Pre-Application Document (PAD), Commencement of Pre-filing Process, Request for Comments on the PAD and Scoping Document, and Identification of Issues and Associated Study Requests for Bad Creek Pumped Storage Project (FERC P-2740), Oconee County, South Carolina.

Dear Secretary Bose:

The U.S. Environmental Protection Agency (EPA) has reviewed the referenced Scoping Document, Pre-Application Document (PAD), and Notice of Intent (NOI) consistent with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and the EPA's authority under Section 309 of the Clean Air Act. The Federal Energy Regulatory Commission (FERC) proposes to issue a new license for the Bad Creek Pumped Storage Project (P-2740). The existing FERC license expires on July 31. 2027. The proposed project is located at Lake Jocassee, Oconee County, South Carolina. The Bad Creek Pumped Storage is operated by Duke Energy, and Duke Energy is proposing to construct a new power complex that includes a new four-unit underground powerhouse adjacent to the existing Bad Creek Powerhouse. he addition of the proposed Bad Creek II Complex would add 1,400-MW to the current capacity of 1,400-MW for a total of 2,800-MW.

We appreciate the opportunity to comment. If you have any questions regarding our comments, please contact Maria R. Clark at clark.maria@epa.gov or 404-562-9513.

Technical Issues and Recommendations:

5.6.3.3 Rock and Soil Disposal Areas: the PAD states that Duke Energy is presently evaluating areas within the project boundary and property owned by Duke Energy to dispose excavated earth and additional rock.

Recommendation: The EPA strongly encourages Duke Energy and FERC to mitigate these impacts by reusing these materials and find other projects in the area that might need fill material, such as old mines, roads, and superfund sites. Further, we strongly recommend avoiding disposing spoil material into water bodies and wetlands.

Additionally, we recommend adding all Duke's owned properties in the vicinity of the project on a map that could be considered for disposal of spoil material such as Figure 6.1-2. This information could help the public recommend sensible mitigation or further alternatives.

6.1.2 Climate: the PAD includes 30-year climate data for the Oconee County, South Carolina, for the years of 1971-2000 and 1981-2010.

Recommendation: we recommend including more recent data.

6.2.5 Known or Potential Adverse Effects: the PAD states that a geotechnical investigation was conducted for the proposed project, and the final report is expected by early 2023.

Recommendation: The EPA understands that geological issues such as high-in-situ stresses were encountered during the construction of the existing powerhouse, and the EPA recommends including studies regarding possible secondary impacts to the existing powerhouse from proposed excavations. Additionally, if such investigations disclosed probable hazards, then please include mitigations to ensure the existing project's stability.

6.4.2.2.4 Summary of Entrainment Study: the PAD includes results of studies regarding fish entrainment. While the PAD noted that consultations were also conducted with resource agencies and Duke Energy received no objections, we noticed that the PAD's observations described that major die-offs occurred when drawdown was extended.

Recommendation: The EPA recommends exploring worldwide hard mitigation technologies (besides operational guidelines) that could be applied to prevent/minimize entrainments. Further, the proposed project poses an additional burden to these fisheries.

Additional recommendations to include in the proposed studies:

- Figure 6.3-5. Lake Jocassee Daily Water Surface Elevation shows the elevations from May 1, 1975, to December 31, 2020. This figure is not clear, please add an additional graph showing the years instead of the "Day of Year."

- Duke Energy has sufficient time to avoid impacts or mitigate impacts. We recommend pursuing additional innovations to help mitigate water quality, and cumulative impacts.

- Please include information on the existing weir such as possible impacts from spoil dumping. Include how the future dumping could impact Lake Jocassee and the weir as a whole.

- Spoil dumping would impact water quality and would impact species. We recommend developing studies in the areas Duke Energy deemed to be ideal for dumping spoil including water bodies and any wetlands.

- We recommend including water quality baseline data for the Bad Creek Reservoir. We believe is important to have this data to compare future data and make accurate determinations and decisions based on data.

- The EPA recommends disclosing construction and operational emissions. We recommend best management practices and potentially implementing a Clean Diesel Policy to minimize mobile sources of emissions during construction. See the following suitable resources:
    - https://www.epa.gov/dera/reducing-diesel-emissions-construction-and-agriculture
    - https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-control-emissions-air-pollution-nonroad-diesel

Subject: FW: [EXTERNAL] Three species of ferns found for the first time in South Carolina at Lake Jocassee
Attachments: 21PhytoN-SCFerns.pdf

From: Chris Starker <cstarker@upstateforever.org>
Sent: Monday, June 27, 2022 12:57:53 PM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Elizabeth Miller <MillerE@dnr.sc.gov>; melanie.olds@fws.gov <melanie.olds@fws.gov>; wes.cooler@mac.com <wes.cooler@mac.com>; Glenn Hilliard <glenn@hilliardgrp.com>; Andy Douglas <adoug41@att.net>; RigginL@dnr.sc.gov <RigginL@dnr.sc.gov>; Rachel.McNamara@ferc.gov <Rachel.McNamara@ferc.gov>; Erika Hollis <ehollis@upstateforever.org>
Subject: [EXTERNAL] Three species of ferns found for the first time in South Carolina at Lake Jocassee

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Good afternoon, everyone. I just learned this morning about the discovery (nearly five years ago) of three new fern species at Lake Jocassee. There is no mention of any of these ferns in the PAD. Despite the deadline for comments on the PAD and SD1 last week, I feel like this is important information relevant to the Bad Creek Project that should be included in both documents as well as any related studies. A link to the journal article published in 2018 (also attached) as well as the December 2017 issue of "The Blue Wall Weekly" are below.

https://www.phytoneuron.net/2018Phytoneuron/21PhytoN-SCFerns.pdf

https://www.jocasseelaketours.com/component/acymailing/listid-1/mailid-149-blue-wall-weekly-december-18-2017?tmpl=component&tmpl=component

Chris Starker
Land Conservation Manager
Upstate Forever
507 Pettigru St.
Greenville, SC 29601
(864) 250-0500 x115
cstarker@upstateforever.org

Upstate Forever is a conservation organization that protects critical lands, waters, and the unique character of the Upstate of South Carolina. Learn more at upstateforever.org.

McMillan, P.D., E.B. Pivorun, R.D. Porcher, C. Davis, D. Whitten, and K. Wade. 2018. Three remarkably disjunct fern species discovered in Pickens County, South Carolina. Phytoneuron 2018-21: 1–5. Published 25 April 2018. ISSN 2153 733X

THREE REMARKABLY DISJUNCT FERN SPECIES DISCOVERED IN PICKENS COUNTY, SOUTH CAROLINA

PATRICK D. MCMILLAN
South Carolina Botanical Garden
Clemson University
Clemson, South Carolina 29634

EDWARD B. PIVORUN
South Carolina Botanical Garden
Clemson University
Clemson, South Carolina 29634

RICHARD D. PORCHER
The Citadel
Charleston, South Carolina 29409

CODY DAVIS
South Carolina Botanical Garden
Clemson University
Clemson, South Carolina 29634

DAN WHITTEN
South Carolina Native Plant Society
Greenville, South Carolina 29602

KAY WADE
Jocassee Lake Tours
Salem, South Carolina 28676

ABSTRACT

Three species of fern in the family Pteridaceae are reported as new to South Carolina: *Astrolepis sinuata* (Lag. ex Sw.) Benham & Windham subsp. *sinuata*, *Bommeria hispida* (Mett. ex Kuhn) Underw., and *Pellaea wrightiana* Hook. One of these, *Bommeria hispida*, is the first record for eastern North America. All three occur in a cliff habitat in Pickens County created in 1968-1971 by quarrying of granite to build the adjacent Jocassee Dam. All three are native to the western USA and are hypothesized to have colonized this site along the leading edge of the Blue Ridge Escarpment as winds from the Southwest continue to bring in spores.

In 2017 Ms. Kay Wade located a large population of a strange fern growing on outcrops near the Jocassee Dam in Pickens Co., South Carolina. She brought this population to the attention of local native plant enthusiast and South Carolina Native Plant Society member Mr. Dan Whitten. Dan visited the site with Kay and confirmed that the plants were a species of *Pellaea*, possibly *Pellaea atropururea* (L.) Link. Mr. Whitten was aware that *Pellaea atropurpurea* was found on calcareous or mafic substrata and thus sent a photograph of the fern to retired University of South Carolina, Upstate professor Gillian Newberry. Dr. Newberry suggested the species was a western species, likely *Pellaea wrightiana*, not *Pellaea atropurpurea*.

Wade took McMillan to the site on December 3, 2017 and McMillan immediately recognized the plant as *Pellaea wrightiana* Hook., a species with which he was intimately familiar from his work in western Texas and North Carolina. McMillan managed to scale up the rock face to secure a sample of the fronds and confirmed this identification upon returning to Clemson University. A return visit with Kay Wade, Edward Pivorun and Richard Porcher on December 6, 2017 allowed a more thorough

examination of the cliff with binoculars. The group identified two additional species: *Astrolepis sinuata* (Lag. ex Sw.) Benham & Windham subsp. *sinuata* and *Bommeria hispida* (Mett. ex Kuhn) Underw. (this determination was suggested by Alan Weakley of the University of North Carolina after examining photographs). McMillan collected one frond from each of these species but most of the cliff was outside the range of hands and binoculars. The team returned to the site on 13December 2017 with a member of McMillan's staff, Mr. Cody Davis, an expert climber. Mr. Davis secured fronds of all three species and thoroughly explored the extent of the cliff for other oddities that might be encountered.

All determinations were confirmed by George Yatskievych via a loan of specimens to the University of Texas at Austin. Taxonomy follows Weakley (2015). Vouchers are as follow.

ASTROLEPIS SINUATA (Lag. ex Sw.) Benham & Windham subsp. *sinuata*

South Carolina. Pickens Co.: Approximately 300-400 vigorous clumps growing along approximately 50 meters of shoreline of Lake Jocassee on exposed granitic outcrops created during the construction of Lake Jocassee dam; plants located in vegetation mats and fissures in the rock face on west and southwest-facing exposures, with *Pellaea wrightiana, Bommeria hispida, Woodsia obtusa, Asplenium platyneuron, Andropogon virginicus, Chrysopsis mariana, Solidago canadensis*, and various bryophytes, 34°58'11.59" N 82°54'45.27" W, 6 Dec 2017, *McMillan s.n.* with Wade, Porcher, and Pivorun (CLEMS); same location, 14 Dec 2017, *McMillan s.n.* with Davis, Maddox, Pivorun, and Huffman (CLEMS, NCU).

BOMMERIA HISPIDA (Mett. ex Kuhn) Underw.

South Carolina. Pickens Co.: Two clumps located shoreline of Lake Jocassee on exposed granitic outcrops created during the construction of Lake Jocassee dam; plants found in fissures in the rock face on south and southwest-facing exposures, with *Astrolepis sinuata, Pellaea wrightiana, Woodsia obtusa, Asplenium platyneuron, Andropogon virginicus, Chrysopsis mariana, Solidago canadensis*, and various bryophytes, 34°58'11.59" N 82°54'45.27" W, 14 Dec 2017, *McMillan s.n.* with Davis, Maddox, Pivorun, and Huffman (CLEMS, NCU).

PELLAEA WRIGHTIANA Hook.

South Carolina. Pickens Co.: Over 2000 vigorous clumps growing along approximately 150 meters (0.1 mile) of shoreline of Lake Jocassee on exposed granitic outcrops created during the construction of Lake Jocassee dam; plants dominant in fissures in the rock face on south, southwest and west-facing exposures, with *Astrolepis sinuata, Bommeria hispida, Woodsia obtusa, Asplenium platyneuron, Andropogon virginicus, Chrysopsis mariana, Solidago canadensis*, and various bryophytes, 34°58'11.59" N 82°54'45.27" W, 3 Dec 2017, *McMillan s.n.* with Wade and Whitten (CLEMS); same location, 14 Dec 2017, *McMillan s.n.* with Davis, Maddox, Pivorun, and Huffman (CLEMS, NCU).

Discussion

All three of these species typically occur far to the west of Lake Jocassee. These discoveries add three species to the flora of South Carolina as well as the first record for *Bommeria hispida* in eastern North America.

The occurrence of ferns in the Southeast with a much more western distribution is not without precedent. *Pellaea wrightiana* is known from two locations in the piedmont of North Carolina, *Myriopteris rufa* Fée from Virginia and West Virginia, *Myriopteris gracilis* Fée from Virginia, *Astrolepis sinuata* subsp. *sinuata* from a single location in Georgia, *Astrolepis integerrima* (Hook.) D.M. Benham & Windham from Alabama, and most remarkably *Pellaea ternifolia* (Cav.) Link subsp. *arizonica* Windham from approximately 7.25 miles northeast of the Lake Jocassee site in Pickens County (Wagner 1965; Knobloch & Lellinger 1969; Wiebolt & Bentley 1982; Mellichamp et al. 1987;

Benham & Windham 1993; Allison & Stevens 1999; Heafner 2001). The Jocassee Gorges region has long been known for the remarkable diversity of ferns found there. One species, the mostly tropical *Hymenophyllum tunbrigense* (L.) J.E. Smith, which was located during surveys of the nearby Eastatoe River gorge (approximately 6.7 miles northeast of the Lake Jocassee site), is still known from only this single metapopulation in the continental USA (Taylor 1938). *Asplenium monanthes* L., another species with a mostly tropical distribution, is present at many locations in the Jocassee Gorges region. A review of published records and herbarium specimens, combined with field work for the preparation of this article indicates that the area of Pickens/Oconee counties now hosts 68 species of fern and fern relatives. Pickens County alone is home to 65 species. The discovery of three additional species certainly places this small region into a category of extremely high regional pteridophyte diversity.

Most, if not all, of the locations of fern species that are far disjunct to the east from more western ranges are reports of a single species per locale. The Jocassee site is remarkable for the presence of three species displaying such a pattern.

Pellaea wrightiana is a common species found on acidic-reaction outcrops in Texas, Oklahoma, New Mexico, Arizona, southern Colorado, and southern Utah and was formerly known from only two other populations east of Texas. It was erroneously reported for South Carolina by Platt and Townsend (1996). The plants originally thought to be *P. wrightiana* from Pickens County were found to be the first record of *Pellaea ternifolia* Link subsp. *arizonica* in eastern North America (Heafner 2001). The population reported here is the first record for South Carolina and is the most extensive population in eastern North America. The closest populations to the Lake Jocassee site are in Alexander Co., North Carolina (roughly 120 miles northeast), with an initially reported population of approximately 100 clumps growing on granite and Stanly Co., North Carolina (roughly 140 miles east-northeast), with an initially reported population of approximately 500 plants. Since their initial discovery, both of the North Carolina populations have apparently declined. Heafner (2001) found the Alexander County population had dropped to only around 25 clumps while the Stanly County population had also declined by half. The Lake Jocassee site is estimated to consist of no less than 2000 clumps. The discovery of the South Carolina population indicates that this species should be searched for on other acidic-reaction rock outcrops throughout the southern Appalachian region. Heafner (2001) reported that there was very little variation in the allozymes between the two North Carolina populations and they were likely to represent dispersal from a single eastward immigration event. Among the populations sampled from the western range, he found that plants in North Carolina were most similar to those sampled from Jeff Davis Co., Texas.

Astrolepis sinuata subsp. ***sinuata*** is also a common species on acidic-reaction outcrops in Arizona and New Mexico east to central Texas. The species is remarkably disjunct from central Texas to a bridge piling in Beauregard Par., Louisiana, and Merriweather Co., Georgia, where it was found on a granite flatrock next to a natural gas distribution station (Benham & Windham 1993; McMillan et al. 2013; L.L. Gaddy, pers. comm. 2017). The Pickens County location is the first for South Carolina and only the second report from east of the Mississippi River; it is the largest population east of central Texas.

The Pickens County location represents the first known station in the eastern USA for ***Bommeria hispida***. This species is remarkably disjunct from the nearest known populations in Brewster Co., Texas (more than 1200 miles to the southwest). This staggering distance might at first seem unique but it is identical to the disjunction in range found in the nearby population of *Pellaea ternifolia* subsp. *arizonica*.

Establishment at the Pickens County site

The site at which all of the observations were made is a human-created habitat. The cliff habitat was created in 1968-1971 by quarrying activity for the material to build the adjacent Jocassee

Dam. The area is known as "The Wall" and is a 10–40 meter high quarry of granitic rock. The entire hill and face of the mountain was denuded with no natural vegetation left during construction. For a better idea of the scale of disturbance, the construction of the site can be seen on video during the opening minutes of the movie *Deliverance*. The habitat these ferns have colonized was barren, newly exposed rock during the construction of the dam.

The resulting cliff forms a horseshoe shape with the upstream portion facing south and ranging to southwest, west, and northwest exposures as it proceeds downstream. All three of the species are limited to southwest and west-facing faces. The base of the cliff extends to the water for the entire length and is well over 150 feet tall along a large portion of its length. This shape, in addition to the fact that the widest portion of the lake extends from the cliff habitat, has created conditions that receive the full impact of the predominant southwest winds that dominate the region. The winds eddy and swirl in this cove and may provide the opportunity for enhanced settling of the spores that brought these ferns to the cliff.

Astrolepis sinuata subsp. *sinuata* (2n = 87, triploid) relies on apogamous reproduction while *Pellaea wrightiana* (2n = 116, allotetraploid) and *Bommeria hispida* (2n = 60) both reproduce sexually (Benham & Windham 1993; Gastony & Haufler 1976). Spore resiliency and longevity has been shown to be high in members of the family Pteridaceae, with spores preserved on herbarium sheets remaining viable for over 40 years (Windham, Wolf, & Ranker 1986). It is hypothesized that spores were transported along prevailing southwest winds and settled on the newly exposed cliff face where competition with local species was reduced or absent due to the disturbance. The site is along the leading edge of the Blue Ridge Escarpment.

An alternative hypothesis is that nearby populations of these species provided spores for colonization of the newly exposed habitat, but we searched thoroughly along the entire shoreline outcrop habitats of Lake Jocassee and located no other populations. We also searched the exposed rock outcrops above the cliff. The area above the cliff was completely denuded during dam construction.

An alternative hypothesis could include the introduction of spores via machinery used in the construction. Several factors argue against this, notably the absence of any non-pteridophyte species from farther west on the site or nearby. Weed seeds would seem to just as easily be moved. Finally, the presence of another nearby species of fern with a similar distribution (*Pellaea ternifolia* subsp. *arizonica*) and the presence of *Pellaea wrightiana* at two sites in North Carolina, where they are assumed to have naturally colonized their habitats, supports the fact that spores must travel these distances and be able to successfully colonize new habitats.

ACKNOWLEDGEMENTS

The authors would like to thank George Yatskievych of the University of Texas for confirming our identifications and his patient search for intact sporangia to determine the subspecies of *Astrolepis sinuata*. Alan Weakley of the University of North Carolina was extremely patient and helpful in discussions concerning these ferns. We also would like to thank Brooks Wade of Jocassee Lake Tours for helping to provide the opportunity to make such discoveries possible, Zachary Maddox for providing boat transportation to the site and Rick Huffman of the South Carolina Native Plant Society for joining us and always encouraging, promoting, and participating in the continued discovery of our native flora. Guy Nesom reviewed and edited the paper.

LITERATURE CITED

Allison, J.R. and T.E. Stevens. 1999. Vascular flora of Ketona Dolomite outcrops in Bibb County, Alabama. Castanea 66: 154–205.

Benham, D.M. and M.D. Windham. 1993. *Astrolepis*. In Flora of North America Editorial Committee. Flora of North America: Vol. 2: Pteridophytes and Gymnosperms. Oxford Univ. Press, New York.

Gastony, G.J. and C.H. Haufler. 1976. Chromosome numbers and apomixis in the fern genus *Bommeria* (Gymnogrammaceae). Biotropica 8: 1–11.

Heafner, K.D. 2001. *Pellaea wrightiana* Hooker (Pteridaceae) in North Carolina revisited with a new record for eastern North America and a key to *Pellaea* species in the Carolinas. Castanea 68: 319–326.

Knobloch, I.W. and D.B. Lellinger. 1969. *Cheilanthes castanea* and its allies in Virginia and West Virginia. Castanea 34: 59–61.

McMillan, J., C.M. Allen, and S.D. Allen. 2013. *Astrolepis sinuata* (Pteridaceae) new to the flora of Louisiana. J. Bot. Res. Inst. Texas 7: 507.

Mellichamp, T.L., J.F. Matthews, and P.J. Smithka. 1987. New state and regional records of vascular plants in the Carolinas. Castanea 52: 95–111.

Platt, S.G. and J.F. Townsend. 1996. Noteworthy Collections: *Pellaea wrightiana* in Pickens County, South Carolina. Castanea 61: 397–398.

Taylor, M.S. 1938. Filmy-ferns in South Carolina. J. Elisha Mitchell Sci. Soc. 54: 345–348.

Wagner, W.H. 1965. *Pellaea wrightiana* in North Carolina and the question of its origin. J. Elisha Mitchell Sci. Soc. 81: 95–103.

Weakley, A.S. 2015. Flora of the Southern and Mid-Atlantic States. (http://www.herbarium.unc.edu/flora.htm, 15 May 2015). Univ. of North Carolina Herbarium, Chapel Hill.

Wieboldt, T.F. and S. Bentley. 1982. *Cheilanthes feei* new to Virginia. Amer. Fern J. 72: 76–78.

Windham, W.D., P.G. Wolf, and T.A. Ranker. 1986. Factors affecting prolonged spore viability in herbarium collections of three species of *Pellaea*. Amer. Fern J. 76: 141–148.

Subject: FW: [EXTERNAL] RE: Comment Clarification

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Wednesday, July 13, 2022 1:42 PM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Navreet Deo <Navreet.Deo@ferc.gov>
Cc: Stephen Bowler <Stephen.Bowler@ferc.gov>
Subject: RE: [EXTERNAL] RE: Comment Clarification

Hi Alan,

Thanks for reaching out for clarification and sorry about the confusion. I checked the GIS data layers including their attribute tables that we received on April 8, 2022. I see now that we did receive some of the data we requested in the AIR, but there are some data layers that we don't have yet. I copied the AIR below and highlighted (yellow and green) the data that I don't see in the GIS layers that we have. The yellow highlighted text was in the original AIR and the green highlighted text is clarification I added today. Also, I took some screen shots of the referenced figures and tried to point to the data we are requesting. I hope this helps to clarify the data request. Feel free to reach out again if needed.

1. Please file the GIS data shown on the following figures in the PAD: (1) existing project features ~~layout with callout labels~~ data layer with names of features as a field in the attribute table (figure 5.4-12; and figure 2 in Appendix E); (2) proposed Complex features ~~layout with callout labels~~ data layer with names of features as a field in the attribute table (figure 5.4-13; figure 6.3-7; and figure 2 in Appendix E); (3) potential spoil locations relative to surface waters with spoil area labels and surface water impact callout labels (figure 6.3-7); (4) the estimated riparian and littoral zones from the desktop analysis and wetlands from the field assessment with callout labels (figure 6.6-2); (5) protected species habitat polygons and photo location points (figure 6.6-4); and (6) Foothills Trail layer, parking area and connector trail to the Foothills Trail in the Bad Creek Project boundary, other recreational facilities in the project vicinity, and the state and federal land layers (figure 6.8-1).

Figure 5.4-12 (existing project feature layer labeled in this map—with names of features as a field in the attribute table, if possible/available)

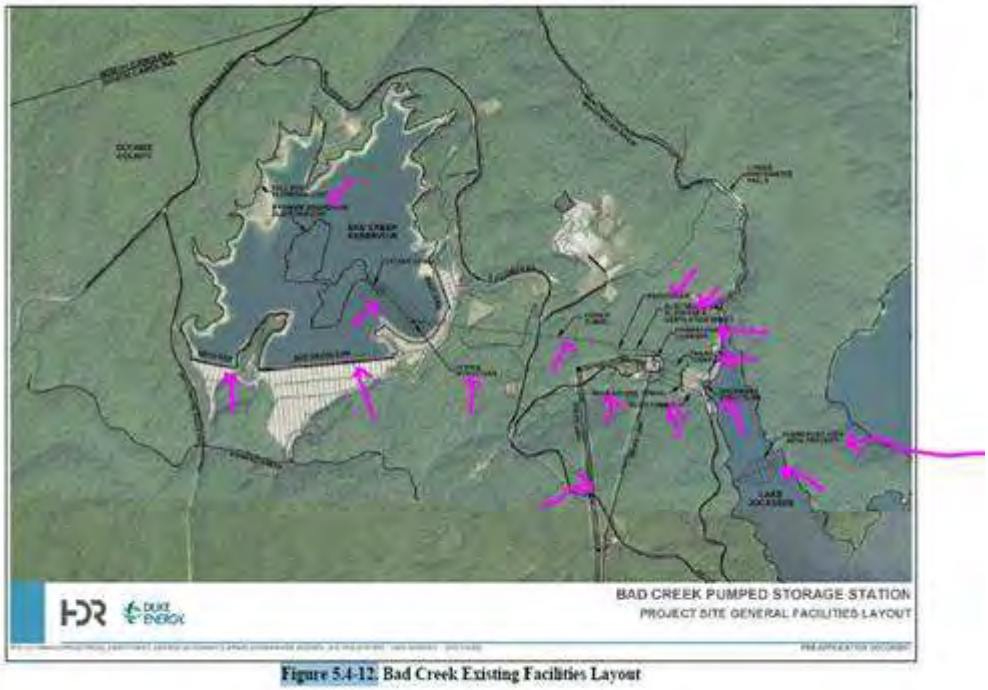


Figure 5.4-12. Bad Creek Existing Facilities Layout

5-18

Figure 5.4-13 (proposed project feature layer labeled in this map—with names of features as a field in the attribute table, if possible/available)

Figure 5.6-1. Proposed Bad Creek II Complex Facilities Layout (Major Existing Bad Creek Project Facilities also Shown)

5-26

Figure 6.3-7 (proposed project/transmission facilities (brown lines) labeled in this map—with names of features as a field in the attribute table, if possible/available)

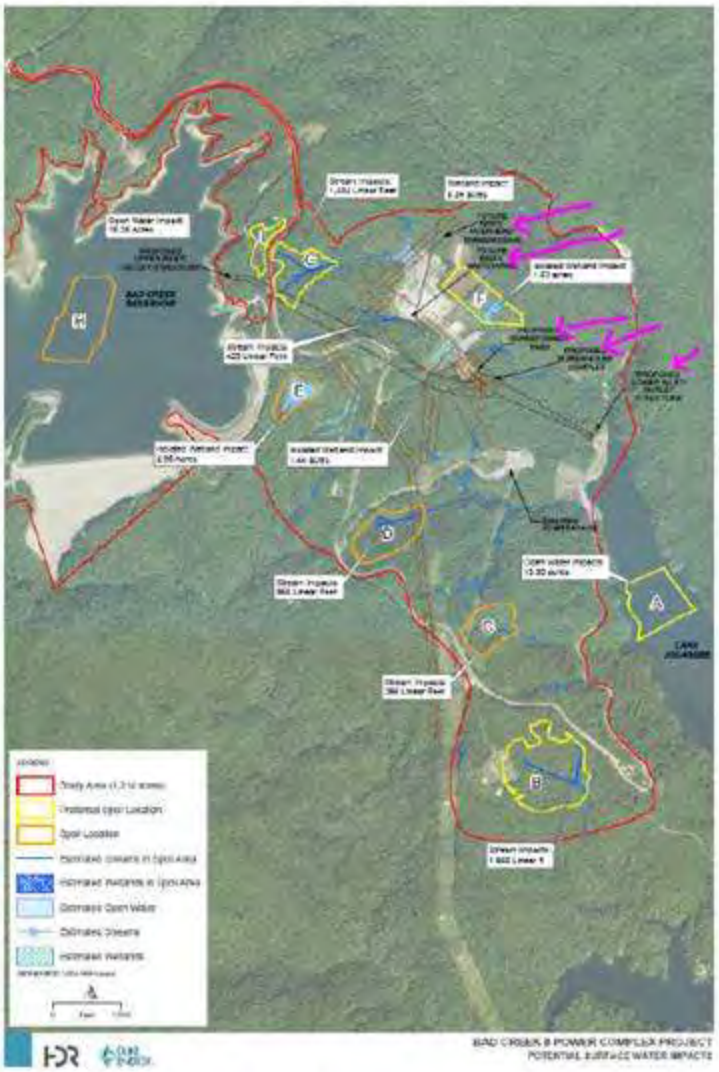


Figure 6.3-7. Potential Spoil Locations Relative to Surface Waters

6-71

Figure 6.6-4 (photo points in legend & map)

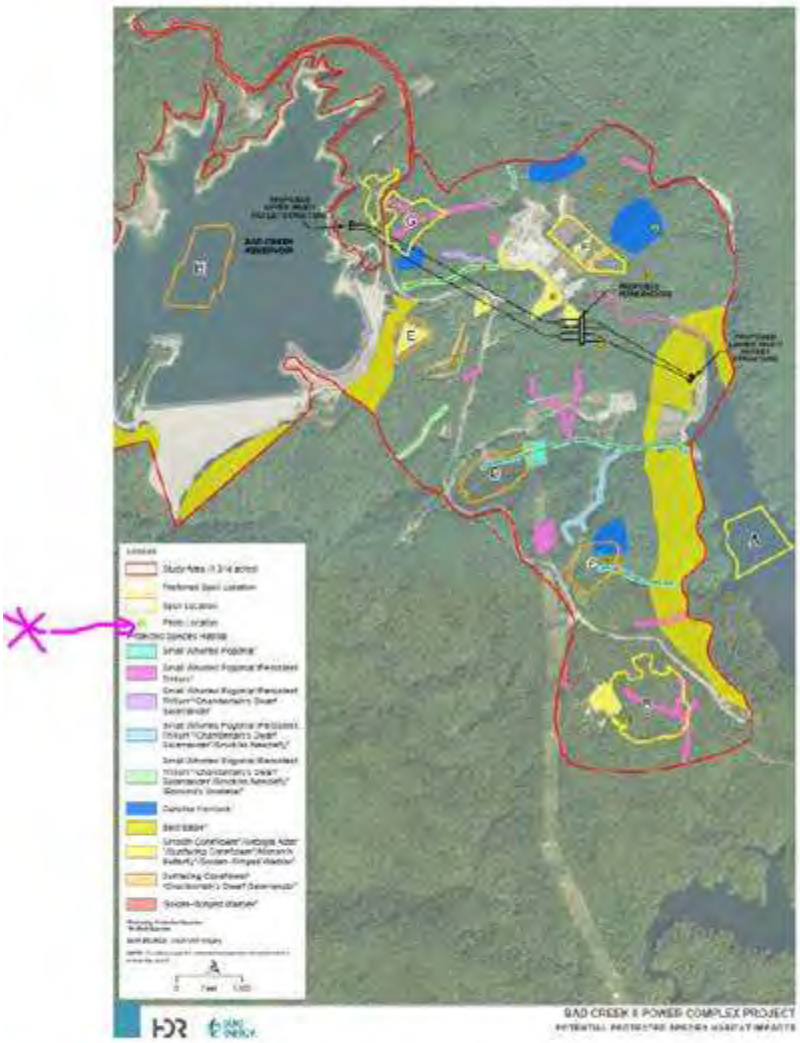


Figure 6.6-4. Proposed Spoil Locations Relative to Protected Habitat

6-167

Thank you,

Sarah L. Salazar *(she/her)* ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* **Please consider the environment before printing this email.**

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, July 13, 2022 11:24 AM
To: Navreet Deo <Navreet.Deo@ferc.gov>
Cc: Sarah Salazar <Sarah.Salazar@ferc.gov>; Stephen Bowler <Stephen.Bowler@ferc.gov>
Subject: RE: [EXTERNAL] RE: Comment Clarification

Thanks Neetu, we will sit tight until hearing from Sara. Will do on future correspondence.

Alan

From: Navreet Deo <Navreet.Deo@ferc.gov>
Sent: Wednesday, July 13, 2022 11:22 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>

Cc: Sarah Salazar <Sarah.Salazar@ferc.gov>; Stephen Bowler <Stephen.Bowler@ferc.gov>
Subject: [EXTERNAL] RE: Comment Clarification

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Hi Alan,

Sarah Salazar, our terrestrial biologist, is looking into this and will try to have answer to you shortly. I will be on leave beginning 12pm so please feel free to reach out to Sarah or Stephen directly with any additional questions, and please cc me.

Thanks,
Neetu

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, July 13, 2022 8:20 AM
To: Navreet Deo <Navreet.Deo@ferc.gov>
Subject: Comment Clarification

Hi Neetu,

We are compiling responses to The Commission's comments on the Pre-Application Document (PAD). The comment below we have a question about. I emailed you on April 8, 2022 a ZIP file with all of GIS data used in the PAD. This action seems to satisfy the request below but we want to make sure we aren't missing something. Is the Commission request to officially file the information we have already provided ?

Please let me know if we are missing something on this one.
Thank you !
Alan

1. Please file the GIS data shown on the following figures in the PAD: (1) existing project features layout with callout labels (figure 5.4-12; and figure 2 in Appendix E); (2) proposed Complex features layout with callout labels (figure 5.4-13; and figure 2 in Appendix E); (3) potential spoil locations relative to surface waters with spoil area labels and surface water impact callout labels (figure 6.3-7); (4) the estimated riparian and littoral zones from the desktop analysis and wetlands from the field assessment with callout labels (figure 6.6-2); (5) protected species habitat polygons and photo location points (figure 6.6-4); and (6) Foothills Trail layer, parking area and connector trail to the Foothills Trail in the Bad Creek Project boundary, other recreational facilities in the project vicinity, and the state and federal land layers (figure 6.8-1).

DUKE ENERGY.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
July 12, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Via FERC Service

Alan Stuart
Duke Energy Carolinas, LLC
Mail Code EC-12Q
526 S. Church Street
Charlotte, NC 28202

Reference: Additional Information Request

Dear Mr. Stuart:

We have reviewed the Pre-Application Document (PAD) for the relicensing of Duke Energy Carolinas, LLC's (Duke Energy) Bad Creek Pumped Storage Project No. 2740-053 (Bad Creek Project), filed on February 23, 2022, participated in the scoping meetings during the week of May 16, 2022, and reviewed the scoping comments filed by stakeholders.

Based on our review of the PAD and the scoping comments, we need additional information related to material presented in the PAD. The requested additional information (see the attached Schedule A) should be filed within 15 days of the date of this letter.

If you have any questions, please contact Navreet Deo at (202) 502-6304, or navreet.deo@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Attachment: Schedule A

SCHEDULE A
ADDITIONAL INFORMATION REQUEST

1. In scoping comments, stakeholders, including the Foothills Trail Conservancy, raised a number of questions regarding ongoing operation and maintenance of the Foothills Trail. Construction of the Foothills Trail was authorized by the Commission in a January 14, 1981 Order Approving Amendment of Exhibit R (14 FERC 62,026 [1981]). Ordering Paragraph 1(A) approves a 61-page document entitled "A Plan for Development and Management of the Foothills Trail" (1980). Commission staff cannot locate this document, or any subsequent revisions (if any), in the record for the project. Please file a copy of the 1980 plan, as well as any subsequent revisions to the plan, or management agreements for the Foothills Trail that have occurred during the term of the current license.

DUKE ENERGY

WATER STRATEGY
AND HYDRO LICENSING

Duke Energy 526
South Church Street /
EC12Q
Charlotte, NC 28202

July 25, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Pre-Application Document Additional Information Request

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC No. 2740) (Project), located in Oconee County, South Carolina. The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission), and the current operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

On February 23, 2022, in accordance with 18 CFR §5.6, Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent with FERC. On July 12, 2022, FERC issued an Additional Information Request related to the PAD.

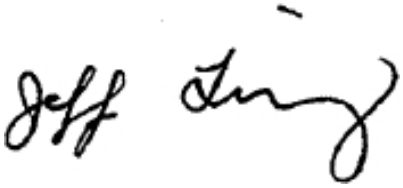
FERC's request is repeated below for reference:

1. *In scoping comments, stakeholders, including the Foothills Trail Conservancy, raised a number of questions regarding ongoing operation and maintenance of the Foothills Trail. Construction of the Foothills Trail was authorized by the Commission in a January 14, 1981 Order Approving Amendment of Exhibit R (14 FERC 62,026 [1981]). Ordering Paragraph 1(A) approves a 61-page document entitled "A Plan for Development and Management of the Foothills Trail" (1980). Commission staff cannot locate this document, or any subsequent revisions (if any), in the record for the project. Please file a copy of the 1980 plan, as well as any subsequent revisions to the plan, or management agreements for the Foothills Trail that have occurred during the term of the current license.*

Duke Energy is hereby providing the requested document “A Plan for Development and Management of the Foothills Trail and a Supplement to The Bad Creek Pumped Storage Project FERC Project #2740 Exhibit R” (along with a copy of FERC’s January 24, 1981 order, for reference) in Enclosure 1 to this submittal. Duke Energy is not presently aware of subsequent revisions to this Plan.

If there are any questions regarding this filing, please contact Alan Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy

Enclosure

cc (w/enclosure): Alan Stuart, Duke Energy
Garry Rice, Duke Energy
Jennifer Bennett, Duke Energy
Service List

Attachment 1

A Plan for Development and Management of the Foothills Trail and a Supplement to Exhibit R

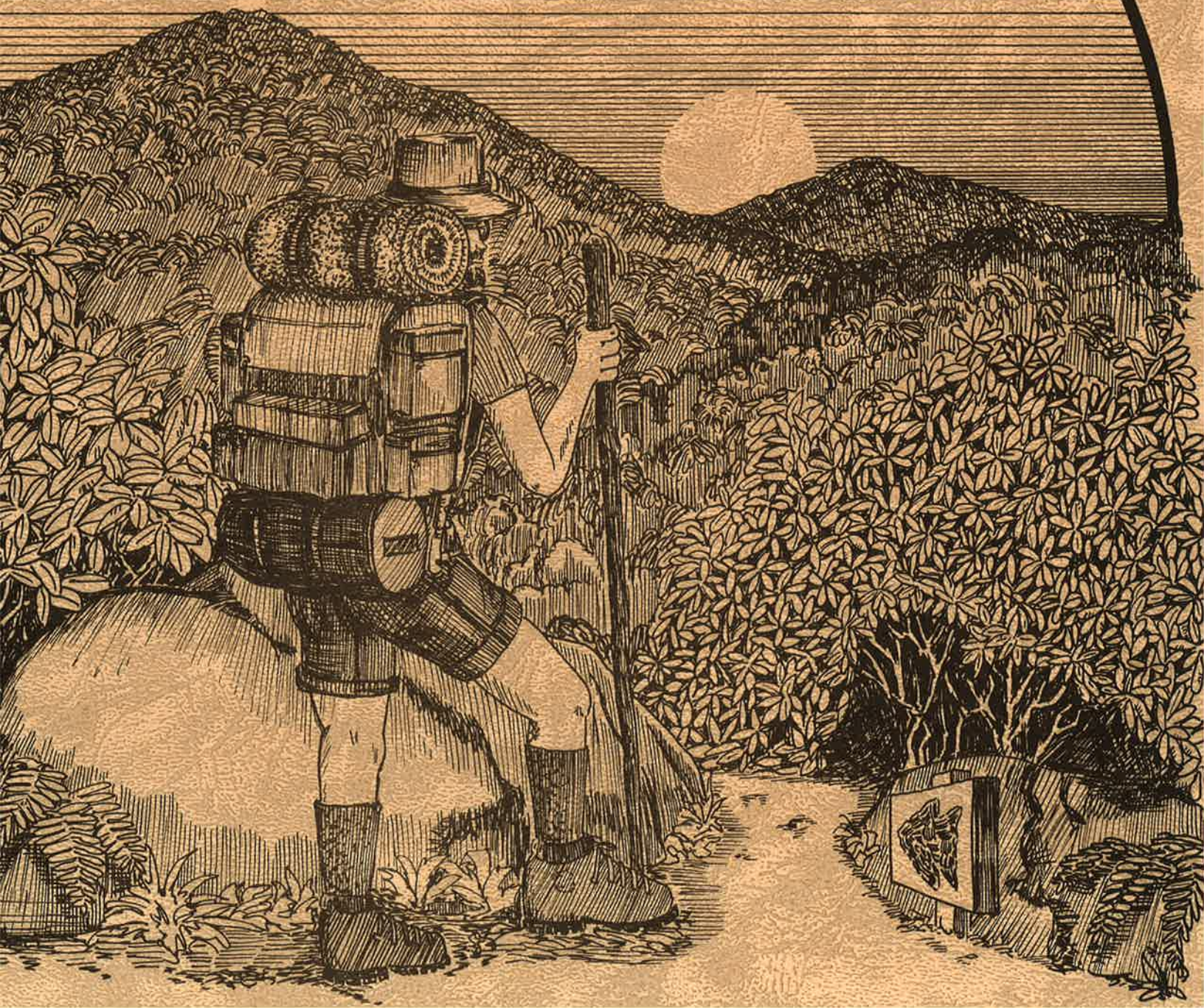
This page intentionally left blank.

BAD CREEK PUMPED STORAGE PROJECT
FEDERAL ENERGY REGULATORY COMMISSION #2740
EXHIBIT R - RECREATION PLAN

FOOTHILLS TRAIL

PINNACLE MOUNTAIN TO WHITEWATER FALLS

DUKE POWER COMPANY



A PLAN FOR

DEVELOPMENT AND MANAGEMENT OF THE

FOOTHILLS TRAIL

AND

A SUPPLEMENT TO THE

BAD CREEK PUMPED STORAGE PROJECT

FERC PROJECT #2740

EXHIBIT R

DUKE POWER COMPANY

PROJECT RECREATION

AUGUST, 1980

CONTENTS

INTRODUCTION.....1
GOALS.....2
THE PLANNING PROCESS.....3
KEOWEE-TOXAWAY PROJECT.....4
BAD CREEK PROJECT.....6
FOOTHILLS TRAIL CONFERENCE.....7
FOOTHILLS TRAIL - A GENERAL DESCRIPTION.....8
DETAILED DESCRIPTION.....10
Pinnacle to Emory Gap.....11
Emory Gap to Hickorynut.....13
Hickorynut Mountain to Fire Tower.....14
Tower to White Pine Point.....17
White Pine Point to Balancing Rock.....18
Balancing Rock to Chimneytop Gap.....20
Chimneytop Gap to Rocky Bottom.....21
Laurel Valley Lodge
Rocky Bottom to Flatrock Mountain.....22
Flatrock Mountain to Double Falls.....24
Double Falls to Laurel Fork Creek.....26
Laurel Fork Creek to Laurel Fork Falls.....27
Laurel Fork Falls to Toxaway.....33
Toxaway to Cobb Creek.....36
Cobb Creek to Bear Gap.....37
Bear Gap to Horsepasture.....38
Horsepasture to Bearcamp Creek.....40
Bearcamp Creek to USFS Land.....41
USFS Land to Thompson River.....42
Thompson River to Old USFS Road.....43
Old USFS Road to State Line.....44
State Line to Whitewater River.....45
Whitewater River to Coon Branch.....47
Whitewater to Parking Lot.....49

x x x x

DESIGN.....50
Appalachian Trail Standards.....50
Access Points.....50
Signs.....51
Footpath.....51
Barriers.....52
Stream Crossings.....52
Camp Areas.....52
Drinking Water.....53
Sanitation.....53
Emergency Facilities.....53
CONSTRUCTION.....55
Use of Volunteers.....55
Schedule.....55
Coordination with U.S. Forest Service.....55
Coordination with S.C. State Parks Division.....55
OPERATION.....56
Timber Management.....56
Wildlife Management.....56
Natural Areas.....56
Law Enforcement.....57

Emergency Procedure.....57
User Behavior.....57
Role of the Foothills Trail Conference.....58
Education and Information.....59
Maintenance.....59
SUMMARY.....61

x x x x

APPENDICES

A. Summary of Comments.....A-1
B. Foothills Trail Conference.....B-1
C. Agreement with Crescent Land and Timber Corp.C-1
D. Agreement with U.S. Forest Service.....D-1
E. Agreement with S.C. State Parks Division.....E-1
F. Facilities and Use at Project #2503,.....F-1
Keowee-Toxaway
G. Agreement with S.C. Wildlife and Marine.....G-1
Resources Department
H. Agreement with N.C. Wildlife Resources.....H-1
Commission
I. Appalachian Trail Standards.....I-1

x x x x

ILLUSTRATIONS

Revision of 1/15/74 Overall Map.....Sheet No. 1
Detail of Trail Route, Access Points,....Sheet No. 2
Camp Sites
Detail of Trail Route, Access Points,....Sheet No. 3
Camp Sites
Access Points 1-8.....Sheet No. 4
Structures for Stream Crossings.....Sheet No. 5
Signs.....Sheet No. 6

x x x x

REFERENCES

x x x x

SUPPLEMENTS

1. Slide Show
2. Guidebook(s)
3. Horsepasture River Trail
4. Keowee State Park Trail
5. Extension of Foothills Trail to the East
6. Extension of Foothills Trail to the West
7. National or State Designation
8. Trail Patch(es)

INTRODUCTION

This plan to guide the development and management of the Foothills Trail is being compiled as part of efforts by Duke Power Company to provide direction and supervision of public recreation use of Company lands and lakes in accordance with the Company's history of public service and applicable Federal Energy Regulatory Commission regulations.

The plan is based on extensive study, field work and consultation with applicable agencies. The North and South Carolina Comprehensive Outdoor Recreation Plans, attendance estimates, user input and comments from federal, state and local agencies and institutions form the data base on which this report is founded.

Additional information is being developed and will be available as supplements to the plan upon completion. These supplements are not a part of the Exhibit R.

The plan will be reviewed annually as part of the Project Recreation Section's budgeting process.

GOALS

In developing this plan, several goals have been identified.

* Provide satisfactory supplemental information to ensure final FERC approval of the Bad Creek Exhibit R.
* Unify the various recreation resources in the area to achieve maximum benefit from each.
* Design the planning process and the facilities in such a way that parts of the proposed development will qualify for government funding.
* Design the facilities so that a particular part or the whole can be placed under the supervision of existing or future governmental programs.
* Compile a development process to guide and coordinate all construction affecting the Foothills Trail and associated facilities.
* Compile a management system to coordinate various operational programs.
* Strive for the highest quality facilities, maintenance and operation.

THE PLANNING PROCESS

The planning process utilized in developing this plan is similar to that used in planning for recreational use of Duke's hydroelectric projects. However, since the concept of primitive recreation use of the mountainous watershed above the Keowee-Toxaway Project has been the subject of previous planning and proposals, the early stages of this planning effort include less study of SCORP and regional data than is usually done.

The following tasks were performed as part of the planning process.

Selection of sites and route.

1. Examine the existing situation.
2. Establish a list of individuals to contact based on existing involvement of various departments and agencies.
3. List sites and routes and their limitations.
4. From the above, list sites and routes to be used.

Determination of facilities to be provided.

1. Inventory existing facilities and the use made of them.
2. Study SCORP for applicable data.
3. Solicit input from interested agencies.
4. Solicit input from users.
5. Determine management limitations.
6. From the above, develop a list of facilities to be provided.

Develop detailed plans.

1. Site and route plans.
2. Cost estimate.
3. Construction schedule.
4. Design specifications.

Management programs.

1. Inventory existing and future needs and programs.
2. Coordinate with various agencies in developing or applying programs.

THE KEOWEE-TOXAWAY PROJECT

Lake Keowee and Lake Jocassee are the two Duke Power reservoirs which support the Keowee-Toxaway electric generating facilities in northwest South Carolina. (FERC Project #2503) The names are of Indian origin, as are the names of many rivers and towns located in this historically rich section of the Piedmont Carolinas.

Lake Keowee is located about 5 miles northwest of Clemson, S.C., home of Clemson University. The cities of Seneca, Salem, Walhalla and West Union also lie close to its shores.

Although its primary purposes are to provide cooling water for adjacent Oconee Nuclear Station, to turn the turbines of the Keowee Hydroelectric Station, and serve as lower pool for pumped storage, the 18,400 acre Lake Keowee is also a major recreational facility. Eight public access areas, complete with paved boat launching ramps, are part of Duke Power's longstanding policy of making its lakes available for recreational use by the public. Information about the development and use of these areas is compiled in Appendix F.

Lake Jocassee serves as the upper pool for the Jocassee pumped storage station which is 11 miles upstream from the Keowee Dam. The 385-feet high Jocassee Dam backs the 7,565 acre lake into the steeply rising Blue Ridge Mountains providing a more primitive recreational area with public access at three locations.

Lake Keowee received a total of 880,000 visits and Lake Jocassee 64,000 visits in 1979.

Both these lakes are near major highways in North and South Carolina. Lake Keowee is approximately 25 miles from I-85 near the Anderson, S.C. exit. Dividing the two lakes, S.C. highway #11, traveling east and west, is designated as the Cherokee Foothills Scenic Highway. In North Carolina, north of Lake Jocassee is highway #64, known as the "waterfalls route".

In conjunction with these major travel routes are 3 national forests and 4 state parks. The state parks include the 1,000 acres of Duke non-utility land, with more than 3 miles of shoreline on Lake Keowee, which was deeded to the State of South Carolina and became the Keowee-Toxaway State Park. Also included is the newly acquired Caesar's Head State Park.

Located near the center of Lake Keowee is the Keowee-Toxaway Visitors Center and the Oconee Nuclear Station. The Visitors Center offers a compelling narrative of man's success in harnessing energy for his own use. Family picnic

facilities are available in a wooded shoreline area nearby.

Duke Power has leased game management rights of over 100,000 acres around parts of Lake Keowee and Lake Jocassee to the South Carolina and North Carolina wildlife management agencies comprising the Horsepasture Game Management Area. More than 18,000 acres are devoted to the propagation of big game such as deer, bear and turkey.

The Bad Creek Project is a 1,000 megawatt pumped storage hydroelectric project under construction in northern Oconee County, South Carolina. The project consists of a 318 acre upper reservoir created by dams across Bad Creek and West Bad Creek, an underground powerhouse and associated transmission lines. A tunnel connecting the upper reservoir and existing Lake Jocassee, which is utilized as the lower reservoir, complete the Project structures.

Access to this mountainous terrain is very limited; a handful of secondary roads and two lane highways serve the perimeter, and no public roads penetrate the more remote areas. Since access is so limited, development is minimal, and activities have been limited to timber and wildlife management. While the majority of the area is not a wilderness in the true sense of the word, it does offer a primitive back-country setting conducive to hunting, fishing, hiking, photography, and other, similar forms of outdoor recreation. Some of the most rugged areas and unusual plant communities have been set aside as natural areas.

The Project is located about midway between Atlanta, Georgia and Charlotte, North Carolina, with a 1970 population of about 3.5 million within a 100 mile radius.

This Project is licensed by the Federal Energy Regulatory Commission as Projec No. 2740 by FERC order dated August 1, 1977. Part of the normal FERC license requirements include provisions for public recreation access to project reservoirs. However, the upper reservoir of the Bad Creek Project is subject to a maximum draw-down of 160 feet, rendering it incompatible with water based recreation use. The upper reservoir will therefore be fenced, and no recreation access will be permitted. Measures will also be taken to minimize the hazards of boating and fishing in the vicinity of the Bad Creek access and discharge structures.

Since access to the upper pool is prohibited and recreation areas are provid-ed at Lake Jocassee pursuant to the Keowee-Toxaway Project license, Duke Power Company has agreed to plan and construct a section of backpacking trail across the watershed lands around Lake Jocassee. The trail will serve public needs and satisfy FERC requirements for an Exhibit R (recreation plan) pursuant to the Bad Creek Project License. The License and subsequent requirements specify that detailed plans for the trail be submitted to FERC by August 1, 1980.

The history of the Foothills Trail Conference began in the late 1960's, when representatives from local interest groups, government agencies and landowners began informal discussions concerning regional trail resources in the area. Through the efforts of the U. S. Forest Service offices in Columbia, South Carolina and Atlanta, Georgia, Clemson University's Recreation and Park Admin-istration Department, the South Carolina Division of Parks, Recreation and Tourism and the Pendleton District Historical and Recreation Commission, a preliminary discussion of the Trail was held during the South Carolina Recreation and Park Society Conference in 1970. Subsequent meetings firmed the conceptual plans for the Trail.

After Duke Power Company proposed to build the section of Trail across Company lands as a condition of the Bad Creek Project License a meeting was called on May 22, 1974 by local interest group leaders for the purpose of organizing a Foothills Trail Conference. At this meeting acting Chairman Glenn Hilliard stated the purpose of the proposed Conference as being, "...the coordination of groups and individuals interested in advancing the completion, maintenance and proper use of the Foothills Trail." There was general agreement that such a conference was desirable and that it should be organized. Actions taken at this meeting included the adoption of bylaws, election of a Board of Directors, and discussions of Trail routes, standards, brochures and future Conference projects. It was recognized at this meeting that many Conference efforts would remain in a holding pattern until the Bad Creek Exhibit R, including amendments, is finalized.

The Conference met again on March 24, 1980 to update representation to its Board and to review information from Duke pertaining to route changes and other planning details. Conference leaders are now working to broaden membership in the group.

The Foothills Trail Conference is a key element in the development and manage-ment of the Foothills Trail, its extensions, side trails and other projects. Through the Conference an ongoing citizen input process vastly improves the responsiveness of various trail and resource management related efforts to citizen needs. The Conference also aids agencies and other landowners in coordinating their individual efforts towards common goals.

FOOTHILLS TRAIL - A GENERAL DESCRIPTION

The backpacking trail which Duke Power Company proposes to construct across Lake Jocassee's mountainous watershed is a part of the Foothills Trail. This Trail was conceived in the middle 1960's and two sections have been constructed and designated as national recreation trails under the National...Trails System Act. The original concept of the Trail called for it to extend from South Carolina's Pleasant Ridge State Park at the eastern terminus to Table Rock State Park, then around Lake Jocassee to Upper Whitewater Falls, where it joins with trails existing or to be constructed in Nantahala and Sumter National Forest; these trails connect with Oconee State Park and the Chattooga Wild and Scenic River in the Sumter National Forest. Stumphouse Mountain Tunnel Historic Site was to be the western terminus of the Trail.

In addition to this original concept, the Foothills Trail links with the Chattooga and Bartram Trails and the possibility exists of extending the Foothills Trail west on the Chattahooche National Forest and Georgia Power Company lands along the Tallulah River. Beyond Georgia Power Company's holdings, some additional private tracts would need to be crossed in order to connect the Foothills Trail with the Appalachian National Scenic Trail.

Another item of stated interest is the addition of side trails linking the Foothills Trail to Keowee-Toxaway State Park, the Horsepasture River with its scenic Rainbow and Windy Falls, Ellicott Rock Wilderness Area, the point at which Georgia, North Carolina and South Carolina join, and other attractions. Through this process the Foothills Trail would become the backbone of a regional trail system.

Whereas the Appalachian Trail with its ridgetop location is largely aloof from the surrounding culture, the Foothills Trail traverses both mountains and valleys, and brings the hiker close to many items of cultural interest as well as a wide variety of microclimates and terrain. This diversity provides a more stimulating and educational experience than would otherwise be enjoyed.

Two sections of the Trail are presently in use. The first is in Sumter National Forest, and consists of about 23 miles. This section has been designated the Foothills National Recreation Trail. An additional 2 miles will be constructed by the U. S. Forest Service in South Carolina plus several miles in North Carolina to join with the section to be built by Duke.

The second part of the Trail which exists is located in Table Rock State Park, and connects Pinnacle Mountain with the access point in the Park.

The section of the Trail which Duke Power Company proposes to construct lies on lands owned by Crescent Land and Timber Corporation, Duke's land management subsidiary. This section begins at Pinnacle Mountain about 1,000 feet from where it connects with an existing trail from Table Rock State Park and continues west about 35 miles to the Upper Whitewater River at the state line northeast of the Bad Creek site. The proposed route is shown on the revised Sheet 1 drawing, attached. Anticipated use on this portion of the Trail will be approximately 6,000 people per year.

The Company reserves the right to alter, discontinue or relocate all or a portion of the Trail to meet changing demands or to avoid conflict with other uses of the area. The Trail location is not within the Bad Creek Project area.

Development of this Trail for use solely as a hiking trail is in response to demand for this type of facility in the area. Duke's section of the Trail is being planned to coordinate with and complement the existing and planned recreation opportunities available at Lakes Keowee and Jocassee and at nearby areas administered by local, state federal and institutional agencies.

DETAILED DESCRIPTION

The following is a detailed description of the Trail broken down into geographical segments. Many of the beginning and ending points of each segment are points of access onto the Trail, or features of scenic interest. Each segment briefly describes:

1. The general direction of the Trail route.
2. Possible alternate routes.
3. The length of the segment and approximate hiking time.
4. Elevation changes from one end to the other.
5. Grade of the Trail along with information concerning the side slopes of the mountain into which the Trail will be cut.
6. Vegetation density.
7. Scenic and other points of interest along the segment.
8. Accessibility to the segment by vehicle.

This and other information gathered will be a determining factor as construction schedules are made. Additional information collected includes: difficulty of using mechanized equipment along some segments, lengths and types of bridge spans to be used and their location, potential drainage problem areas and areas which will require use of steps.

Some short sections of trail may be relocated before construction is completed in order to bypass several patches of Oconee Bell, a flowering ground cover with a limited range. Such relocation will have limited effect on the hiker using the Trail. The final route including any necessary relocations will be shown in the "as constructed" drawings which will be submitted upon completion of construction.

Pinnacle to Emory Gap

The first section of trail that Duke proposes to build will begin at the Crescent Land and Timber Corporation-Table Rock State Park property line, about 1,000 feet southwest from the top of Pinnacle Mountain.

The main section of trail will extend northwestwardly around the Drawbar Cliffs, Piney Mountain Gap and on to Emory Gap.

The Greenville Watershed owns land adjoining Crescent along the section of trail from Pinnacle to Emory Gap. Because this land is posted to trespassers, and because of the terrain, no alternate routes have been selected.

The distance from the beginning of Duke's portion of trail at Pinnacle Mountain to Emory Gap is about 2.8 miles. It will take about 2½ hours to walk this section, with the hiker experiencing about a 700 foot drop in elevation. Although the desired slope for this trail is set at 10%, some areas may be in the 20% range for up to 300 feet. Side slopes along this section will vary from a gentle 5% to steeper slopes around 60%.

The vegetation of this section is typical of what can be found along the entire trail. A mixture of hardwoods, including several species of oak, hickory, black cherry, locust and poplar, can be found. The most abundant evergreens to be found include the pitch and white pine and hemlock. These are only a few of the 57 different trees found in this mountain region. Several shrubs to be found along this section and along the whole trail are dense patches of rhododendron, mountain laurel, and along the valleys, the impenetrable dog-hobble.

Several scenic attractions can be found along the first section of trail. The "Lighthouse" consists of a large rock crevice in the rock walls of the "Drawbar Cliffs". The crevice is situated about 200 feet above the trail and has an opening of about 30'w x 50'h x 20'd. Standing in this opening will give the hiker an eerie feeling. The trail intertwines among large boulders that have fallen from the crevice and cliffs above.

The Marion Rock House located located adjacent to Piney Mountain gap holds significant interest. According to local legend, Marion Castles lived under this rock for several years during the Civil War hoping he could evade being called into the service.

The Emory Gap toll road is perhaps the most noted point of interest along this section of trail. Constructed in the early 1900's, this was the only road crossing over the mountains from the Pickens County area. Users of this road paid a fee from 50¢ for a horse and rider, to $1.25 for an oxen-pulled wagon

laden with supplies. The road was last used in the 1930's and a section of about 1,000 feet is now included as part of the Foothills Trail.

This section of trail is relatively inaccessible compared to other sections. There are only two access points along this section. The first is on the southern ridge of Pinnacle Mountain and is referred to as the "Rock-Ridge - Road". The other referred to as the "Marion Rock House Road", extends from Camp Adger to the southeastern side of Piney Mountain. Both of these roads are old logging roads. They join together southeast of Camp Adger and run into S.C. Highway #11 about 1½ miles east of its intersection with #178.

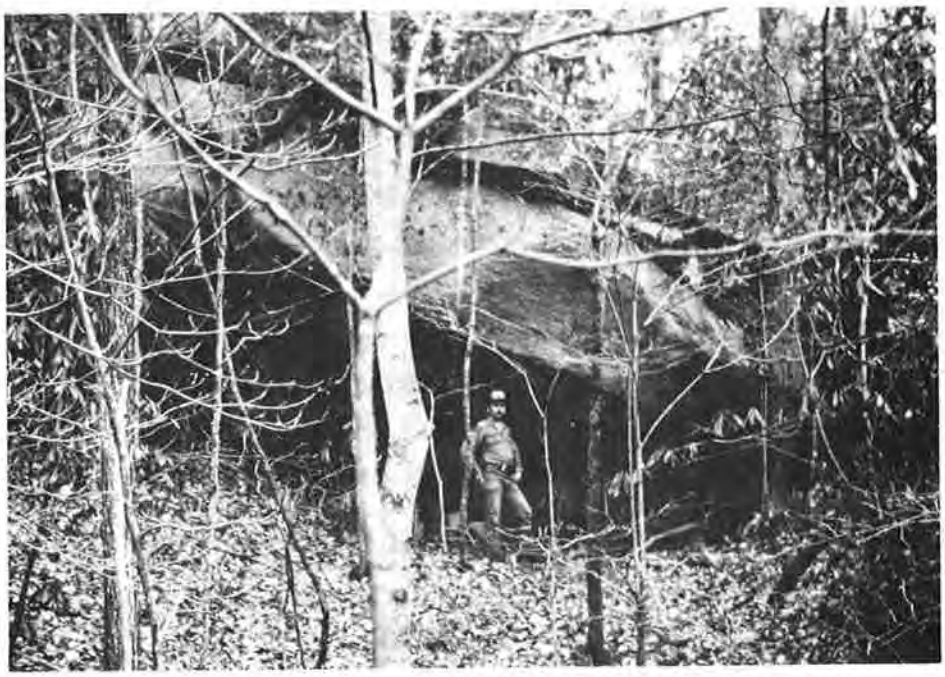


Photo #1
Marion Castles Rock House

Emory Gap to Hickorynut

From the Emory toll road at Emory Gap the trail will take a sharp turn to the northwest and upward. From that point it is a steady climb for about the next 1½ hours to the top of Hickorynut Mountain. This section of trail is in a generally northwesterly direction and remains on the southern slope of the mountain ridge from Emory Gap to Hickorynut.

Because of the Greenville watershed property line running along the ridge above the trail, there are no alternate routes along this section.

The distance for this section is approximately 1.4 miles. Although the trail climbs continously from Emory Gap to Hickorynut, gaining 630 vertical feet, there is very little strain on the hiker. The trail maintains a 10% slope except perhaps in switchback areas. The side slopes of this section are also gentle, averaging from 20-30%.

The vegetation of this section consists of mixed hardwood with an understory of thick laurel persisting almost the total distance.

There are no points of cultural interest along this section.

There is no access to this section except by entering from segment 1 or 3.

The total hiking time is approximately 1½ hours.

Hickorynut Mountain to Fire Tower

This section of trail begins in small gap on the southern ridge of Hickorynut, about 1,000 feet from the crest of the mountain. From this point the trail will basically follow the contour around the southwest side of Hickorynut and continue in a northwestwardly direction toward Sassafras Mountain and the fire tower. No alternate routes have been selected along this section. There is a woods road along the ridge top of this section that runs parallel with the trail. It serves as the Greenville watershed property line, and therefore will not be used.

The length of this section of trail will be about 1.8 miles long and will have a total elevation change of +204 feet from Hickorynut to the tower. Most of this climb will be in the 2,000 feet of trail closest to the tower. The terrain over the majority of this section is very gentle. Side slopes range from 20 to 40% with some sections being relatively level.

The vegetation of this ridgetop section consists mainly of mixed hardwoods with some yellow pine. As in the other sections, some patches of laurel will be experienced along the way.

This section holds one of the most scenic spots along the whole trail. Sassafras Mountain is not only the highest point in Duke's section of trail; it is the highest peak in South Carolina. Buildings in Greenville, and also Pisgah Mountain on the Blue Ridge Parkway in North Carolina 23 miles away, can be seen. At the present time, the only structures on Sassafras Mountain are a repeater station and a fire tower, located on the N.C.-S.C. state line and operated by the S.C. Forest Service. The area around Sassafras will receive more day use than perhaps any other section of the trail. A parking access area (Site 2) is planned for the trail near the crest of Sassafras.

While hiking along a woods road on the southwest side of Hickorynut, the hiker will see the remains of the John L. Cantrell homeplace. Built about 1840, it was the home of one of this area's earliest settlers. Cantrell and his family raised sheep and cattle on the open range. All that remains today are the stone chimneys. The area nearby the site may serve as a camp site.

This section is easily accessible from both ends. The woods road mentioned earlier runs the length of this section and can be entered from Horse Mountain or from the paved road about 600 feet from the crest of Sassafras. Although the trail does not follow the woods road, it parallels the road within 300-400 feet.

The hiking time for this section is about 1 hour.

As mentioned earlier, the area around Sassafras will receive more day use than most other sections of the trail. The terrain from Sassafras to Hickorynut is more gentle than perhaps anywhere else along the trail. During the planning and construction stages Duke's Health & Recreation Services Department will be working with the S.C. Chapter of the National Federation of the Blind. They are in the development stages of building a camp for the blind at Rocky Bottom. This camp is located on the paved road leading to Sassafras. They have expressed interest and enthusiasm about the trail and are looking forward to useing this section of trail as part of their activities.

Photo #2

Sassafras Mountain Fire Tower (Elv. 3,554')

Photo #3

Cantrell Homesite

Tower to White Pine Point

This section of trail will travel in a westwardly direction from the tower, down to the paved road and continue on for about 1,500 feet to White Pine Point.

There have been no alternate routes chosen although the paved road leading to the top of Sassafras can be used as an alternate route for the upper segment.

The distance for this section is about 1 mile with an elevation change of -354 feet from the top of Sassafras to White Pine Point. The terrain is more gentle than the sections that will follow. The side slopes will average from 20 to 40% with some areas being relatively level.

A hardwood overstory persists over this section with some laurel scattered. Much of this section has been reforested and planted in white pine. These trees were planted around 1970.

This section is very accessible as the paved road leading from Rocky Bottom to Sassafras divides the section in half. The road can be traveled year-round unless closed by snow. Logging roads also extend from the paved road toward White Pine Point, and could be used as service roads, although this would require closing them to the public.

The section from Sassafras to White Pine Point will take about ½ hour to hike.

White Pine Point to Balancing Rock

At the end of White Pine Point the trail will switchback to the right and descend at about 10% toward Balancing Rock. Two gaps are encountered in this section with the trail crossing in each from one side of the ridge to the other. At the first gap, (gap #1) the trail will cross to the northern slope before reaching Balancing Rock.

At Balancing Rock the main trail will bear south with a short spur of about 100 feet leading to the right and out the ridge to the rock itself.

No alternate routes along this section have been chosen. The southern slope between gap #1 and #2 was considered, but because of dense laurel and steep side slopes, was not selected.

This is a relatively short section being only about ½ a mile in length. From White Pine Point to Balancing Rock there is a -200 foot drop in elevation. The maximum percentage of slope on the trail is 10% with the average being about 7%. The side slopes along this section will average from 50 to 70%. Some side slopes may be steeper and trail tread width will be increased to about 40 inches.

Vegetation along this section is divided into two different catagories. The first 1,000 feet consists of a mixed hardwood overstory with a dense laurel thicket the entire length. After entering gap #1 and crossing onto the northern slope, the hiker will have easy walking through open hardwood until reaching Balancing Rock.

After arriving at gap #1 the hiker will find himself among several large chestnut trees that died during the American Chestnut blight of the 1930's. Some of these trees measure over 4 feet in diameter. The American Chestnut grew straight and tall not only producing mast for animals, but also producing a superior wood for furniture. Its chemical make-up made it almost rot-resistant. Chestnut was also considered superior to pine for paper making in the South. Research is being done to bring back a blight resistant species of the American Chestnut.

Another scenic attraction along this trail section is Balancing Rock. It was known to the earliest settlers of the Rocky Bottom area. The rock stands on the edge of a bluff overlooking not only the Rocky Bottom area, but also the southwestern section of the Appalachian mountains of South Carolina into Georgia. Sections of Lake Keowee and Jocassee, along with the rock cliffs above the parking area at Whitewater Falls, can be seen. Facing west the view from this rock makes a perfect setting for pictures highlighting a sunset.

There are no points of significant cultural interest along this section.

There is no access to this section except by the trail.

Hiking time for this section is about ½ hour.

Balancing Rock to Chimneytop Gap

This section of trail may be considered one of the rougher sections of the trail. After leaving Balancing Rock the trail will follow a southern direction for several hundred feet before switching back to the left into a draw. At the draw, the trail will switch back to the right and around the bluff. Through a series of long switchbacks the trail will take on a southwestwardly direction to reach Chimneytop Gap.

There is no alternate routes along this section due to the established points at each end and also because of terrain.

The straight distance from Balancing Rock to Chimneytop Gap is only about 3,000 feet. Because of the change of 460 feet in elevation along this section, 4,600 feet of trail is needed to negotiate the many switchbacks.

The trail rarely exceeds 10%, although in some areas this may increase to 15% for short distances. The side slopes will average about 30% along this section. Some areas below the bluff may reach 80%. In these areas the trail tread will need to be at least 40 inches wide.

The vegetation of this section is made up of mixed hardwood with some scattered pine along the ridges. Some greenbrier will be found along the old logging roads and will require more maintenance than some other areas.

There are no scenic attractions along this section.

There are no points of significant cultural interest along this section.

Access to this section is by the road at Chimneytop Gap; access site #3 is nearby. No other roads are in the area.

The time required to hike this section will be determined by which way the hiker is going. If traveling westward from Balancing Rock, it will take about 30 minutes. If hiking up to Balancing Rock from the "Gap", it will take longer to climb the 460 feet.

Chimneytop Gap to Rocky Bottom

This section of trail will begin at the paved road at Chimneytop Gap, travel around the southern slope of Chimneytop Mountain and down to the bridge on Highway #178 at Rocky Bottom - Laurel Valley.

An alternate route around Chimneytop can be utilized if the need arises. Presently a logging road travels to the west side of the mountain but does not change greatly in contour from that of 2,400' at the gap. This road, being on the northern slope, is very stable with ground cover. It should be closed while not in use.

The distance along this section of main trail is about 2 miles.

The change in elevation from Chimneytop Gap to Rocky Bottom is about -720 feet. The trail maintains a slope of 10% almost the whole distance. Side slopes will average 50% with some areas ranging up to 80 and 90%.

The vegetation along this section will vary with the elevation. Along the higher ridges on Chimneytop the woods are rather open consisting of a mixture of hardwoods. As the trail descends lower toward Rocky Bottom more laurel and rhododendron are encountered, especially on the northwestern slopes.

There are no scenic attractions along this section.

Although there are no significant attractions along the trail, several remains of liquor stills may be found in some of the streams. If the hiker wanders from the trail, he may find himself where history is...."in the mak'in".

Access to this section of trail is good. The trail may be reached by leaving Rocky Bottom and traveling up the Sassafras Fire Tower road to Chimneytop Gap where the trail crosses the road. One may also travel #178 north of Rocky Bottom to Laurel Valley where the trail enters the road at the bridge on #178.

The hiking time from Chimneytop Gap to Rocky Bottom will be about 2 hours. Hiking from Rocky Bottom up will take considerably longer.

Laurel Valley Lodge

This is a small area below the bridge at Laurel Valley, the only developed area along the trail route. Highway #178 from Rosman, N. C. to Pickens, S. C. crosses at this point. The lodge consists of a restaurant, motel with about 10 units, and two apartments.

For people hiking the whole trail, this would be a good stopover point to eat, pick up some supplies, and shower.

Rocky Bottom To Flatrock Mountain

After leaving Highway #178 at Rocky Bottom the trail will follow the dirt logging road at Laurel Valley for about 1,500 feet. This is because both sides of the road along this section is private land. At the end of this 1,500 feet is the Rocky Bottom access parking area. (Site #4) At this point the trail will leave the road and begin to climb the ridge on the inside of the curve. The trail will follow along the ridge for about .5 miles before descending to the dirt road again. This is because the Crescent property line comes within 50 feet of the road. At this point the trail will again leave the road and will climb Flatrock Mountain. After crossing one more logging road and one transmission line right-of-way, the trail will turn westward and follow the contour around Flatrock Mountain. After hiking for about an hour around the mountain through mostly open woodland, the hiker will reach the dirt road from Laurel Fork Gap to Flatrock Mountain. Approximately 1,000 feet before reaching the road, a large bottom will serve as a camping area for this section.

An alternate route exists along the first mile of this section of trail. After leaving Laurel Valley and hiking along the road to the parking area, the trail leaves the road and follows around the contour of a ridge above the road. From the parking area to the point where the road and the property line meet, the logging road could be used for the trail. This would be an extra .7 miles in addition to the first 1,500 feet from Laurel Valley. The hiker would be walking a total of about 1 mile on the dirt and gravel logging road. This alternate route would eliminate building the section of trail that runs parallel to the road. The terrain on this section is rough and is dense laurel the entire distance. If the road is used, the hiker will need to be cautioned of traffic on the road. Signs should be posted on the road to caution both driver and hiker. The hiker should use the outside edge of the road for safety as a result of "blind" curves along this section.

This section is 3.5 miles long. As mentioned previously, the first mile is either by the road or running parallel with it.

The first 1.5 miles from Laurel Valley to Rocky Bottom is the most strenuous. Much of the 640 vertical feet between Laurel Valley and Flatrock Mountain is gained in this section. This first section also has the roughest terrain. Several sections of steps and switchbacks will be required to make this area passable. Side slopes range from 40 to 90%. This is quite a contrast to the second section of this segment that contains gentle side slopes of 10 to 30%

through mostly open woodland.

The vegetation varies as much as the terrain. Along the section parallel to the road the vegetation consists of a dense thicket of laurel and rhododendron. After climbing several hundred feet around the side of Flatrock, the thickets disappear and, with the exception of a few small sections of laurel, the trail travels through open woodland.

There are no significant scenic attractions along this section although there are several small picturesque waterfalls along the way.

There are no known points of significant cultural interest along this section.

This section is relatively accessible by road. The main dirt logging road leading into Laurel Fork is either part of, or close to, the trail for the first mile. A new cut logging road crosses the trail at 90 degrees about ½ way up the mountain along with a 100KV power line. The trail also intersects the logging road running from Laurel Fork Gap to Flatrock Mountain.

Flatrock Mountain to Double Falls

After crossing the dirt road from Laurel Fork Gap to Flatrock Mountain, the trail will follow an old roadbed for about .5 mile before reaching the west branch of Laurel Fork Creek. After crossing the creek the trail will follow the creek downstream, crossing back to the east side and then back to the west side. After hiking about 600 more feet the hiker will find himself at Double Falls.

Because of the old roadbed perhaps being opened in the future, an alternate route has been selected which would tie from Flatrock Mountain Road into the west branch of Laurel Fork below the Double Falls.

The distance along this section of the main trail is only about .75 mile. Most of the elevation change of -200 feet is witnessed in the lower section around the creek and falls. The majority of this section is along an old roadbed with a very gentle slope. The side slopes for this section, however, are more drastic; they run from 40 to 60%.

As the trail descends into lower elevations the vegetation changes considerably. Along with the increased amount of moisture is the increased amount of vegetation. Dense thickets of rhododendron and laurel lie intermingled. Closer to the creek banks are blankets of dog-hobble (Leucothoe axillaria var. editorum). This shrub normally grows to a height of around 5 feet. Although these plants have no thorns, their density make the ground they grow on virtually impassible.

As the hiker reaches the lower portion of this section, he will experience some of the rougher terrain along the trail. He is also entering some of the most scenic terrain. As he descends along switchbacks beside the creek, he will pass a small "rockhouse" that can be noted as a place of shelter for 2 or 3 people in case of a storm. Below this point he will encounter several waterfalls. This area is named for 2 falls, "Double Falls", one located at each end of a switchback. Although not the largest, these falls are most picturesque for their size.

There are no points of significant interest along this section.

The only access to this section is the road from Laurel Fork Gap to Flatrock Mountain.

The total time to hike this section is about 1 hour.

Photo #4

Falls on West Laurel Fork Creek

Double Falls to Laurel Fork Creek

This section of trail will run along the west branch of Laurel Fork Creek. It will follow and old logging road that meanders from side to side along the creek. After reaching a falls, the trail will run parallel with the creek until reaching the main branch of Laurel Fork Creek. At this point the trail will remain on the northern bank of Laurel Fork and continue around the ridge until reaching a small clearing adjacent to the dirt road leading into Laurel Fork Falls.

No alternate routes have been considered along this section.

The distance along this section is about 1 mile with a change in elevation from Double Falls to the road being around -480 feet. This change in elevation is experienced over such a distance that this section can be considered "easy walking". Since this section follows creek bottom land the side slopes are relatively level when compared to other sections.

The vegetation along this section is considerably thicker than in the higher elevations. As in the previous section, much of this terrain is covered with thickets of laurel, rhododendron and dog-hobble.

Although the ground cover along this section is basically the same as seen in other sections, the over-story on this section is quite different. A major scenic attraction along the entire trail is found along the west branch of Laurel Fork Creek. Giant virgin hemlock are scattered along the creek bank. Some of these trees will measure 5 feet in diameter and reach a height of over 100 feet. Several dead trees can be seen lying on the ground; even trees as large as these have a limit on how long they can survive. This is one of the underlying principles of forest management carried on by Crescent Land and Timber Corp.

Another point of interest is the waterfalls close to the road. Again, although not the largest falls along the trail, it does hold a great deal of scenic value.

The road leading from Laurel Valley - Rocky Bottom to Laurel Fork Falls is the only access to this section. The lower part of this trail section will run parallel to the road, separated only by Laurel Fork Creek.

The hiking time for this section will be about 1½ hours from Double Falls to the dirt road.

Laurel Fork Creek to Laurel Fork Falls

This section will run with Laurel Fork Creek and also the dirt road leading to Laurel Fork Falls. It will be crossing from one side of the Creek to the other using the existing bridges along the road (refer to drawings on pages 29-31). From below bridge #12 the trail will cross the creek and continue to the falls using the old roadbed. The road has been closed to vehicular traffic, and using it will eliminate constructing 1 mile of trail, including 4 bridges, along the creek. This is the only route considered along this section. The section will end on the road at the top of the hill overlooking Laurel Fork Falls. Information on this section can be seen on the attached maps.

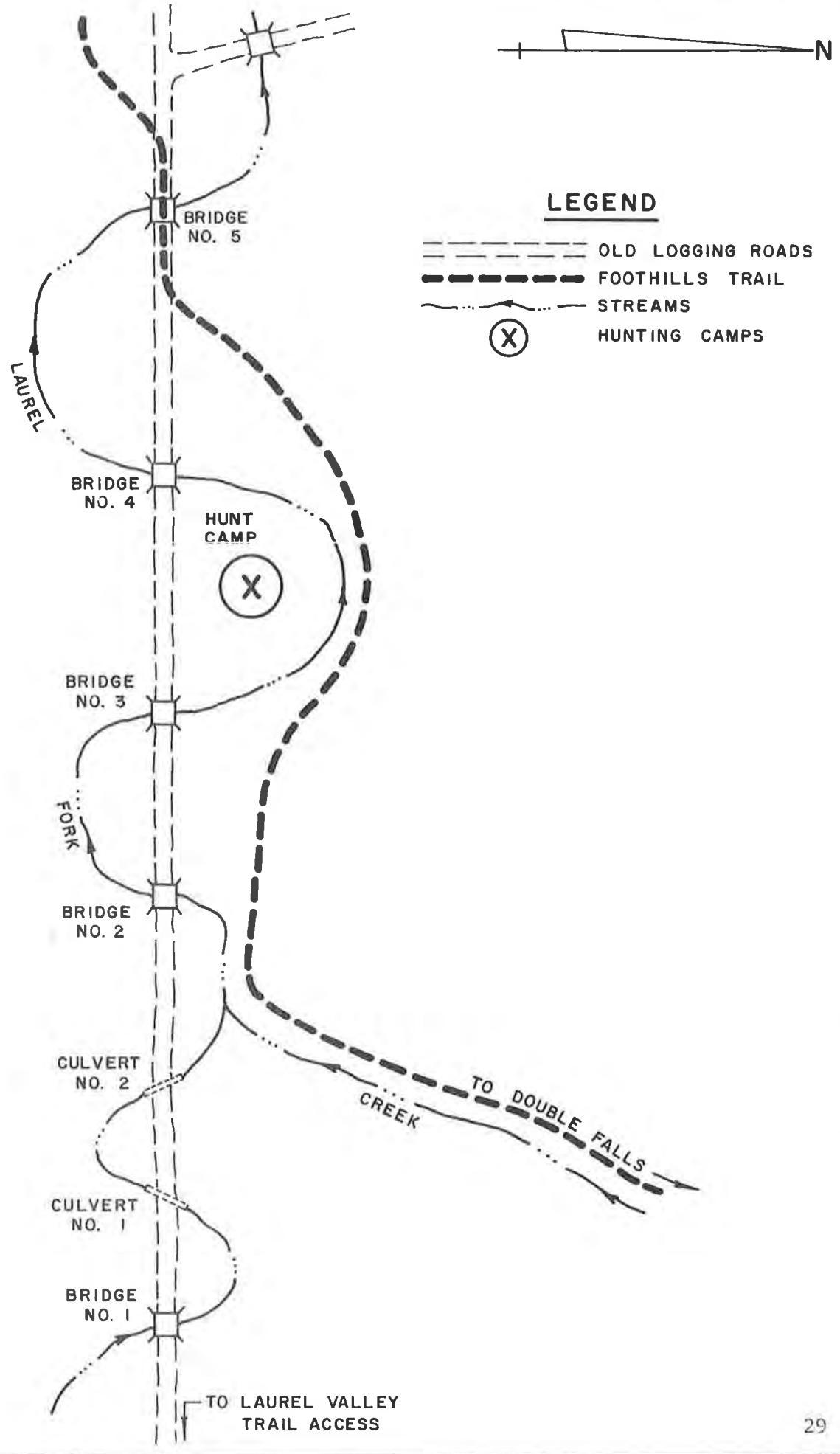
The distance along this section is about 2.8 miles total. The last mile will be along the old roadbed that is closed to traffic. Hiking will be relatively easy along this section. There is about 440 feet difference in elevation in the almost 3 miles. This averages to about a 3% slope on the trail. The side slopes on this section, as a whole are level. A few exceptions include one area on a ridge with slopes up to about 80%.

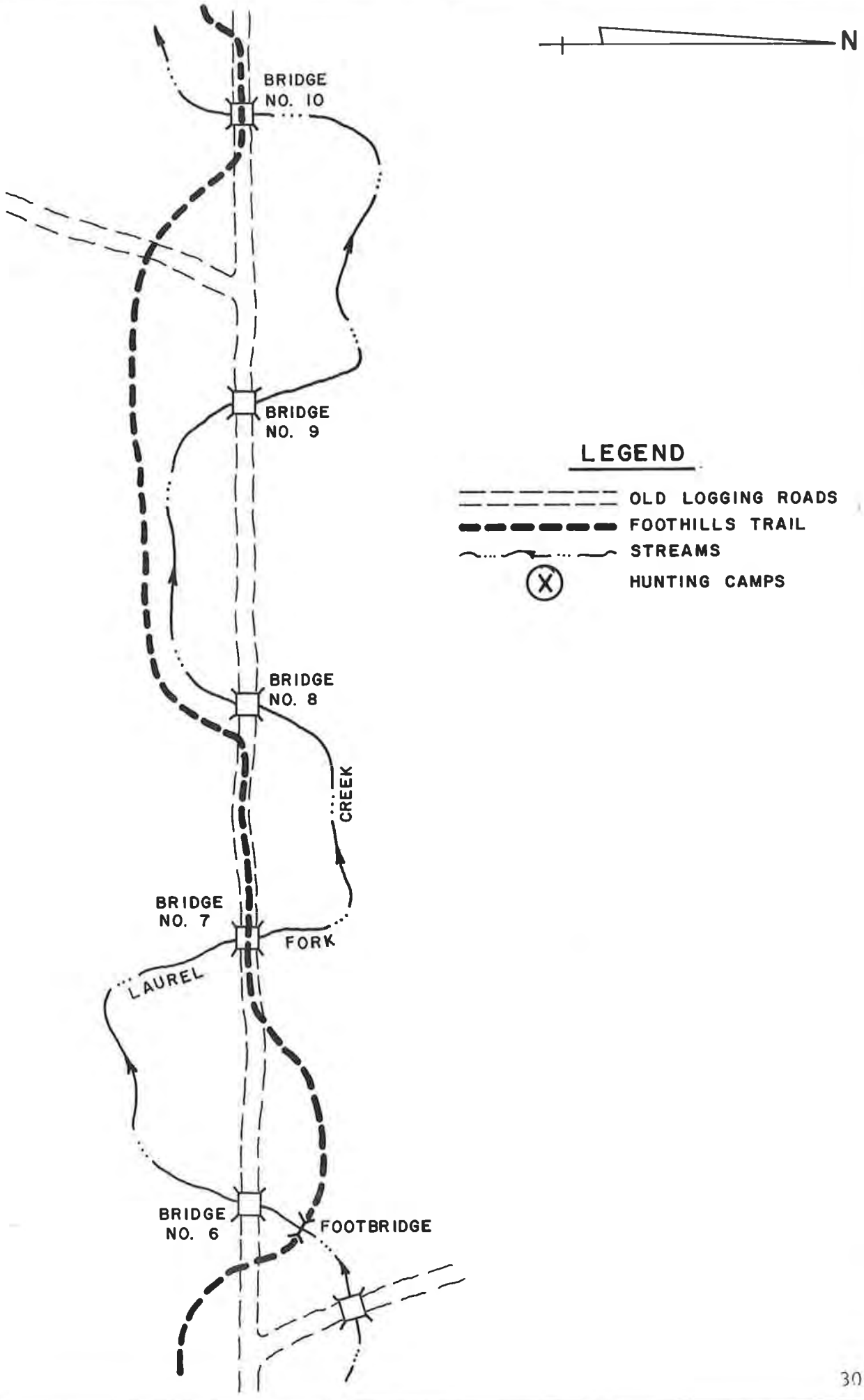
The vegetation is much like that experienced in previous sections. Some changes can be noticed. Very little laurel will be found along the creek. Much more rhododendron along with dog-hobble will be found. The rare plant, Oconee Bell, can also be found along this section. This plant seems to grow in the lower elevations on the more moist soils of the hollows. It can be identified from its cousin, Galax (same family), by its square stem.

Laurel Fork Falls is one of the trail's most scenic points. Fed by more water than any other, with the exception of Whitewater, this fall drops directly into Lake Jocassee. A campsite is planned along Laurel Fork Creek several hundred feet upstream of the falls.

A point of special interest along this section is the location of the Laurel Fork School. Built in 1900 this small one-room school was used by the many residents that once resided in the Laurel Fork valley. When the crops didn't need "tendin", children were in school although their main job was "standing by their crops". That's how Laurel Fork became known as the "stand-by school". As dedicated as the students were the teachers, some who rode on horseback all the way from Pickens to teach. The school also served as a church for area residents. The attached picture was made in 1907. Many of the residents pictured are from the Holcomb family including Press Holcomb who donated the picture and information.

This section is easily accessible by the road leading into Laurel Fork Falls, the same road leading in from Laurel Valley. It is also the first of many sections that can be reached from Lake Jocassee.


N
LEGEND
OLD LOGGING ROADS
FOOTHILLS TRAIL
STREAMS
HUNTING CAMPS
BRIDGE NO. 5
LAUREL
BRIDGE NO. 4
HUNT CAMP
BRIDGE NO. 3
FORK
BRIDGE NO. 2
CULVERT NO. 2
CREEK
TO DOUBLE FALLS
CULVERT NO. 1
BRIDGE NO. 1
TO LAUREL VALLEY TRAIL ACCESS


N
BRIDGE NO. 10
BRIDGE NO. 9
BRIDGE NO. 8
CREEK
BRIDGE NO. 7
FORK
LAUREL
BRIDGE NO. 6
FOOTBRIDGE
LEGEND
OLD LOGGING ROADS
FOOTHILLS TRAIL
STREAMS
HUNTING CAMPS

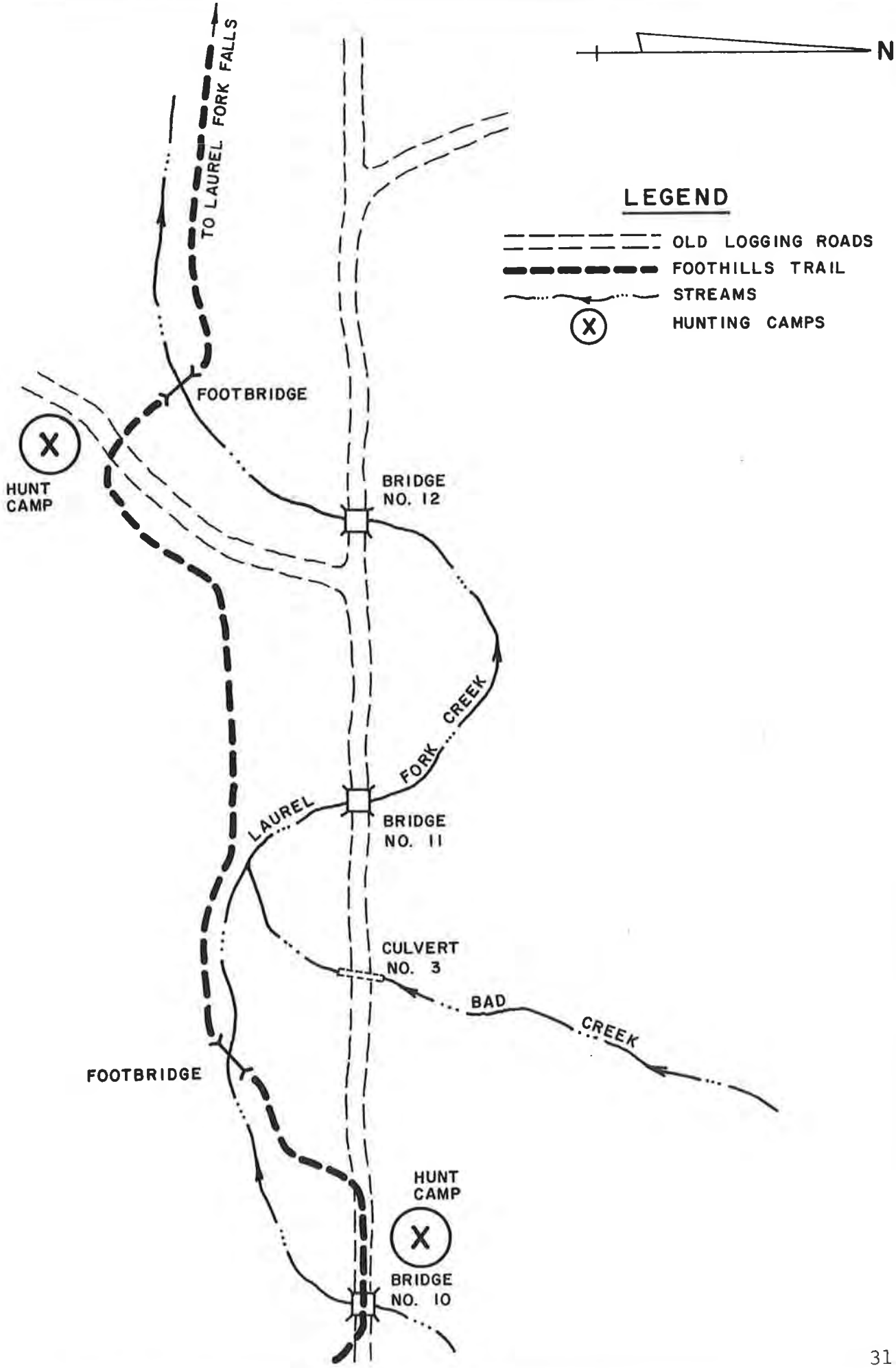

N
LEGEND
OLD LOGGING ROADS
FOOTHILLS TRAIL
STREAMS
HUNTING CAMPS
TO LAUREL FORK FALLS
FOOTBRIDGE
HUNT CAMP
BRIDGE NO. 12
FORK CREEK
LAUREL
BRIDGE NO. 11
CULVERT NO. 3
BAD CREEK
FOOTBRIDGE
HUNT CAMP
BRIDGE NO. 10

Photo #5
Old Laurel rk School

Laurel Fork Falls to Toxaway

This section of trail is one of the longest under one heading. This is mainly because of the continuity of the segment. It will begin on the old logging road above Laurel Fork Falls and will continue around the ridge for about .5 mile. At this point the road forks (Intersection #1). The left fork continues several hundred feet ending at the Lake (access site #5). The trail will continue on the right fork. After following this road about .6 mile, the trail will turn 90 degrees left on another logging road (Intersection #2) and follow it for about 1,000 feet before reaching the crest of a ridge. At this point the trail will turn right on an even older logging road (Intersection #3). This section of trail follows along a ridgetop overlooking the Toxaway section of Lake Jocassee. After following this section for nearly 1,500 feet, the trail will intersect with a heavily traveled logging road (Intersection #4). At this point the trail will turn onto an older logging road (Intersection #5). This road will be followed for about 4,500 feet in a northwest direction. After climbing a hill for a short distance, the trail will enter a gap. At this point the trail will turn left (Intersection #6) for about 1,000 feet. The road will end and the trail will descend the mountain passing by the N.C.-S.C. state line and around the lakeshore to Rock Creek. After crossing the creek the trail will cross over a rocky ridge and descend to the Lake's edge following the contour to Toxaway Creek and Toxaway River which empty into the lake within a hundred feet of each other. The total length of this section is a little over 5 miles. Bridges discussed in another section, will be constructed to cross both the creeks and the river.

One alternate route has been considered along this section. At Intersection #2 the trail could travel straight as opposed to proceeding to Intersection #3 and #4. If this route is used, it will intersect the main dirt road between Intersections #4 and #5. This route is secondary due to the already eroded condition of the road resulting from timber harvest and use by 4-wheel drive vehicles.

The attached drawing shows respective locations of intersections along this section.

The terrain along this section of the main trail is considerably more rugged than many previous sections. Over much of this section side slopes will climb to excess of 150%. Some sections of the trail itself will exceed 15% with about 100 feet being about 40%. This is because of no alternate routes being available.

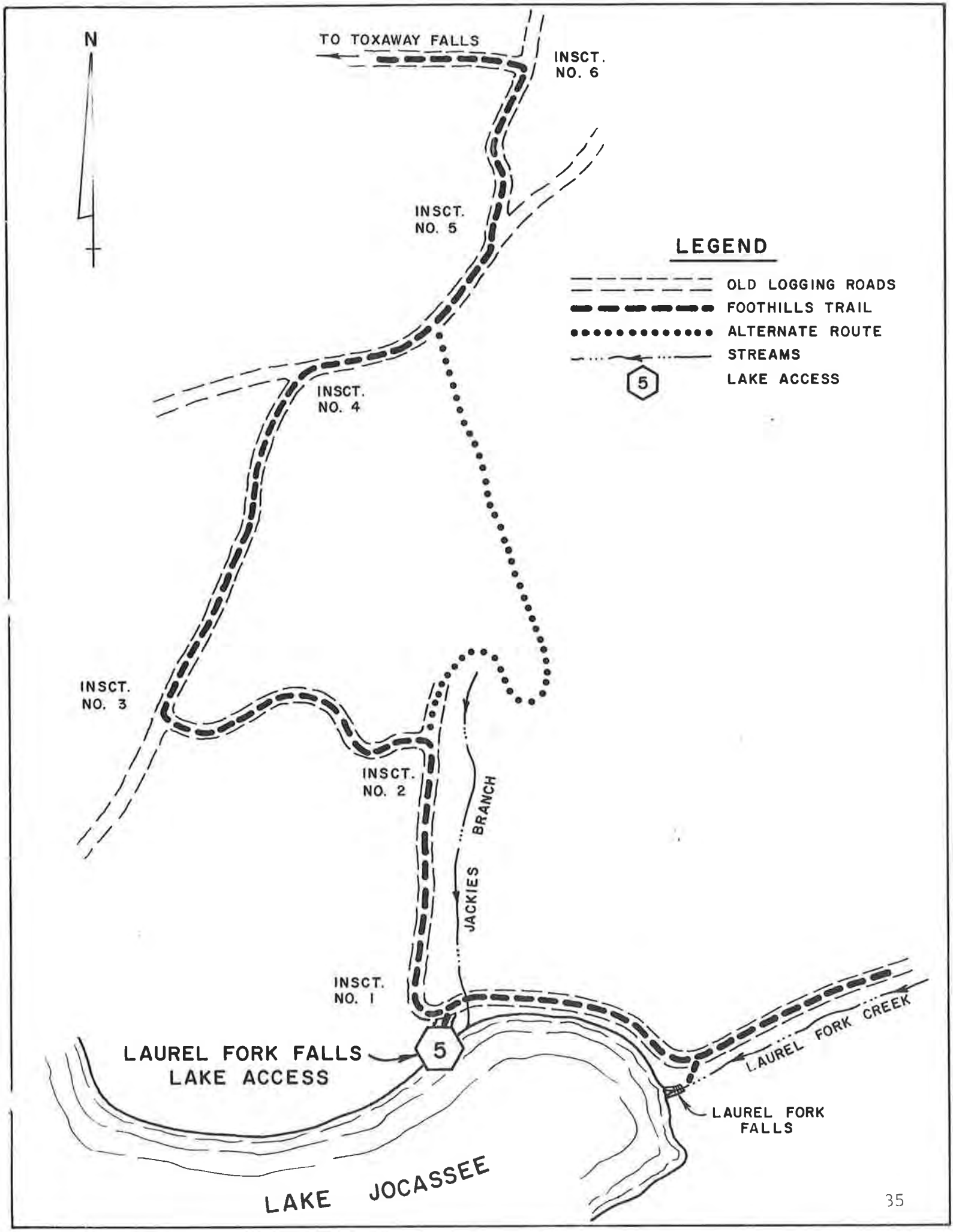
Vegetation continues to be heavy with laurel and a mixed hardwood overstory. Small hardwood will be dominate with some white pine across cut-over areas.

There are no scenic attractions along this section unless the adjoining landowner opens the waterfalls on his land to the public.

There are no points of cultural interest along this section.

There are several access routes for this section. The road from Laurel Fork Gap to Flatrock Mountain can be used to reach this area along with the road from Laurel Fork Gap to Laurel Fork Falls, which is the same heavily traveled dirt road mentioned in the previous section. There is also a road located on the northern slope above Toxaway Creek leading from "The Wilds" group camp to the Toxaway River.

Photo #6
Old Logging Road Used As Trail


N
TO TOXAWAY FALLS
INSCT. NO. 6
INSCT. NO. 5
INSCT. NO. 4
INSCT. NO. 3
INSCT. NO. 2
INSCT. NO. 1
JACKIES BRANCH
LEGEND
OLD LOGGING ROADS
FOOTHILLS TRAIL
ALTERNATE ROUTE
STREAMS
5
LAKE ACCESS
LAUREL FORK FALLS LAKE ACCESS
LAUREL FORK CREEK
LAUREL FORK FALLS
LAKE JOCASSEE

Toxaway to Cobb Creek

This section will follow the southwest shore of Lake Jocassee for about .5 mile. After passing an old homesite and leaving the shoreline at access site #6, the trail will begin dipping in and out of draws, gaining elevation. Traveling in a northwesterly direction the trail will rise to an elevation of 1,480 feet, and cross Cobb Creek. At this point a large bottom will be found which will serve as a campsite.

From the point of crossing the Toxaway River to Cobb Creek the total distance is about 1.5 miles.

Around the Lake's edge, side slopes will be no problem. The area is rather flat. Once the trail leaves the lake, side slopes increase along with the evelvation. The slopes will average 70% with a few areas having side slopes 100%+.

Laurel thickets are the dominate cover plant. Mixed with rhododendron along Cobb Creek, the vegetation is very thick. The overstory, again, consists of mixed hardwood with a few pine along the ridges.

There are no scenic attractions along this section.

There are no points of cultural interest along this section.

Access to this section is by the trail or by the Toxaway branch of Lake Jocassee only. The Toxaway Lake-Trail access point is located about .75 mile below where the Toxaway River flows into the lake. (access site #6)

Cobb Creek to Bear Gap

After crossing Cobb Creek the trail will make a large "U" turn and head southwest climbing between 5 and 10%. Where the trail reaches Cobb Gap it will turn right onto an old logging road and proceed for about 2 miles. This road leads all the way to Bear Gap, crossing Bear Creek on the way.

Although there is continuous change in the terrain and elevation, there is only 120 feet net elevation change during the 2.2 mile hike between these two points. Most of the trail along this section will not have a slope of over 5%. Side slopes may range from 20% to 40% between Cobb Creek and Cobb Gap. From Cobb Gap to Bear Gap side slopes will be irrelevant as a result of the trail taking only half of the roadbed.

The vegetation along this section will consist of an overstory of mostly mixed hardwood with some white and yellow pine along the ridgetops. Laurel will dominate the ground cover. Some open woodland can be noticed along the old roadbed.

Although there are no scenic attractions along this section, there is one point of interest. On the northern slope at Cobb Gap the hiker will notice an old sawdust pile. This evidence of previous timber harvests can be identified as a reason for the present younger, second growth timber.

Access to the area is by road leading from the "through road" into Bear Gap. For emergency access to the Cobb Gap area, there is an old trail leading up the southern side of Cobb Creek from Lake Jocassee. This trail can be followed to the point where it crosses to the northern side of the creek. At this point there is a rock bluff on the left side of the creek. From this point by climbing several hundred feet above the rock bluff, one will find himself at Cobb Gap.

Bear Gap to Horsepasture

The trail will leave the roadbed at Bear Gap and travel northwestward for about 3,000 feet. This distance of trail consists of a series of switchbacks, steps, and usage of an old logging road which follows the contour of the mountain. This road will be used to within 200 feet of its intersection with the main "through" road. At this point the trail will turn southwest.

From here the trail will be built below, and parallel to the "through" road the entire distance to the Horsepasture River. Several pole bridges will be utilized along this section in order to cross deep draws.

Most of this section of trail can be hiked from either end easily. Few steps are used and the grade does not exceed 10%.

An alternate route exists for this section. Beginning at Bear Gap, a woods road exists that travels southwest toward the Horsepasture River crossing. The road has several long, steep grades and is considerably longer. Much stablization would be required as a result of erosion problems caused by 4-wheel drive vehicles.

The distance for this section of the main trail will be about 2 miles with a change in elevation of about -300 feet. The trail grade will not exceed 10% with few exceptions where steps will be needed over rough terrain.

Although this section of trail rests on the southwestern slopes many thickets of laurel and rhododendron will be encountered. The overstory again will consist of mixed hardwoods with a few pine along the ridgetops.

This section will offer a scenic overlook from the ridgetop above Bear Gap. Facing southwest, the overlook offers a view of Lake Jocassee, and the mountainous area surrounding the lake.

Access to this section of trail is easily obtained. About 90% of the section lies below, and parallel to, the main "through" road. The trail can often be seen about 50 vertical feet below the road. (The opposite is not necessarily true. Many times, because of the side slope of the mountain, a road 20 feet above the trail will remain unnoticed).

Hiking time for this section is estimated to be about 1½ hours.

Photo #7

Horsepasture River Crossing

Horsepasture to Bearcamp Creek

Once the Horsepasture River has been crossed, the trail will begin to climb southerly for several hundred feet until it reaches an old logging road situated about 100 vertical feet above the edge of Lake Jocassee. This road will be referred to as "Sam's Road". From this point the trail will follow "Sam's Road" the entire distance to the crossing at Bearcamp Creek. This section of trail will be one which will require little construction work. Once the old road is closed to vehicles, and the roadbed stabilized, it may serve as access into the Horsepasture river crossing (one of the more time consuming areas of trail construction).

The distance of this section is about 2.5 miles. This includes about 400 feet gross elevation change, although there is little net change.

With the exception of the first several hundred feet, this segment of trail will use the old logging roadbed. Therefore, side slopes will present no problems.

One scenic area along this section is part of Bearcamp Creek downstream from the bridge crossing. A waterfall and large pool exists and is presently inaccessible. A spur trail into this area may be a possibility in the future.

Access to this section can be gained from each end. A logging road from Lake Jocassee ties into the trail about 3/4 mile from the Horsepasture crossing. From the bridge crossing on Bearcamp Creek, Sam's road continues parallel to the creek until reaching the "through" road. (This section of road will be closed to vehicles).

Hiking time for this section is a little over one hour.

Bearcamp Creek to USFS Land

After crossing the bridge at Bearcamp Creek, the trail will travel westward up a ridge by way of an old logging road. At the end of the old road the trail will swing south along the contour and then begin to climb at 10% slope. One draw is crossed which will need additional study before it is spanned with a bridge. The trail will continue to climb until reaching the end of another old logging road. It will then follow the road westward until reaching the crest of a ridge and the intersection of the "through" road. This point is also referenced by the state line and the present boundary of the Nantahala National Forest.

This section of trail does have an alternate route. From the crossing on Bearcamp Creek, the section of road along the creek extending to the "through" road could be used. At the "through" road the trail would turn southwest and follow the road until it reaches a fork in the road .7 mile from the state line (as described in the next segment) This alternative is not recommended due to the extra length (about 2 miles) all on the road.

The distance for this section of the main trail is about 1.4 miles. Traveling from NE to SW there is a 600 foot gain in elevation with the trail averaging about a 10% grade throughout. The side slopes are rather gentle with the exception of one draw with almost vertical sides.

Vegetation within this section consists of mixed laurel and rhododendron thickets along the entire route with the overstory dominated by mixed hardwood.

Access to this section may be gained from each end by use of the "through" road.

Hiking time for this section is about 1 hour.

USFS Land to Thompson River

The trail will continue to follow the old roadbed until it reaches the crest of the ridge at the state line and the "through road". This point is just north of a set of metal gates. The trail will turn north and follow the "through road" along the ridgetop for about .7 mile. As an alternate route, the trail may be routed parallel to and off of the main "through" road. At the end of the .7 mile section there is a road turning back southwest. The trail will turn and follow this road for approximately one mile crossing several streams.

At the end of this one mile section the road will make a sharp turn to the right and downhill. The trail will bear left down along a ridge at this point following an old logging road. After traveling about 100 feet along the old roadbed the trail will bear right and downhill toward Thompson River. It will follow an old road at 10 to 15% for about 600 feet. At the end of this road a set of log steps will be necessary to drop an additional 20 vertical feet. At this point the trail will switch back down to the right at 10% and continue several hundred feet with side slopes 50% and more. Several switch-backs are used in conjunction with steps before reaching the river.

Trail construction will be coordinated with the USFS.

The distance for this section of the main trail is about 2.2 miles. There is little change in elevation until reaching the gap above the river (referred to as Thompson Gap). From this point to the river there is a 300 foot drop in elevation. Side slopes from Thompson Gap to the river are the steepest along this section, averaging from 50 to 70%. Side slopes along the remainder of this section are not of great concern since the trail uses existing roadbeds.

Vegetation is similar to that of other sections of the trail. Mixed pine and hardwood are dominant along the ridgetops and road section. Once the trail leaves the road and begins the descent to the river, dense laurel thickets will be encountered until reaching the river.

The Thompson River is perhaps one of the most scenic points along the trail. Water cascades over large boulders collecting in large, clear pools before continuing downstream.

Access to this section is limited to the "through" road and the USFS road that forks off of it.

Hiking time for this section is about 1½ hours.

Thompson River to Old USFS Road

This trail segment and those to follow will be broken down into smaller segments as a result of planning and construction being coordinated with the USFS and potential changes of the trail route.

The trail will travel from the river crossing to the crest of a ridge on the west side of the river by a combination of switchbacks and the use of an old logging road. Once on the ridge, the trail will travel around the northwest slope and through thick laurel for several hundred feet before reaching the old USFS road.

Because of the terrain of this section and surrounding area, no alternate routes have been selected.

The distance of this section is considerably shorter than those previously described. Although only 3,200 feet in length, the trail climbs 350 vertical feet by a series of switchbacks. Switchbacks are used extensively due to the side slope of the ridges both upstream and downstream from the crossing point. The side slopes of the ridge used are moderate, ranging up to 50%. This section will also require a pole bridge spanning about 40 feet.

Vegetation along this section consists of mostly open mixed hardwood with the exception of the last several hundred feet before reaching the USFS road. Here dense laurel dominates the ground cover.

There are no scenic attractions or points of cultural interest along this section.

Access to this section is gained by the old USFS road along Long Spur Ridge in North Carolina.

Hiking time is about 20 minutes.

Old USFS Road to State Line

This section will follow the existing logging roadbed in a southwestward direction to the N.C.-S.C. state line, and also the USFS-Crescent property line.

The distance along this section is about 1.2 miles with a gain of 400 feet in elevation.

The area adjacent to the state line was clear-cut and re-planted by the USFS about 5 years ago.

Information is presently being gathered concerning the closing of this section of Forest Service road to public use. In the event the road is not closed and stabilized, an alternate route below and parallel to the road has been considered. This alternate route will tie into the state line at approximately the same location as the road.

State Line to Whitewater River

At the state line, the trail will turn south and continue along a logging road for about 3,700 feet. Although this road has not been used in several years, some sections will require stabilization because of grades exceeding 15% for distances of 100 and 200 feet.

This segment of trail will extend from the state line to approximately ½ the distance to Whitewater Mountain, switchback in a small gap, and then descend toward the river.

At the switchback, the trail will turn southwest. From here the trail will gently drop down onto an open ridgetop and continue for several hundred feet. A short switchback to the left of the ridge will then carry the trail down along a stream.

The trail will follow the stream bank down into the river bottom, crossing over another small stream, before reaching the Whitewater River.

The trail, although being in the river bottom will be above the high water mark at this point.

A possible alternate route has been selected on the map which would go almost directly from the state line, southwesterly, to the Whitewater River. More consideration will be given to this route at a later date.

At the river, the trail will split. One branch will lead across the river up into the Coon Branch Natural Area, and the tie-in with the USFS Trail section leading to Whitewater Falls. The distance up Whitewater to the Coon Branch is 1 mile. The other branch will lead to the parking lot at access point #7.

The distance along this section is about 1.2 miles with a loss in elevation of 400 feet. With the majority of this section of trail following along an old roadbed, side slopes will not present any construction problems.

The vegetation for this section consists of mixed hardwood overstory with very few laurel thickets.

There are no point of scenic interest along this section.

Access to this section is by the "through" road at the 1st gap east of the Whitewater River Crossing, and also from the USFS road along Long Spur Ridge.

Hiking time for this section is about 40 minutes.

Photo #8

Trail Near Whitewater River

Whitewater River to Coon Branch

After crossing the Whitewater River the trail will follow the west bank of the river up to Coon Branch. At this point a bridge will span back to the east side of the river and the trail will continue up-stream until reaching the USFS boundary. Here, one of the Forest Service's prospective routes may be used to carry the Foothills Trail on to the Whitewater Falls area. (access site #8) (See photo #9.)

The distance up to the Coon Branch Natural Area boundary line is about 1 mile. This 1 mile has about a 40 foot gain in elevation with virtually level side slopes.

Mixed Laurel and rhododendron thickets dominate the ground cover along with some dog-hobble. Large hemlock make up the overstory. Many of these hemlock have diameters of over 4 feet and a height of over 100 feet.

Access to this section is by the Whitewater River only.

Hiking time for this section is about 30 minutes.

Photo #9
Whitewater Falls
USFS Property

Whitewater to Parking Lot

A spur trail will lead from the bridge crossing on Whitewater and turn southeast along the river for about 600 feet before reaching the "through" road. The trail will then utilize the road, crossing over Whitewater River above the lower set of falls, and continue for about 200 feet before reaching access site #7.

This spur section from the river crossing on the trail, to the parking lot, will be about 2,000 feet. It will offer an excellent view of the Whitewater River-Coon Branch area, along with a view of the Whitewater Falls. The parking area will offer an excellent view of Lake Jocassee.

Hiking time will be about 10 minutes.

DESIGN

In planning the details of the footpath, camp areas, access signs and other facilities associated with the Trail, many publications, standards, field observations and experiences of agencies and users with other trails were evaluated. The following data represent the best compromise in the application of these standards.

Appalachian Trail Standards

Because of their almost universal acceptance among the groups who will be utilizing the Trail, the Appalachian Trail Conference design standards will be used in planning the Foothills Trail. These standards are incorporated in Appendix (I) for reference.

Access Points

Two types of access points are provided: access from vehicles and boat access from Lake Jocassee. A third type of access, that which is gained from possible future side trails, is considered in the selection of camp areas and in the location of blazes and signs. Vehicle access points will be located at Table Rock State Park (site #1), Sassafras Mountain (site #2), Chimneytop Gap (site #3), Rocky Bottom (site #4), Lower Whitewater Falls (site #7), and Upper Whitewater Falls (site #8).

The access point in Table Rock State Park will be provided by the State of South Carolina. The existing Forest Service parking area at Upper Whitewater Falls will serve Trail users in addition to performing its present function of serving tourists wishing to view the Falls.

Vehicle access point site design calls for parking spaces ten feet wide to allow room for packing and unpacking of vehicles, airing of wet equipment and other activities. Provisions for expansion of parking capacity have been studied in the event use levels increase beyond that which can be accommodated by initial spaces.

Access by boat from Lake Jocassee is also provided at Laurel Fork Falls (site #5) and Toxaway River (site #6). Site plans for the access points are illustrated on Sheet 4.

Trash receptacles will be provided at each access point, and will be labeled with signs directing hikers to "burn it or pack it out". Since garbage buried or in containers along the Trail or near camp areas draws vermin and larger animals, the policy will be for hikers to carry their unburnable trash to the

next access point.

Appropriate signs will be provided at each access point for information and to guide user behavior, as detailed below.

Signs

Several types of signs which will be installed at access points and along the Trail route are illustrated on Sheet 6. The first type is an entrance sign to be located at each point of access to the Trail. Constructed of treated posts and redwood boards, this sign provides a high quality first impression of a facility. Similar signs at other Duke parks have resisted vandalism well.

Another sign to be located at each access point is an information board which will include a map of the Trail, data concerning the Bad Creek Project, the Trail, pertinent regulations and contacts for further information.

The third type of sign is a directional arrow fashioned after a stone arrowhead similar to those utilized in this area by the Cherokee Indians. This arrow can be oriented in any position to guide motorists to Trail access points or hikers to the Trail.

Once the hiker is on the Trail, he will be guided by a single blaze painted on trees along the Trail. At locations where, due to an intersection or clearing the correct route may be difficult to choose, a double blaze will be displayed.

Duke will work with the S.C. Dept of Highways in establishing pedestrian cross-walk zones and appropriate signs on highway #178 at Rocky Bottom and crossings along the state road leading to Sassafras Mountain. Warning signs will also be posted along the 1,500 feet of access road which the Trail follows from highway #178 to the Rocky Bottom access parking lot to alert drivers of logging trucks which use the road and hikers of each others' presence.

Signing and blazes for possible future side trails will be developed through a consensus of the Foothills Trail Conference members.

Footpath

The footpath will be designed to minimize erosion and visual impact. Banks of graded areas will be sloped and planted where necessary to control erosion. The Trail will consist of a cleared passage 4 feet wide and 8 feet high through the understory. The footpath will be 2 feet in width and the tread will consist of naturally existing material. By maintaining close surveillance of the footpath during the initial period of use, Duke can determine which areas need stabilizing. Reinforcement will be applied to these areas only, leaving the

footpath as a whole in the most natural state possible. Runoff devices such as frequent water breaks will be constructed, and the Trail will be designed to limit adverse concentrations of drainage.

As previously mentioned, Appalachian Trail standards are the criteria by which the Foothills Trail is routed and designed. However, as in some sections of the Appalachian Trail, these standards are difficult to attain. Several short sections of the Trail, typically no longer than 300 feet, may exceed the standards for gradient of the footpath due to the rugged terrain and other limitations. Some sections of the Trail will be utilized initially as access roads to bridge locations. These roads will then be restored to hiking use only and stabilized as described above.

Barriers

In order to enforce the policy of permitting only hikers to use the Trail, vehicles and horses will be excluded by barriers at access points. Curbs around the parking lots, "foot traffic only" signs at points of entry to the Trail and information about the ruggedness of the Trail will help to discourage vehicular and equestrian traffic. In addition, steps, switchbacks and other devices will be utilized at access points and road crossings to prevent passage of vehicles and horses.

Duke will work with Crescent in closing selected logging roads, now open to vehicular traffic, which will become part of the Trail.

Stream Crossings

Safe stream crossing structures will be provided at each watercourse crossed by the Trail. These structures will range from simple stepping stones to rustic suspension bridges, depending on stream flow characteristics, the width of the proposed span and other criteria. The four types of crossings to be used are shown on Sheet 5. Details of the designs and installations will be according to good engineering practice. (see Photo #10)

Camp Areas

An appropriate number of suitable camp areas will be located along the Trail with eight sites to be opened initially. Camp area locations will be determined by the difficulty of the Trail and the availability of suitable sites. The camp areas will be located near to, but not on the Trail, so that hikers will not disturb those in the camp sites.

Each camp area will have a clearing large enough to accommodate one or more

groups of backpackers. These grassy or mulched areas will be suitable for camping under the stars or in lightweight tents. Individual sites will not be designated; the impact of camping use will thereby be dispersed and will not be as noticeable.

Although the installation of adirondack type shelters was originally proposed, subsequent study indicates this is not a wise choice. In addition to concentrating the impact of many campers with resulting trampled, muddy areas, the shelters attract vermin and harbor odors. In the early 1900s, when backpackers were few and tents were bulky and heavy, the trail shelter was a popular facility. The inexpensive, lightweight tents now available give the backpacker unprecedented freedom to camp where he wishes, and many consciously avoid shelters. Many management agencies are also steering away from shelters. Neither the state park nor the national forest sections of the Foothills Trail have shelters.

Drinking Water

Directions to the nearest water source will be provided in the form of blue blazes, if the source is not readily visible from the camp area.

Due to health regulations, no development of water sources such as wells, spring boxes or pipes will be done. Information signs at access points will emphasize the necessity of boiling or chemically treating any water.

Sanitiation

A single latrine building constructed over a percolating pit according to applicable health regulations will be provided near each camp area.

No trash collection facilities will be provided at camp areas or along the Trail. Hikers will be encouraged to "burn it or pack it out" rather than bury garbage or deposit it at the camp area.

Emergency Facilities

In order to respond to emergencies such as fire, injuries or illness, certain preparations will be made. Logging roads which provide access to various sections through which the Trail passes will be identified for use in fire-fighting, search and rescue and enforcement activities. A radio communications system will be established to coordinate both emergency and routine tasks. Certain sites will be maintained in a safe condition for helicopter landing points. Emergency procedures will be detailed at access points and in the guidebook.

Photo #10

Typical Suspension Bridge

CONSTRUCTION

Many details concerning the schedule and methods to be used in construction of the Trail, access points and various structures will be solidified soon after FERC approval of the supplemental information filed as an amendment to the Bad Creek Exhibit R.

Use of Volunteers

Volunteer participation during trail construction may be open to some individuals and groups such as the Foothills Trail Conference, college interns in recreation and park administration curricula, college trail planning and construction classes, local institutions and employment programs. Incentives such as patches or badges for participants or recognition of groups may be offered.

Schedule

The Trail will be completed two years from the date of final approval of the Bad Creek Exhibit R, including any amendments or supplemental information. The schedule for construction of components such as major stream crossings and the road to the Lower Whitewater Falls access point will be coordinated with construction work to be done at the Bad Creek Project site when possible. If some sections are completed early, they may be opened before the entire Trail is finished.

Coordination with Forest Service

Considerable coordination, including correspondence and field work, has been done with Forest Service staff from both Sumter and Nantahala National Forest. Agreement has been reached concerning trail standards, routes and access points. Coordinating correspondence is included in Appendix D.

Due to budgetary limitations, volunteers may be utilized to construct the two mile link between the existing Foothills Trail section on Forest Service land and the western terminus of Duke's section.

Coordination with S.C. State Parks Division

An existing parking area and trail in Table Rock State Park will be utilized for access and most of the State section of the Foothills Trail: therefore only signs will be added. An exception is a short section of trail to be built along the ridge from the existing state park trail to the eastern terminus of Duke's section. Correspondence with the Parks Division is included in Appendix E.

OPERATION

Before the Trail is opened to the public, several existing and planned management programs will be placed in operation. All of these programs will involve coordination among Duke, Crescent Land and Timber Corporation and the Foothills Trail Conference. Several agreements which establish responsibilities, lines of communication and procedures are appended for information; the details of these agreements may change to accommodate future management needs.

Timber Management

Almost the entire portion of the Foothills Trail to be constructed by Duke is located on land owned by Crescent Land and Timber Corporation, a wholly owned subsidiary of Duke Power Company. The primary use of Crescent's land has been for timber production. The forestry lands through which the Trail passes are scientifically managed on a sustained yield basis for continued timber production and watershed protection. Although the Company has reserved the right to relocate sections of the Trail affected by timber cutting and associated operations, in some instances this may not be necessary.

Following logging operations, the cut areas are reforested with white pine, or on the more desirable hardwood sites the trees regenerate naturally. The logging roads are seeded to provide wildlife foods and curtail erosion.

Wildlife Management

Management of wildlife is accomplished through lease agreements between Crescent and the North Carolina Wildlife Resources Commission and the South Carolina Wildlife and Marine Resources Department. These agencies perform a wide range of propagating, stocking, research, supervisory and enforcement functions to enhance conditions for wildlife in general and to support stocks of fish and game for managed hunting.

Through the opening of clearings, seeding of forestry roads and preservation of filter strips along streams, Crescent Land and Timber Corporation is doing its part to provide improved wildlife habitat.

Natural Areas

Several valley bottoms contain old growth timber. Two sites have been registered as undisturbed natural areas with the Society of American Foresters and contrast with the vigorous new forests.

Other areas have features of unique natural beauty such as rock formations, waterfalls or unusual plant communities. Timber and trail management will be

modified where necessary to protect these resources.

Law Enforcement

Enforcement of game management regulations, drug laws, user behavior standards, public health and other laws requires close coordination with various agencies having enforcement responsibilities. While each landowner has the ultimate duty to prohibit illegal actions on his lands, several benefits can be derived through this coordination. The first benefit relates to the use of the Trail itself. If, through coordination, a uniform set of user behavior guidelines can be agreed upon, the hiker will find it easier to understand and adhere to these guidelines.

Coordination also maximizes the effectiveness of enforcement agencies whether dealing with vandalism, production of controlled substances, poaching, dumping or other violations, or involved in rescue operations.

For the benefit of the user and the agencies, a series of agreements and authorizations will therefore be established. Copies of these documents are appended. Agencies with which coordination will be established include county sheriffs, state parks, state wildlife management agencies and the U.S. Forest Service.

The Foothills Trail Conference will be a party to these agreements to improve communication and assure uniformity along the entire length of the Trail. In addition to coordination with the Conference and other agencies Duke Power will locate a full time professional employee in the vicinity. Among this employee's responsibilities will be supervision of the Trail and associated facilities.

Emergency Procedure

In addition to enforcement responsibilities, many of the same agencies can also provide assistance in the event of fire, storm, injury or illness. Procedures to enhance communication, coordinate searches, and establish access points and methods of access will also serve these purposes. Through coordination with the agencies and the Foothills Trail Conference, Duke can draw upon expertise, materiel and manpower in a businesslike fashion on occasions when the time to go and find these resources may not otherwise be available.

User Behavior

The success with which managers guide user behavior has strong correlation with the quality of the user's experience and to the difficulty and expense of supervision and maintenance. Fortunately, backcountry recreaters have traditionally been more sensitive to the need for behavior standards when the need for these

standards is interpreted in a positive manner. However, several factors may have a negative effect on public willingness to be governed by these standards. Many individuals inexperienced and lacking ability to choose alternatives with less impact on others and on the resource are now hiking and camping in the backcountry. The other side of this coin is that many of these newcomers are bringing with them a new environmental ethic; instead of cutting boughs for beds or shelter they bring foam or inflatable pads and lightweight tents; instead of cooking on fires they use compact stoves.

In addition to the changing character of the user, there is a tremendous increase in participation levels of all adventure type activities. Deterioration of footpath, camp areas and the resulting expense of increased maintenance will occur unless user and manager can work together to channel campers to less used areas and otherwise minimize impacts of increased use.

Finally, in supervising dispersed recreation use, the only successful system will be that in which the users police themselves.

Foothills Trail Conference

Since the need for citizen input to design, construction and operation is vital to this project, the Foothills Trail Conference will have a key role in the management of the Trail. The Conference should perform several functions. First, it should set standards for user behavior for the entire length of the Trail to eliminate inconsistency and simplify enforcement.

Second, the Conference should coordinate the compiling of a guidebook for the backpacker which includes data on topography, locations of water, unusual geologic, plant or cultural points of interest, mileage, net climb and descent between two points, applicable rules, safety precautions, weather and other helpful information.

The Conference should be the clearing house for Trail related information. Any press release relative to the Trail by a user group or management agency should be filed by the Conference and be readily available upon request.

Proposed extension of the Trail or side trails should be coordinated by the Conference. Conference members may need to furnish time to help build and maintain extensions of the Trail over private lands.

Emergency telephone lists should be maintained in an up-to-the-minute status to provide quick day or night contact of key agency and user group representatives.

Education and Information

To guide user behavior and to inform potential participants and the general public about the Trail, two projects will be completed before the Trail is opened. A slide show will be prepared to tell the story of the planning and construction of the Trail and to convey some of the necessary guidelines for hikers to follow. This show will be offered to civic and school groups through the Keowee-Toxaway Visitor Center and other locations.

The trail will be placed on the topographic model of the Keowee-Toxaway Project area at the Visitor Center. A display of information will be maintained at the Center, as will a supply of guidebooks when they are available. The information will include contacts in the various landowning agencies and the Foothills Trail Conference.

Duke will also coordinate with the other landowners along the Trail and with the Foothills Trail Conference in the development of a guidebook for the Trail. This is an important management tool, and should be available to the public before the Trail is opened.

Maintenance

Maintenance of the stream crossing structures, signs, latrines, gates, footpath and clearing of Duke's section of the Trail will be performed by the Company's Project Recreation Section. A full time, professional employee will be placed in the area to perform this and related work. Specific maintenance schedules will be determined by physical characteristics and initial use levels of the different trail segments. Areas receiving high use may require considerably more maintenance.

An effective educational effort through the guidebook, the Conference, information signs at access points, slide shows and other methods will help in reducing vandalism, damaging concentrations of use and other maintenance problems. In addition to regular inspections by the supervising employee, hikers will also be encouraged to report maintenance needs.

Close coordination with enforcement agencies will reduce improper uses of access points and littering and other vandalism. Radio contact will be established between Duke's Recreation Section and key agents in the area to facilitate reporting of offenses.

Trash removal from the access points can be done on a regular basis by truck or boat. Litter pickup along the Trail will be done on foot and should not involv large volumes of trash if the "burn it or pack it out" rule is enforced.

The Foothills Trail Conference should encourage its members to report vandalism and improper uses, pick up litter and otherwise set an example for the public.

SUMMARY

This plan and appendices comprise the proposal for development by Duke Power Company of the portion of the Foothills Trail located on Crescent Land and Timber Corporation land between Pinnacle Mountain and Upper Whitewater Falls.

Although not a part of the initial plan, several supplements are contemplated and will be attached to the plan for reference upon completion. These supplements include the guidebook and slide show mentioned in the plan, plans for extension of the Trail to the east and west and plans for side trails.

Consideration is being given to the designation of the Duke section of trail as a national recreation trail under the National Trails System Act. This proposal will be evaluated in a supplement.

APPENDIX A

Appendix A is broken down into 4 categories. A-1 includes comments Duke received from various agencies concerning the original Exhibit "R" submitted in 1974.

Since then, much discussion and several changes have occurred.

After complying with Article 31 of the License, a draft of this Exhibit R was sent out to members of the Foothills Trail Conference for review. The Exhibit has taken into account comments received from Conference members. Section A-2 consists of these comments.

In addition to a review by the agencies represented in the Conference, a letter was sent March 24, 1980, to various interest groups in the area. This letter, along with comments received are included in section A-3.

Section A-4 consists of other miscellaneous correspondence pertaining to the Trail.

A-1

This section consists of correspondence and comments received after the initial Exhibit R was sent out in 1974. These comments were of a general nature as detail plans had not been formulated at that time.

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
SOUTHEAST REGIONAL OFFICE
148 Cain Street
Atlanta, Georgia 30303

IN REPLY REFER TO:

JUL 1 1974

Mr. Robert M. Moore
Duke Power Company
Post Office Box 2178
Charlotte, North Carolina 28242

Dear Mr. Moore:

We have recently received a copy of the Duke Power Company application for Federal Power Commission license for unconstructed Bad Creek Project No. 2740, located on Bad and West Bad Creeks, Oconee County, South Carolina. We are reviewing the recreation plan and related portions of the application and, as per your recent phone conversation with Mr. Ken Compton, Chief of our Water Resources Division, we appreciate the opportunity to make a field survey of the site on July 8 and 9 with personnel from your staff.

We are in the process of inviting personnel from the Bureau of Sport Fisheries and Wildlife, the Federal Power Commission, and the South Carolina Department of Parks, Recreation, and Tourism to participate in the field trip. Mr. Jerry Palmer, engineer with the Atlanta Office of FPC, will accompany Mr. Compton and Miss Sabina Joe of Water Resources Division. Miss Joe will be contacting you shortly by phone regarding confirmations from other agencies and to arrange further details of the trip.

Our specific interest is to survey the Bad Creek project site, Lake Jocassee, the area of the proposed hiking trail, and to discuss the recreational esthetic aspects of the project in these areas, as well as the proposed transmission line.

I look forward to our close cooperation on this and future Duke Power applications for license.

Sincerely yours,

for Kenneth R. Compton

Paul D. Adams
Assistant Regional Director

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
SOUTHEAST REGIONAL OFFICE
148 Cain Street
Atlanta, Georgia 30303

IN REPLY REFER TO:

JUL 6 1974

Mr. Robert Moore
Duke Power Company
Post Office Box 2178
Charlotte, North Carolina 28242

Dear Mr. Moore:

We appreciate your cooperation in our recent field survey of the Bad Creek project site and hiking trail route. I understand that the personnel you had arranged to attend from Duke Power and Crescent Land and Timber were most helpful and comprehensively informative.

As promised, attached is a preliminary copy of our comments on the application for the Bad Creek project. I understand Miss Joe discussed most of our concerns about the recreation plan with Mr. Borawa of your staff during the field survey. However, we welcome your reaction and further discussion of these issues with us by telephone, following your review of our comments.

We would appreciate your contacting our Water Resources Division (404- 526-4711) before July 23, so that we can consider your reactions when we submit our final comments on July 24.

Sincerely yours,

Paul D. Adams
Assistant Regional Director

Attachment

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

Comments on the Application for Bad Creek Project

In accordance with the June 10, 1974, memorandum from the Director, Office of Environmental Project Review, U.S. Department of the Interior, we have reviewed the recreational aspects of the application for license for unconstructed Bad Creek Project No. 2740, located on Bad and West Bad Creeks, Oconee County, South Carolina.

While the recreational development proposed in the application is considered generally adequate for this project, certain objectionable conditions noted in the Exhibit R necessitate our recommending disapproval of the recreation plan until these issues can be appropriately resolved in the interest of the recreating public.

Exhibit R

The hiking trail provided by this project will help satisfy a statewide priority need identified in the current South Carolina Statewide Comprehensive Outdoor Recreation Plan. Initial recreation use is estimated at 1,500 visits annually, according to the Exhibit R. Applicant is coordinating with the U.S. Forest Service, as well as the South Carolina Department of Parks, Recreation, and Tourism and several private organizations, in the construction of applicant's trail as the central link in the ultimate development of the over 100-mile-long Cherokee Foothills Trail, extending from Table Rock State Park to Oconee State Park. The eastern trail section, from Table Rock State Park to the eastern terminus of applicant's proposed trail, is already in existence. The U.S. Forest Service has completed 17 of the approximately 20-mile-long trail which will extend from Oconee State Park to the western terminus of applicant's proposed trail.

While no United States lands will be affected by the project, both the Bad Creek project site and the hiking trail lie within the purchase boundary of the Sumter National Forest. Also, the Bad Creek site is located 5 miles east of the Chattooga River, designated as a National Wild and Scenic River on May 10, 1974 (Public Law 93-279). Our consultation with the U.S. Forest Service, Southeast Region, Atlanta Office, reveals that the proposed project will not conflict with any Forest Service plans, including the current master planning for the Chattooga.

According to the Bureau's field inspection, the proposed trail route, located outside the project boundaries, is attractive and suitable for the facilities proposed. We also concur in applicant's opinion that severe fluctuation in the Bad Creek reservoir, as designed, precludes the feasibility and desirability of including recreation at the project site.

However, we note that land adjacent to the proposed trail is under timber management by the applicant's subsidiary, Crescent Land and Timber Corporation. We cannot review the adequacy of land devoted to recreation until the recreation plan includes dimensional specifications for appropriately buffering the trail from conflicting timber management operations or other conflicting uses.

According to the Exhibit R, "Applicant reserves the right to alter, discontinue, or relocate all or a portion of the trail to meet changing demands or to avoid conflict with other uses of the area." We object to any such option reserved to the applicant as being contrary to the best interests of the recreating public. However, we would have no objection to an option reserved to the applicant to relocate trail sections, excluding the trail termini as proposed, as long as such relocation does not exceed a cumulative total of more than half the length of the proposed trail over any consecutive 5-year period and further that such relocated sections shall simulate the nature of the trail as proposed to maintain a continuity in the quality of the trail experience. Such an option would allow the applicant to conveniently relocate interior sections of the trail to allow resource recovery from use, in accordance with sound trail management practice. The stipulation would also provide for convenient trail relocation for other appropriate purposes of the applicant and its subsidiary.

According to the Exhibit R, applicant proposes completion of the trail within 2 years of the approval of the Exhibit R. We believe it would be more appropriate for applicant to schedule timely completion of the trail contingent upon licensing and operation of the project.

In view of the applicant's commendable history in providing public recreation, the Bureau is confident that the above conflicting issues can be speedily and equitably resolved. We believe that the ultimately developed Cherokee Foothills Trail may have the potential to qualify for designation as a National Recreation Trail and are appreciative of the applicant's consideration of such possible designation for the trail in the future.

Exhibit V

The Bureau has included the entire proposed 525 Kv transmission line in its review of this application. The Exhibit V generally reflects adequate consideration for protecting the recreation-related natural, scenic, and historic values of the area; however, we urge applicant's strong consideration of setting towers by helicopter, as noted on pages 3-6 of the Exhibit W, particularly around Howard Creek to protect this fishing stream's recreational environment.

North Carolina Department of Natural & Economic Resources

JAMES E. HOLSHOUSER, JR., GOVERNOR • JAMES E. HARRINGTON, SECRETARY

DIVISION OF
RESOURCE PLANNING
AND EVALUATION

STEPHEN G. CONRAD
DIRECTOR

BOX 27687, RALEIGH 27611
TELEPHONE 919 829-3833

March 17, 1975

Mr. Charles J. Borawa, Supervisor
Public Recreation Development
Duke Power Company
P. O. Box 2178
Charlotte, N. C. 28201

Dear Chuck:

It was a pleasure to meet with your group last Friday and learn more of your company's plans for trail development in connection with the Bad Creek Project. I am anxious to work further with you and your staff and hope that such efforts will be mutually beneficial.

As I indicated, the North Carolina Trails Committee has just received approval of its first annual report. I am enclosing a draft copy for your information and use. The recommendations concerning money and staff increases were not approved in toto but the remainder of the report contains information that may be of use to you.

Also, please pass along a copy of the enclosed DNER organization chart to Mr. Dewey. Again I must caution that the scheme represented on the chart is in various stages of finalization; particularly below the division level.

Let me know when we may be of further assistance.

Sincerely,

James B. Hallsey
Recreation Planner

JBH:dl

Enclosures

A-2

A preliminary draft of the Exhibit R was sent out to the members of the Foothills Trail Conference, comprised of representatives from interest groups and agencies. Included in this draft was a map of the trail route, a detailed description of the trail route and basic construction requirements. Comments and critizism was solicited.

Following are the comments received to date concerning this draft.

North Carolina Department of Natural Resources & Community Development
James B Hunt, Jr., Governor
Howard N Lee, Secretary

DIVISION OF
PARKS & RECREATION
James S. Stevens, Jr., Director
Box 27687, Raleigh 27611
Telephone 919 733-4181

April 25, 1980

Mr. Charles J. Borawa
Supervisor, Project Recreation
Duke Power Company
422 South Church Street
Charlotte, NC 28242

Dear Mr. Borawa:

I appreciate the opportunity to review the exhibit R material for the Cherokee Foothills Trail. It is encouraging to see the idea reach this stage in the planning process.

The emphasis given to volunteerism and the partnership role to be assumed by Duke Power Company are most supportive of the management philosophy of the N. C. Trails System. In fact, I urge you to consider seeking designation of the North Carolina portion of the trail as a State Scenic Trail. A brochure containing general information about the application process is enclosed.

Thank you for the support of trails you and your company have committed. I anticipate being able to refer to your efforts in future years as prime examples of corporate leadership and involvement in the trails movement.

Sincerely,

James B. Hallsey, Assistant Chief
Planning & Special Studies Section

Attachment

cc: NC Trails Committee
James S. Stevens
Robert L. Buckner

JBH/aw

An Equal Opportunity Affirmative Action Employer

April 22, 1980

Mr. Charles J. Borawa
Supervisor, Project Recreation
Duke Power Company
Post Office Box 33189
Charlotte, North Carolina 28242

Dear Mr. Borawa:

Thank you for your letter of April 4, 1980 enclosing a map and trail descriptions for the route of the proposed Foothills Trail proposed for construction across lands owned by Duke Power Company and its subsidiary, Crescent Land and Timber Company. This response to your request for comments is offered in several capacities. In addition to serving as Chairman of the Foothills Trail Conference, I also represent the Sierra Club for the Foothills Trail project and serve as a member of the Board and as an officer of YMCA Camp Greenville, another large potential user of the trail. On behalf of all these groups, I strongly endorse the concept of the Foothills Trail extension across your lands and urge early consideration, approval and construction of the project.

At a time when energy has become a critical concern for all our people, it is especially important to sponsor such projects as the Foothills Trail which is located near enough to major metropolitan areas so that it can be utilized without undue consumption of energy and offers a recreation opportunity which does not deplete our energy reserves.

Initially, I would like to note that in your cover letter you have agreed to adopt many of the earlier proposals submitted by the Foothills Trail Conference and various members and representatives of the Sierra Club. These are good suggestions which will certainly add to the overall use and enjoyment of this important recreation project. Duke is to be commended for accepting the proposals. For the record, some of these are as follows: The construction and maintenance of the trail in accordance with Applachian Trail and United States Forest Service specifications, the use of dispersed camping as opposed to Adirondack type shelters and a uniform marking system to be established by the Foothills Trail Conference and utilized for the full length of the Foothills Trail.

Although I have not yet reviewed the latest draft of the full Exhibit R, I assume and trust it will address and resolve other important issues such as steps taken to limit use to foot travel only, the protection of a scenic corridor for the trail, the construction and availability of parking areas for the use of campers and hikers to leave cars with some assurance of safety, publication of a brochure describing the availability and description of the trail and its facilities and steps taken to identify and protect rare and endangered species. I also urge that some of the more important and beautiful scenic areas along the route, such as Windy Falls and Laurel Fork Creek, be protected as "mini-wildernesses" and eliminated from the timber management area. Such areas will add immensely to the long-term value and use of the trail and contribute much to the natural heritage of the Carolinas. Most of the route as now proposed has been reviewed with maps and trail descriptions. Unfortunately, I have not been able to personally look at the change in the trail corridor from that originally discussed at the Foothills Trail Conference. I am generally acquainted with the area, however, and have no problems with the corridor currently proposed.

The new corridor, however, does present one additional problem - the difficulty of access. The length of the trail section between Highway 178 and Bohaynee Road (Whitewater Falls) will mean very limited use unless an intermediate access can be developed to divide this area. As you recall, the original corridor would have placed the trail north along the Chattooga Ridge, making intermediate access along this portion of the route possible. A spur trail to the Windy Falls/Rainbow Falls area was contemplated.

To accomplish this goal of dividing this part of the trail into hikable sections, I would like to propose a connecting trail extending along the Horsepasture River, via Windy Falls and Rainbow Falls - a truly spectacular route or via Chestnut Mountain and Bearwallow Creek, to connect with U. S. Highway 64 near the area of the Toxaway Mountain fire tower road.

In addition to increasing access and use and opening a spectacular part of this country to the use and enjoyment of many hikers and campers, this spur will go a long way toward connecting the Foothills Trail with the trail system of the Pisgah National Forest. As you are aware, I have been working on the Foothills Trail since 1972. During this time, we have worked with a long-range goal of a hiking trail not only for the region, but also for national use and significance. If this is to become a reality, it eventually must connect with the Art Loeb trail in Pisgah National Forest and with the Appalachian Trail System. We then will have a true national trail system to be enjoyed by the ever-increasing numbers of people who seek such outdoor recreation. I am already negotiating with the landowner north of Toxaway Mountain (The Liberty Corporation) for a trail corridor along the Tuckasegee River. If I can show that the trail now will be extended to the edge of their property, I feel certain they will be pleased to help make this project become a reality.

Again, I commend Duke for the work which has been done and the efforts expended to build the trail and accommodate the many groups with interest in its construction. I will be glad to join in efforts to urge early approval of Exhibit R Recreation Plan by the Federal Energy Regulatory Commission.

Thank you for giving us the opportunity to comment and make suggestions concerning this project.

Yours very truly,

R. Glenn Hilliard

RGH:at

PRT

April 23, 1980

Mr. Charles J. Borawa
Duke Power Company
422 South Church Street
Charlotte, North Carolina 28242

Re: Cherokee Foothills Trails

Dear Mr. Borawa:

The Planning and Development Division of the South Carolina Department of Parks, Recreation and Tourism has reviewed the submitted material for the above referenced project. I feel the project will offer an excellent recreational opportunity for the hiker and unique natural corridor connecting Oconee State Park and Table Rock State Park. Our office supports the construction of the facility and will investigate the possibility of additional trail potential in this part of the state.

Sincerely,

John Ransom

John Ransom
Landscape Architect

JR/hb

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

P.O. Box 749
Highlands, N. C. 28741

REPLY TO: 2353 - Development Trails

May 16, 1980

SUBJECT: Foothills Trail

TO: Mr. Richard K. Thompson
Recreation Assistant
Health & Recreation Services
Operating Department
Duke Power Company
P.O. Box 33189
Charlotte, N. C. 28242

Dear Mr. Thompson:

Regarding the Foothills Trail, the USFS will cooperate with Duke Power Company where the trail crosses National Forest land. The USFS is interested and committed to seeing this trail constructed. At this time, due to budget constraints and other trail priorities we cannot establish a time table for our construction. However, we will try to provide resource assistance when possible.

Sincerely,

BRISCOE PRICE
District Ranger
Highlands District

cc: Forest Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
P.O. Box 749
Highlands, N. C. 28741

REPLY TO: 2353 - Development Trails May 19, 1980

SUBJECT: Foothills Trail

TO: Richard K. Thompson
Duke Power Company
P. O. Box 33189
Charlotte, N. C. 28242

Dear Richard:

Looks like our scouting efforts on the Foothills Trail are receiving favorable attention despite our frustrated marking attempts last Wednesday. As you know, we are presently considering 2 alternatives in connecting to Duke's portion of the trail. The best looking alternative is to connect near Coon Branch and continue upstream along Whitewater River and up the steep slope or river out to the Whitewater Falls Trail. The other alternative is to start at the NC/SC state line between the Thompson and Whitewater rivers.

After talking with District Ranger, Briscoe Price and Melinda Waldrip in our Supervisor's Office, they agree with me in trying to work out the first alternative despite the costs of a major bridge span and approximately 300 yards of steep steps. Seems these structures' cost might be offset by decreased trail construction costs due to a shorter length. This could also be tied to a Whitewater Falls Development Plan.

After reviewing the Exhibit R, I find it thorough and well planned. The USFS recommends that it be approved and trail construction begin as soon as possible. The parts that we hiked, with the exception of the steep area and cliffs near Coon Branch, are well laid out and acceptable to USFS standards.

We are checking into our transportation plan to see if part of the Long Spur Ridge road could be closed as you requested. At this writing no decision has been reached.

Wherever the trail crosses the National Forest, an Environmental Analysis Report (E.A.R.) must be prepared by the USFS prior to any construction by Duke or us. Also, the Foothills Trail can not preclude any USFS management policies. Timber, wildlife, waterm soil control, and recreation will continue to be managed. The USFS will help maintain the trails' integrity and cooperate with Duke on any changes.

We would also like to work with you to encourage the Foothills Trail Council to stay involved and active. A trail logo and blaze need to be designed; this would be an early project to consider.

The USFS is interested and committed to completion of the Foothills Trail as monies become available and priorities allow. We will also work toward establishing it as a National Recreation Trail.

Sincerely,

TERRI SIZEMORE
Outdoor Recreation Planner
Highlands District

c.c. Larry Bloomer
Melinda Waldrep

PRT

Fred P. Brinkman
Executive Director
(803) 758-2566

May 20, 1980

Mr. Robin Andrews
Recreation and Conservation Services
Duke Power Company
Charlotte, North Carolina 28242

Dear Robin:

It was good to see you and participate last week in the annual Fontana Conservation Roundup.

I commend Duke Power Company and your outstanding leadership and efforts in development of the Foothills Trail. This is a most significant accomplishment that will contribute immensely to the development of outdoor recreation opportunities in South Carolina's Upcountry.

Enclosed is information on the South Carolina Mountain Bridge Project and other State Parks in the Upcountry.

PRT is well aware of the many contributions Duke and Crescent Land and Timber Company have made to public recreation in our State. We particularly appreciate the donations of land for Keowee-Toxaway State Park and Landsford Canal State Park in Chester County. We also look forward to working further with your fine organization on the proposed trade of lands for the park in Fairfield County.

Please feel free to call on us whenever PRT might be of assistance to you.

Cordially,

Fred

Fred P. Brinkman

FPB:pbs

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
National Forests in North Carolina
P. O. Box 2750, Asheville, N. C. 28802

2300
May 22, 1980

Mr. Richard Thompson
Duke Power Company
P. O. Box 33189
Charlotte, NC 28242

Dear Mr. Thompson:

We have reviewed the proposed route of the Foothills Trail as described in the draft Exhibit R of the Bad Creek Project and find it acceptable. We will continue working with you with the on-the-ground location of the trail segments that cross National Forest land and urge that you begin construction of this trail as soon as possible.

We look forward to our continued participation in the Foothills Trail Council.

Sincerely,

GEORGE A. OLSON
Forest Supervisor

6200-11 (1/69)

WILLIAM RENNINGER ASSOCIATES
LANDSCAPE ARCHITECTS & PLANNERS
ROUTE 12 WOODHAVEN DRIVE
GREENVILLE, SOUTH CAROLINA 29609
May 27, 1980

Mr. Richard K. Thompson
Duke Power Company
P. O. Box 33189
Charlotte, N. C. 28242

RE: Foothills Trail

Dear Mr. Thompson,

The firms of William Renninger Associates and MBTB Architects-Engineers, Inc. would like to express their support of the Foothills Trail, proposed to stretch from Oconee State Park to Table Rock Reservoir.

Our two firms are presently acting as a consultant to the South Carolina Department of Parks, Recteation & Tourism in the preparation of a master plan for Caesar's Head State Park, just to the east of Table Rock Reservoir. It is most likely that the Foothills Trail could lead into one or more hiking trails through Caesar's Head State Park. In addition, present efforts are being made by various groups to acquire other trails to the east leading to the Poinsett Reservoir, as part of the "Mountain Bridge" concept. If all these plans develop, South Carolina could claim a most valuable natural resource, that many feel would compare with the noted Appalachian Trail.

The overwhelming natural beauty of this mountain area has certainly impressed us during our studies for the Caesar's Head State Park. Every effort should be made to preserve this unusual wilderness area for the use of future generations and we eagerly support the proposed Foothills Trail.

Sincerely,

William P. Renninger
William Renninger Associates

James L. Townsend, Jr.
MBTB Architect-Engineers, Inc.

MEMBER OF THE AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS
PHONE (803) 232-4887

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
P. O. Box 2227
Columbia, South Carolina 29202

April 9, 1980

Charles J. Borawa
Supervisor Project Recreation
Duke Power
422 South Church Street
Charlotte, North Carolina 28242

Dear Mr. Borawa,

Your proposal for the Cherokee looks very interesting and if carried out will be an asset to hikers and amplify the value of trails on National Forest land. The attached map shows the temporary ending of our portion of the trail at Highway 107. We stand ready to complete the one mile portion to the State line when we know where the trail will be located on the Nantahala National Forest.

The portion on the Sumter National Forest was recently designated as the Foothills National Recreation Trail and will be managed in conformance with those regulations. We were not aware of the "Cherokee" designation and this should probably be resolved to avoid confusing the public.

Our comments, without walking the route, are:

1. On page 4, water sources are mentioned. With the new water quality regulations it is nearly impossible in South Carolina to provide approved drinking without a pressurized and clorinated system. You may want to check with the Department of Health and Environmental Control before doing anything that could be viewed as developing a water source (springbox or hand pump well).
2. On page 21, in particular, you list numerous long bridges which would certainly add to the hikers experience. However, they will be very expensive to construct, maintain, and inspect. On National Forest land we would probably have to re-route the trail to avoid projects of this magnitude.
3. On page 23, and several others, the draft mentions log steps. In an effort to reduce maintenance cost they should either be locust or pressure treated. I have found in trail construction that it is easier and quicker to bring in

6200-11 (1/69)

pressure treated material predrilled with holes and use rebar to anchor it than try to use native material.

4. Getting materials to the site will be very difficult. You may want to consider a large helicopter to place the bridge spands after the abutments have been prepared. This would allow pressure treated materials to be used and construction to be done at a shop. The attached information on a Washington toter may be useful as I have had very good reports on them.

Thanks for the opportunity to comment and good luck. Please drop Gene Cooke's name from your list as he retired several years ago.

William S Craig

WILLIAM S. CRAIG
Recreation and I&E Staff Officer

C. GRANVILLE WYCHE
ALFRED F. BURGESS
C. THOMAS WYCHE
DAVID L. FREEMAN
JAMES C. PARHAM, JR.
JAMES M. SHOEMAKER, JR.
WILLIAM W. KEHL
CHARLES W. WOFFORD
LARRY D. ESTRIDGE
D. ALLEN GRUMBINE
CARY H. HALL, JR.
CARL F. MULLER
HENRY L. PARR, JR.
BRADFORD W. WYCHE

WYCHE, BURGESS, FREEMAN & PARHAM
PROFESSIONAL ASSOCIATION
ATTORNEYS AT LAW
GREENVILLE, SOUTH CAROLINA 29603

POST OFFICE BOX 10207
44 EAST CAMPERDOWN WAY
CABLE ADDRESS: JURAL

TELEPHONE 803-242-3131

June 9, 1980

Mr. Richard Thompson
Duke Power Company
P. O. Box 33189
Charlotte, N. C. 28242

Re: Foothills Trail

Dear Richard:

I have read the portion of Duke's "Exhibit R" which you sent me and want to compliment you and Duke on the fine job you have done in laying out this portion of the Foothills Trail.

As I told you over the phone last week, I think that it would be very desirable to have the trail continue over the northern boundary of the Table Rock Watershed so that it could continue through the Caesar's Head and Jones Gap State Park. This would add another 20 miles or so of trail over spectacular terrain. Of course, Champion International owns the property north of the Watershed. Perhaps someone of Duke might be interested in helping the Foothills Conference in persuading Champion to grant a tract easement for this purpose?

Very truly,

Cary H. Hall, Jr.

CHH, JR: dlh

A-3

The following letter was sent to some 15-20 church, scout and other youth camps within a 25 mile radius of the Trail as a means of soliciting use information from the area.

Following are the comments received to date giving an indication of interest in the Trail.

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

P. O. BOX 33189

TELEPHONE: AREA 704
373-4011

March 24, 1980

Dear Friends:

Presently Duke Power Company is finalizing plans concerning construction of a backpacking trail through the mountainous areas of Transylvania, Pickens and Oconee Counties. Duke is planning this 35 mile section of the Cherokee Foothills Trail in conjunction with the Company's Bad Creek Hydroelectric Project. This section of the Trail will extend from Pinnacle Mountain in Table Rock State Park to the National Forest Service Recreation Area at Upper Whitewater Falls.

This backpacking trail will be for hikers only; no motorized vehicles will be allowed. Duke's section of the Trail will take approximately seven days to cross in its entirety, although several sections will be suited for day use activities.

As part of our planning efforts we would like to recieve comments from interested parties. Since the Trail (including Duke's section) may be a valuable resource to your program, your comments are especially pertinent. Of particular interest is the anticipated use of the Trail by your campers.

In order to meet our planning deadlines, we need to have your comments by April 28, 1980. If you have questions or wish to discuss the project, you may contact me at 704-373-7113.

Very truly yours,

Richard K. Thompson

Richard K. Thompson
Project Recreation

National Federation of the Blind of South Carolina

FORMERLY THE SOUTH CAROLINA AURORA CLUB OF THE BLIND, INC.

119 S. KILBOURNE RD.
254-3777

COLUMBIA, S. C.
29205

STATE OFFICERS
DONALD C. CAPPS
President

ROBERT R. BELL
First Vice President

MRS. MATTIE BELL GATLIN
Second Vice President

MISS SHELIA BYRD
Secretary

MARSHALL C. TUCKER
Treasurer

BOARD OF DIRECTORS

MISS SUZANNE BRIDGES
MRS. LOUISE BRISTOW
CAREY BURRISS, JR.
MRS. SHEILA COMPTON
MRS. EARLENE GARDNER
MRS. REBA B. HANCOCK
RAYMON HELLAMS
MRS. OLLIE HEYWARD
GROVER JONES
RONNIE LOGAN, JR.
MRS. FRANCES MESSER
MRS. SANDRA REEVES
MRS. MERCEDES ROYAL
JAMES R. SIMS
CHARLES STOUDENMIRE
MRS. PATRICIA TUCK
REV. FRED WALKER
MRS. HELEN WEBBER
JERRY WHITTLE

April 11, 1979

Mr. Richard K. Thompson
Recreation Assistant
Duke Power Company
P. O. Box 33189
Charlotte, North Carolina 28242

Dear Mr. Thompson:

Thank you for calling on our state board member, Mrs. Patricia Tuck, in Greenville concerning Rocky Bottom Camp of the Blind.

At the outset let me thank you for your interest in the camp. As you probably know, we are just getting started with the development of the camp. Thus, your interest is particularly appreciated.

I understand that presently a nature trail is being developed beginning at Table Rock and progressing near our camp to the summit of Sassafrass Mountain. Naturally we are very interested in that project and will appreciate your giving us more information concerning these plans. Also, if there are ways Duke Power Company can assist us in development of our camp, we would be most grateful.

I shall look forward to hearing further from you in this regard.

Very sincerely,

Donald C. Capps

Donald C. Capps
President

DCC:lja

The South Carolina Methodist Camp

WESLEY A. VOIGT • SUPERINTENDENT

STAR ROUTE • CLEVELAND, SOUTH CAROLINA

March 27, 1980

Mr. Richard K. Thompson
P. O. Box 33189
Charlotte, North Carolina 28242

Dear Richard:

I am delighted to know more about the section of the Cherokee Foothills Trail mentioned in your letter dated March 24, 1980.

For several years, some of our older campers have been hiking on various sections of the Appalachian Trail and more recently on trails in Pisgah National Forest. These have been 6 or 7 day trips for distances of 25-35 miles.

I would be very much in favor of a trail here in South Carolina restricted to backpacking only. It would be a hope of mine that this will be better maintained than many of the trails now available in our general area. I feel that only trails with good maintenance and control are suitable for me to let our campers use.

While our camp has from 900 to 1000 campers each summer obviously not all of them would be permitted to take trips on this trail. I do feel that a good percentage of the campers would be interested in this type of experience.

Thanks for the progressive work that you and Duke Power Company are doing in helping to make this trail a reality.

Cordially yours,

Wesley A. Voigt

Wesley A. Voigt

WAV:baf

"ON TOP OF THE BLUE RIDGE"

CAMP GREENVILLE

A PROGRAM SERVICE OF THE GREATER GREENVILLE YMCA, SOUTH CAROLINA
CAMP ADDRESS: CEDAR MOUNTAIN, NORTH CAROLINA 28718
PHONE (803) 836 3291

ROY W. TULP
Camp Director

March 29, 1980

Mr. Richard K. Thompson
Duke Power Company, General Offices
422 South Church Street
Charlotte, North Carolina 28242

Dear Mr. Thompson:

The letter in regard to a new hiking trail through Transylvania, Pickens and Oconee Counties was of great interest to me. We, at YMCA Camp Greenville, would like to get as much information in regard to this as possible, and to be kept informed of developments.

Would this, or could this, also be tied up with the Mountain Bridge concept that many people are strongly interested in which would go from the North Saluda Reservoir to Table Rock.?

We would have a strong interest in such a backpacking trail as you describe it as we have a building backpacking program and presently use part of the Appalachian Trail in our program.

As you may know, our YMCA Camp Greenville has some 1500 acres and is located next to the 2600 acres which P.R.T. has acquired in the Caesars Head Area.

We are definitely interested and hope to hear from you as you proceed.

Sincerely,

Roy W. Tulp

Roy W. Tulp, C.C.D.

RWT:sdt

cc: Mr. Glenn Hilliard
Mr. W. Hayne Hipp
Mr. B. Darrell Corder

ROBERT D. TAYLOR
General Presbyter
Stated Clerk
Treasurer

DENNY M. HILL
General Pastor

BETTYE V. KILLGORE
Christian Education Associate

ROBERT M. MATTHEWS
Clemson Campus Minister

THOMAS C. HERRINGTON
Youth Ministry Consultant

PRESBYTERY OF THE PIEDMONT
Presbyterian Church, U. S.

KOGER EXECUTIVE CENTER
Suite 226 • Chesterfield Building
Greenville, South Carolina 29615

Telephone (803) 288-5774

April 3, 1980

Mr. Richard K. Thompson
Project Recreation
Duke Power Co.
General Offices
422 S. Church St.
Charlotte, NC 28242

Dear Mr. Thompson:

I am the new director at Camp Buc, which is located at the headwaters of the Thompson River in western Transylvania County, North Carolina. The camp is owned and operated by the Presbytery of the Piedmont as an educational and recreational facility, and part of our program includes backpacking and hiking.

I am in full support of the proposed trail from Table Rock to Whitewater Falls. The trail would be an excellent resource for us as we try to expand our programs at Camp Buc.

Let me know if I can be of any further help.

Sincerely,

Samuel L. Pendergrast

Sam Pendergrast
Piedmont Presbytery Camps

SP:bh

SOUTH CAROLINA DISTRICT OF THE WESLEYAN CHURCH

DISTRICT SUPERINTENDENT
REV. W. D. JAMES
Route 3, Box 156
Pickens, S. C. 29671

ASST. DISTRICT SUPERINTENDENT
REV. MELVIN GENTRY
1 South Texas Avenue
Greenville, S. C. 29611

DISTRICT SECRETARY
REV. PAUL WILCOX
Route 1, Box 222
Liberty, S. C. 29657

DISTRICT TREASURER
REV. GEORGE NALLEY
Route 2, Box 235
Fountain Inn, S. C. 29644

April 14, 1980

Duke Power Company
General Offices
422 South Church Street
Charlotte, N. C. 28242

Gentlemen:

Thank you for your letter of March 24, 1980 regarding the backpacking trail. Inasmuch as we are planning to develop a camp which joins Table Rock State Park, I am sure that there will be some who use our camping facilities who will be interested in doing some hiking.

We certainly commend you for this step, but just how much our people will use the trail cannot be determined at this time. We will be having youth camps along with some other type of camps.

Be assured, we would like to see the trails developed.

Sincerely yours,

W. D. James

W. D. James
District Superintendent

WDJ/cj

A-29

the Wilds
The Ultimate Christian Camp/ Conference Center
P. O. BOX 5211 • GREENVILLE, SOUTH CAROLINA 29606 • (803) 268-4760

April 16, 1980

Mr. Richard Thompson
Duke Power Company
422 South Church Street
Charlotte, NC 28242

Dear Mr. Thompson:

We received your information concerning the proposed Cherokee Foothills Trail which is very close to our campsite property at the easternmost part of Lake Jocasse where the Toxaway River runs into the lake. We have a wilderness camp, and I am sure that they would be utilizing this trail or parts of it. My only concern would be if folks hiking, wanting to start at that point, would be going through our property to get there or if those wanting to stop would be making our trails from that area a regular passageway.

We allow people to go through our property who request to do so, and we have no problem with that as long as they are not creating problems to our campers. We trust that this hiking trail will not create a great deal of traffic that could be a hindrance to the safety of our campers. It certainly is a beautiful area for a proposed trail, and I trust that it will be successful.

Thanks for allowing us input in this matter.

Sincerely yours,

Ken Hay
Director

KH:vdr

SUMMER ADDRESS:

GIRL SCOUTS

Old Ninety Six
Girl Scout Council, Inc.
P. O. Box 8398
Greenville, S. C. 29604
(803) 233-6246

April 25, 1980

Mr. Richard K. Thompson
Duke Power Company
General Office
422 South Church St.
Charlotte, N.C. 28242

Dear Mr. Thompson,

You and your employer's interest in contructing a backpacking trail is an excellent idea. This trail would be used by our girls and their families. Our only wish is that this trail was constructed today. Please proceed with haste!

Sincerely,

Vic Greene

Vic Greene
Property Manager

VG/mlg

A United Way Agency

A-4

This section includes correspondence between Duke and the agencies pertaining to the presence of the rare plant, Oconee Bell, along the trail route.

Other miscellaneous correspondence pertaining to the Trail is included.

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

P. O. BOX 33189

TELEPHONE: AREA 704
373-4011

May 21, 1980

Mr. Tom Kohlsaat
S.C. Wildlife and Marine Resources Department
P. O. Box 167
Columbia, S.C. 29202

Re: Bad Creek
Foothills Trail
File No: BK-1410.02

Dear Tom:

As part of our Bad Creek Project proceedings, Duke Power plans to construct a hiking trail across company holdings above Lake Jocassee. The trail will be approximately 35 miles in length and will extend from near Pinnacle Mountain west to upper Whitewater Falls.

The section of trail developed by Duke will be a major segment of a trail extending from Table Rock State Park to Oconee State Park. Other segments are to be built by SCPRT and the U.S. Forest Service.

The development and maintanance of the trail will be accomplished with advice from the Foothills Trail Conference. This organization consists of interested individuals from various agencies and organizations including SCPRT, U.S. Forest Service, Sierra Club, Boy Scouts, and Duke Power. The conference is involved in the planning of all aspects of the trail, such as its location, width, grade, access points, etc. In general, many of the trail standards are similar to those of the Appalachian Trail.

Enclosed is a map of the proposed trail route at this time. To date, the route has been flagged, but construction will not likely begin until at least late 1980. We are locating all colonies of Shortia along the route and plan to protect them from construction activities. We would appreciate any comments you might have on this project regarding rare natural features to be protected.

Thank you.

Yours very truly,

S. B. Hager, Chief Engineer
Civil/Environmental Division

John S. Garton by A.L.

By: John S. Garton
Biologist

JSG/mdc

Enclosure

cc w/o att: C. J. Borawa
D. W. Anderson

South Carolina
Wildlife & Marine
Resources Department

James A Timmerman, Jr., Ph D.
Executive Director
Jefferson C Fuller, Jr
Director of
Wildlife and Freshwater Fisheries

June 4, 1980

CK-1444.00

CAD/File
Please handle
coordinating with
Jere as appropriate
SBH 6/6

Mr. S.B. Hager
Civil/Environmental Division
Duke Power Co.
P.O. Box 33189
Charlotte, NC 28242

Dear Mr. Hager:

At Tom Kohlsaat's request I am responding to your May 21th letter concerning the Cherokee Foothills Hiking Trail. Plotting the natural element occurrences from the Heritage Trust inventory file revealed that the most critical areas along the trail are those providing habitat for Oconee bells, Shortia galacifolia. The areas outlined in red on the blueprint indicate past or present populations of Shortia provided to us by Steve Jones in 1979. Where possible these areas should be avoided with construction and disturbance held to a minimum. I hope this information will be useful in the planning of the trail. If I may be of further assistance please feel free to call.

Kc Jere

Sincerely,

SPM

Sam Phillips
Heritage Trust Program

SP/mam
cc:Tom Kohlsaat
John Garton

NO ATTACHMENT TO FILE

CENTRAL RECORDS/DIVISION USE

A-34

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

P. O. BOX 33189

TELEPHONE: AREA 704
373-4011

June 11, 1980

Mr. Robert Sutter
Pesticide and Plant Protection Division
N. C. Department of Agriculture
P. O. Box 27647
Raleigh, NC 27611

Re: Bad Creek Project
Foothills Trail
File No: BK-1410.02

Dear Robert:

As we discussed by phone on May 20, 1980, Duke Power Company plans to construct a hiking trail across company holdings above Lake Jocassee. This work is part of our proceedings for the Bad Creek Pumped Storage Project, which will be located in Oconee County, S. C. The trail will be approximately 35 miles in length, and will extend from near Pinnacle Mountain west to Upper Whitewater Falls. Portions of the trail are in North Carolina and South Carolina.

The 35-mile section of trail developed by Duke will be a major segment of a trail extending from Table Rock State Park to Oconee State Park. Other segments are to be built by SCPRT and the U. S. Forest Service.

The development and maintenance of the trail will be accomplished with advice from the Foothills Trail Conference. This organization consists of interested individuals from various agencies and organizations including SCPRT, NCDNRCD, U. S. Forest Service, Sierra Club, Boy Scouts, and Duke Power. The conference is involved in the planning of all aspects of the trail, such as its location, width, grade, access points, etc. In general, many of the trail standards are similar to those of the Appalachian Trail.

Enclosed is a map of the proposed trail route at this time. To date, the route has been flagged, but construction will not likely begin until at least late 1980. We are locating all colonies of Shortia along the route and plan to protect them from construction activities. We would appreciate any comments you might have on this project regarding rare natural features to be protected.

Thank you.

Yours very truly,

S. B. Hager, Chief Engineer
Civil-Environmental Division

John S. Garton

By: John S. Garton
Biologist

JSG:sd
Enc.
cc w/out Enc: C. J. Borawa, D. W. Anderson

TELEPHONE: OFFICE
883-8141

TELEPHONE: JAIL
884-4230

SHERIFF'S OFFICE

Transylvania County

MILFORD C. HUBBARD, SHERIFF

Brevard, North Carolina 28712

March 31, 1980

To: Richard Thompson
Duke Power Company
Oconee County Road-S3715
Seneca, South Carolina 29678

From: James E. Stroup, Det. Sgt.
Transylvania County Sheriff's Department
12 East Main Street
Brevard, North Carolina 28712

Subject: Problem areas of law enforcement on Duke Power lands.

Dear Sir:

Per our recent conversation pertaining to the problems of law enforcement on Duke Power lands in and around Lake Jocassee in Transylvania County. During the year of 1979 this Department seized in excess of $1,000,000.00 of marijuana growing on Duke Power lands. Due to the remoteness and ruggedness of this area we are certain that we seized only a small part of the illegally grown marijuana last year. Also, the area is very popular for moonshine operations and at this time we have information that non-tax-paid liquor is being made on your lands.

This Department has also recovered numerous stolen vehicles from that same area. The remoteness and seclusion of the area makes it a favorite place for criminals to strip and hide the stolen automobiles. This Department has also worked numerous reports of people missing or lost in this same area.

During the year 1979 this Department and local rescue squads have searched the Horse Pasture area extensively for a body which drowned near the Whitewater Road in Transylvania County. We also plan another extensive search for sometime in June 1980 to attempt to locate and recover the body. Our Department, local rescue squads and a special unit assigned to Search & Rescue of the United States Army will be conducting the search the total length of Horse Pasture River and part of Lake Jocassee.

This area is also a favorite haunt for poachers during the last 4 - 5 years. It is a well known fact by officers of this Department that poaching is a very serious problem in this area.

Agreeable with our recent conversation I have discussed this problem with the Sheriff of this County and he has concurred that our Department will work with Duke Power for a common goal in law enforcement.

Efforts reference protection supplied by Duke Power, Sheriff Hubbard states that Duke Power's personnel assigned to protection detail by Duke Power will upon meeting state requirements for a duly authorized law enforcement officer be sworn in as deputy sheriffs of Transylvania County with full powers of arrest in this State and County.

This Department will work closely with Duke Power on any problem arising in the area where assistance is needed by Duke Power.

This Department feels that due to the remoteness and ruggedness of the area it would be beneficial to this Department if roads were accessible for patrol either by 4-wheel drive vehicles or regular patrol units whichever the situation and terrain permits.

This Department plans an extensive search and destroy mission in 1980 upon Duke Power lands against illegally grown marijuana, liquor stills and/or any other criminal activity in that area. Any assistance and recommendations that may assist this Department will be greatly appreciated.

Please feel free to contact me at any time: Office 704-883-8141
Home 704-885-2179.

Respectfully,

James E. Stroup, Det. Sgt.

JES:rrs

The Liberty Corporation

R. Glenn Hilliard

March 14, 1980

Re: Foothills Trail

Dear Foothills Trail Supporters:

During 1974 many of you participated in the organization of the Foothills Trail Conference which was designed to coordinate the activities of groups and individuals interested in advancing the completion, maintenance and proper use of a connected trail, to be called the Foothills Trail, running, as far as practicable, over the summits of the mountains and through the wild lands of the southern Appalachian Mountains. During the last several years a significant part of the trail has been established through the Sumpter National Forest. Duke Power Company/Cresent Land and Timber Company have continued planning for the portion of the trail they have agreed to build above Lake Jocassee which will connect with Forest Service trails near White Water Falls and extend to Table Rock State Park.

Last week Charles Borawa from Duke called to say that they have completed marking their proposed section of the trail and requested that we hold a meeting of our Trail Conference for purposes of reorganizing and updating the board members on the progress of the trail.

I have also learned that the United States Forest Service has completed an additional segment of trail which extends along the Georgia side of the Chattooga River from Highway 28 bridge to Highway 76 bridge. Another ten miles of trails are planned for construction in the Sumpter National Forest during 1980.

We are, therefore, calling a meeting of interested groups to be held in the home office of Liberty Life Insurance Company, Greenville, South Carolina, in the Board of Directors Room at 1:30 p.m. on Monday, March 24, 1980. A tentative agenda for the meeting is enclosed.

Please call my secretary, Anita Turner, at 268-8396 to let us know if you will attend or if you have designated another representative to participate in your place.

I look forward to seeing each of you at the meeting and re-establishing the momentum of the Foothills Trail.

Yours very truly,

R. Glenn Hilliard

RGH:at

Enclosure

The Liberty Corporation

April 16, 1980

Dear Foothills Trail Supporters:

Enclosed is a list of people invited to participate in the last meeting of the Foothills Trail Conference. I have checked the names of those persons who were present at the meeting. Also enclosed is a guide to the Andrew Pickens Ranger District Trails in the Sumter National Forest provided by Joe Wallace.

Each of you have separately received or should be soon receiving materials from Charles J. Borawa of Duke Power Company. This information includes Exhibit R to be filed with the FERC on August 1, 1980 and a map showing the proposed trail route across the property of Duke and Crescent Land and Timber Company. Duke has requested your written comments by April 28, 1980, and I urge you to submit them as early as possible.

Following the assimiliation of these comments and suggestions into the Exhibit R by Duke, we will plan an additional meeting of the Foothills Trail Conference. At that meeting we will review the final draft of Exhibit R prior to submission to the FERC and, hopefully, review slides of the proposed route. Within the next several weeks we will distribute copies of the minutes of our last meeting and announce the date of our next meeting.

I look forward to seeing each of you then.

Yours very truly,

R. Glenn Hilliard

RGH:at

Enclosures

APPENDIX B

This Appendix contains a copy of the Foothills Trail Conference Bylaws and a list of the F.T.C. Board of Directors, along with correspondence with the Conference.

FOOTHILLS TRAIL CONFERENCE - NAMES & ADDRESSES

1. Dr. Don Bessinger, Greenville Medical Crt., 24 Vardry St., Greenville, SC 29601
2. Charles J. Borawa, Duke Power Co., P.O. Box 33189, Charlotte, NC 28242
3. Ronald M. Bost, Crescent Land & Timber Corp., Box 2695, Charlotte, NC 28234
4. Dr. Herbert Brantley, Head, RPA Dept., Clemson University, Clemson, SC 29631
5. Thomas L. Brown, 138 Mt. Vista Ave., Greenville, SC 29605
6. Gene Cocke, U.S. Forest Service, 1801 Assembly St., Columbia, SC 29201
7. Frank F. Couch, Jr., Dept. of Parks, Recreation & Tourism, Box 1358, Columbia, SC 29202
8. William S. Craig, Supt., U.S. Forest Service, Sumter National Forest, Star Route, Walhalla, SC 29691
9. Jim Culp, Forest Ranger, U.S. Forest Service, Sumter National Forest, Star Route, Walhalla, SC 29691
10. Mike Despeaux, 300 Haverill Circle, Easley, SC 29640
11. Cary H. Hall, Jr., Wyche, Burgess, Freeman & Parham, P.A., P.O. Box 10207, Greenville, SC 29603
12. Charles Harrison, Dept. of Parks, Recreation & Tourism, Box 113, Edgar A. Brown Bldg., Columbia, SC 29201
13. R. Glenn Hilliard, The Liberty Corp., P.O. Box 789, Greenville, SC 29602
14. Dr. William K. Marsh, Dept of Parks, Recreation & Tourism, Box 1358, Columbia, SC 29202
15. Col. John B. May, Dept. of Parks, Recreation & Tourism, Box 1358 Columbia, SC 29202
16. Marshall I. Pickens, 305 North Street, Anderson, SC 29621
17. Sam Stokes, S.C. Wildlife & Marine Resources Commission, Box 167, Columbia, SC 29202
18. Dan Turpin, Dept. of Parks, Recreation & Tourism, Box 113, Edgar A. Brown Bldg., Columbia, SC 29201
19. Joe F. Watson, Dept. of Parks, Recreation & Tourism, Box 1358, Columbia, SC 29202
20. John S. Garton, Duke Power Co., P.O. Box 33189, Charlotte, NC 28242
21. Jim Hallsey, N.C. Dept. of Natural & Economic Resources, P.O. Box 27687, Raleigh, NC 27611

A member from the following agencies:

N.C. Wildlife Resources Commission, Archdale Building, 512 North Salisbury St., Raleigh, NC 27611

United States Forest Service, Nantahala National Forest, Highlands District Office, Highlands, NC 28741

Oconee State Park, Star Route, Walhalla, SC 29691

Table Rock State Park, Route 3, Pickens, SC 29671

BYLAWS

OF THE FOOTHILLS TRAIL CONFERENCE, INC.

1. Name

The name of this organization shall be "The Foothills Trail Conference, Inc."

2. Purpose

The purpose of this organization shall be to promote and coordinate for the benefit and use of the general public the proper use, construction and maintenance of a connected trail, to be called The Foothills Trail, running, as far as practicable, over the summits of the mountains and through the wild lands of the Southern Appalachian Mountains, to be supplemented by a system of primitive camps at proper intervals, so as to render accessible, for tramping, hiking and camping, the said mountains and wildlands, and as a means for conserving and developing, within this region, the primeval environment as a natural resource.

3. Location of Trail

The Trail shall be located so as to utilize, as far as possible, trails already in existence. Any club, organization, or governmental unit responsible for the maintenance of such trails, may make any regulations it deems necessary as to access thereto and as to the use of trails, cabins, huts, shelters, and other equipment used in connection therewith.

4. Members

Sec. 1. There shall be five classes of membership.

A. Clubs, organizations or governmental units which have been assigned, by the Conference, sections of The Foothills Trail for maintenance.

B. Clubs and organizations not assigned sections of The Foothills Trail, but which are interested in the purposes of the Conference.

C. Individuals to whom there have been assigned, either in a personal or official capacity (other than as a member of the member club), maintenance or supervision of the maintenance of sections of The Foothills Trail; such assignment being either by the Conference or by arrangement with a Class A member.

D. Individuals, whether or not members of member clubs, who are interested in the purpose of the Conference.

E. Lifetime, consisting of individuals, whether or not members of member clubs, who are interested in the purposes of the Conference and have paid the lifetime membership fee provided for in Article 10, Section 1.

Sec. 2. The Executive Committee in approving the application for membership shall assign the class of membership, but such assignment may be changed by

the Executive Committee from time to time as circumstances may warrant, due notice being given to the member.

Sec. 3. Honorary Members. Upon recommendation of the Board of Directors, Honorary Membership may be conferred at a regular meeting of the Conference on an individual who has made a distinguished contribution to The Foothills Trail project.

5. Board of Directors

The control of the affairs of the Conference shall be vested in a Board of Directors, to be elected by the Conference at each annual meeting. This Board shall consist of fifteen persons, of which a majority shall constitute a quorum, and they may vote either at a meeting, or by mail on written propositions submitted to them in the same way.

Any vacancy in the Board of Directors caused by death or resignation may, but need not be, filled by the Directors for the unexpired term.

6. Executive Committee

In the intervals between the meetings of the Board of Directors, the affairs of the Conference shall be under the control of an Executive Committee of the Board, to be elected by the Board of Directors from their membership. There shall be five members and three members shall constitute a quorum, and they may vote either at a meeting, or by mail on written propositions submitted to them in the same way.

Between meetings of the Board of Directors, vacancies in the Executive Committee shall be filled by a majority vote of the Executive Committee, by an election duly called by the Chairman, which voting may be by mail.

7. Officers

Sec. 1. The officers of the Conference shall consist of a Chairman, two Vice-Chairmen, a Treasurer, a Secretary, a Corresponding Secretary, and an indefinite number of Assistant Secretaries to be elected by the Board of Directors from their membership.

Sec. 2. The Officers of the Conference shall be elected annually at the meeting of the Board of Directors held after the Annual Meeting of the Conference, provided, however, that any vacancy in any office, however caused, may be filled by the Board of Directors at any lawful meeting.

Sec. 3. It shall be the duty of the Chairman to preside at all meetings of the Conference and of the Board, to keep in personal touch, as far as possible, with all members actively engaged in the construction and maintenance of The Trail and generally to carry out the purpose for which the Conference is organized.

The Treasurer shall render at least annually to the Board of Directors and membership an accounting of all receipts and disbursements of the Conference.

The Vice-Chairmen, Secretary, Corresponding Secretary, and Assistant Secretaries shall perform the duties usually pertaining to such offices.

8. Meetings

Regular meetings of the Conference shall be held at times and places determined by the Board of Directors; provided that an annual meeting shall be held at least once each calendar year. Special meetings may be called by the Board, to be held at other times and places. Not less than two months' written notice shall be given of all meetings.

The Board of Directors shall meet immediately after all meetings of the Conference, and special meetings may be called by the Executive Committee.

9. Representation at Meetings of the Conference

Each Director of the Conference shall have one vote. Each Class A member shall be represented by its president and secretary or other appropriate officials and one delegate for every ten miles of Foothills Trail assigned to it. Fractions of ten miles shall count as one vote, if in excess of one-half of the unit distance of ten miles. For the purpose of voting, the decision of the Chairman as to the extent of mileage maintained by each Class A member shall be accepted. Each Class B member shall be represented by its president, secretary, and treasurer. Each official representative of Class A and Class B members and each Class C and Class D member shall have one vote which must be cast in person. In the absence of the president and secretary or other appropriate officials of a Class A member, or of the president, secretary, or treasurer of a Class B member, such officer may be represented by duly designated alternate.

All voting for Directors may be done by ballot which shall be mailed with the notice of the meeting.

10. Finances

Sec. 1. Dues. There shall be no fixed memberhip fee for Class A, B, and C members. Class D members shall pay a membership fee of $7 per year or whatever other annual rate may subsequently be fixed by the Board of Directors, due on election and at the expiration of 12 calendar months each year thereafter. Class E members shall pay a membership fee of $200, due on election. Honorary members shall not be assessed dues.

Sec. 2. Expenses. The expenses of the Conference shall be met by dues from Class D and Class E members and by voluntary contributions from Class A, B, and C members and others interested in its purpose.

11. Amendment

Amendments to these bylaws may be proposed at any regular or special meeting of the Conference by a majority vote of the members present and voting, by petition bearing the signatures of at least thirty Class D or E members, or by the Board of Directors. Proposed amendments shall be reviewed within three months by a Constitution Committee appointed by the Chairman, put in proper context and then made known to the voting members by publication in the next notice of meeting of the Conference. A two-thirds vote of members present and voting at said meeting will make an amendment effective.

Recommended

FOOTHILLS TRAIL

STANDARDS

WILLIAM BARTRAM GROUP
SIERRA CLUB

FOOTHILLS TRAIL STANDARDS COMMITTEE
APRIL, 1973

FOOTHILLS TRAIL STANDARDS

Multiple Use

General Standards

The purpose of the Foothills Trail is to provide pleasure and recreation on foot through a primeval environment as remote as possible from sight and sound of civilization. It is intended that the trail will be a wilderness route limited to foot travel and cleared, marked and signed according to the following standards. In general, the intent is to provide a footway with no alteration except that made naturally by those walking on it. The trail will follow a route which provides the best combination of wilderness scenery and trail practicality. To provide a natural approximation of a primitive setting for the trail, the land bordering (within 75 yds.) would be left in natural condition.

The Trail

When developed to meet standards, the Foothills Trail will be a well cleared pathway enabling the hiker to walk freely errect, without obstruction and permitting required visibility of the footing ahead. It is specifically intended that no large trees will be cut. Blow downs will be cut and removed, not detoured. Young trees will be cut and annual summer growth will be removed.

Width

Where practical, the trail will be cleared to a width of four to six feet. Conditions may dictate a narrower three foot trail and in some cases, a wider trail may be desirable to more clearly define the route. As a general guide, the trail should be wide enough so that the trail route is clearly obvious and the hiker is unencumbered by branches or undergrowth.

Height

Under normal conditions the trail will be cleared to the height of a man's reach. Wherever possible, a high overhead of branches will be left and lower branches which add to trail beauty will be untrimmed.

Footway

To safeguard the wilderness character of the Foothills Trail, it is intended that the trail show no improvement save for that made naturally by those walking on it. Switchbacks will be used only where necessary to minimize grades and prevent errosion. Increased traffic may eventually force the use of water bars and/or grading at critical points to control the washes caused by heavy rains so common in the upper Piedmont region.

Near Environment

Insofar as it can be controlled, the trailside to a minimum of 75 ~~feet~~ yards either side of the trail will be left in a completely natural condition. Cut brush residue of trail maintenance will be removed beyond the 75 yard perimeter and distributed so as not to constitute a fire hazzard. It is hoped that land owners can be prevailed upon to cooperate in restricting cutting and other deleterious usage of land immediately adjacent to trailside areas. It will be impressed on users that each hiker is expressly responsible to clear the trail and trailside of any man made litter.

Marking

The Foothills Trail will be marked with paint blazes indicating trail location in both directions. Blazes will be placed with discretion to protect the wilderness character of the trail. However, it will be borne in mind that markings are for the benefit and protection of strangers in the area and the trail must be clearly defined. A description of the distinctive Foothills Trail

blaze marking is contained in the attached appendix together with signing recommendations.

Stiles

The Foothills Trail will avoid fences wherever possible. Where no other alternative is available, a stile will be employed to permit passage over livestock and boundary fences.

Shelters

There are no plans for shelters on the Foothills Trail. The short distances between established areas with overnight facilities negate the need for shelters. It is planned that overnight tent camping in the trailside will be permitted to provide a heightened wilderness experience. Hikers will find instructions posted at trailheads explaining "Leave No Trace" camping techniques. These techniques will enable campers to minimize ecological impact. Impact can be further reduced if specific tent sites are not designated and small groups of six or under are permitted over night trailside camping the full length of the trail. If necessary, overused trailside areas would be closed to campers to allow natural recovery.

Direction and Distance Signs

Trailheads and other logical trail divergencies will be marked with informational pointers showing direction and distances to major points of interest. Signs will be kept to a minimal number and size in keeping with their informational context to help preserve the wilderness quality of the trail.

Highway Crossing Signs

There are numerous highways and secondary roads intersecting the route of the

Foothills Trail affording ready access to even remote areas of the trail. It would be a major convenience to trail users to have these crossing well identified with signs. Unfortunately, experience, particularly on the Appalachian Trail, has shown that such signs are irresistible targets for motorized vandals. The outlook for maintaining a coherent highway crossing sign program is somewhat dim.

Springs

Springs abound in the Foothills Trail region. Major all weather springs will be located, cleared and marked with special spring trail blazes illustrated in the attached appendix.

The foregoing Standards for the Foothills Trail are a distilation and abridgment of Appalachian Trail Standards in force for several decades. As such they represent proven and attainable minimums which use and experience will expand as special needs of the Foothills Trail become apparent.

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

P. O. BOX 33189

TELEPHONE: AREA 704
373-4011

March 10, 1980

Mr. Glenn Hilliard
The Liberty Corporation
Post Office Box 789
Greenville, South Carolina 29602

Dear Glenn:

As we discussed during our March 6, 1980, telephone conversation, Duke has completed the marking of its proposed section of the Cherokee Foothills Trail. Final approval by Crescent Land and Timber Corporation should be obtained shortly.

I believe it is appropriate to reactivate the Cherokee Foothills Trail Conference. One of the first steps is to update the board of directors list. The attached list indicates people I have contacted that should be removed from the board. The second list shows persons that should be considered for appointment to the board of directors.

At the meeting scheduled for 1:30 P. M., March 24, 1980, I would like some time to discuss Duke's trail plans. I will have a map showing the proposed route and some handouts for the board members. A schedule for discussing, hiking and reviewing Duke's Exhibit R will be presented.

The board of directors may need to make some preliminary decisions on the direction the Cherokee Foothills Trails Conference should take. Subsequent meetings may include additional agencies and user groups. Information should be distributed before the second meeting so attendees can comment on the proposed trail.

I am anxiously looking forward to the meeting and construction of the trail.

Yours very truly,

Charles J. Borawa

Charles J. Borawa
Supervisor, Project Recreation

CJB/fs

Attachment

The Liberty Corporation / GREENVILLE, SOUTH CAROLINA 29602
POST OFFICE BOX 789 (803) 268-8396

LEGAL DEPARTMENT
DAVID W. ROBINSON, II
ROBERT R. SCALES, JR.
HARRY L. EDWARDS
R. GLENN HILLIARD
MARTHA G. WILLIAMS

October 27, 1975

Mr. Jim Culp
U. S. Forest Service
Star Route
Walhalla, South Carolina 29691

Mr. Dan Turpin
Department of Parks, Recreation
& Tourism
Suite 113
1205 Pendleton Street
Columbia, South Carolina 29201

Mr. Charles Harrison
Department of Parks, Recreation
& Tourism
Suite 113
1205 Pendleton Street
Columbia, South Carolina 29201

Mr. Charles Borawa
Duke Power Company
P. O. Box 2178
Charlotte, North Carolina 28242

Gentlemen:

This letter is to serve as minutes of our meeting held at Duke's Keowee-Toxaway Vistor Center on October 8 to discuss trail standards for the Cherokee Foothills Trail.

Present at the meeting were R. Glenn Hilliard, Sierra Club; Jim Culp, U. S. Forest Service; Dan Turpin, PRT; Charles Harrison, PRT; and Charles Borawa, Duke Power Company.

Subject to approval of the Board of Directors of the Foothills Trail Conference, general agreement was reached in the following three areas:

1. STANDARD TRAIL MARKER - The standard trail marker for the entire length of the trail was agreed upon as follows:

Color - White

Dimensions - Approximately 6" x 4"

Design - Arrowhead with rounded corners which can also serve to point to changes in trail direction. Glenn Hilliard to secure pattern.

2. SHELTERS AND CAMPING AREAS - Agreed that construction of trail shelters will not be encouraged and tentatively agreed that the camping policy will be that as used by the U. S. Forest Service in Wilderness Areas - "No camping is permitted within 1/4 mile of another campsite or within 100 feet of Trail or streams." Jim Culp is to get the precise language which, if adopted, will be posted at all Trail access areas.

3. TRAIL STANDARDS - Tentatively agreed to recommend adoption of Appalachian Trail Standards as revised by Charles Borawa, for local conditions, change of name, special requirements, etc. Charles Borawa is to circulate the revised standards within next month.

Once information and materials are received and circulated, a meeting of the Board will be called to consider our recommendations.

Yours very truly,

R. Glenn Hilliard
Legal Vice President & Secretary

RGH:scg

The Liberty Corporation / GREENVILLE, SOUTH CAROLINA 29602
POST OFFICE BOX 789 (803) 268-8396

LEGAL DEPARTMENT
DAVID W. ROBINSON, II
ROBERT R. SCALES, JR.
HARRY L. EDWARDS
R. GLENN HILLIARD
MARTHA G. WILLIAMS

September 26, 1975

Mr. Charles Borawa, Recreation Section ✓
Duke Power Company
P. O. Box 2178
Charlotte, North Carolina 28242

Mr. Bill Craig, Superintendent
Sumpter National Forest
United States Forest Service
Star Route
Walhalla, South Carolina 29691

Mr. Joe F. Watson, Chief Naturalist
State Parks Division
S. C. Department of Parks, Recreation & Tourism
Box 1358
Columbia, South Carolina 29202

Gentlemen:

This is to confirm a meeting of a committee of the Foothills Trail Conference to be held at the Keowee Visitor Center on October 8 at 2:30 p.m. for the purpose of drafting proposed construction and maintenance standards for the Foothills Trail.

I look froward to seeing all of you or your representatives at that meeting.

Yours very truly,

R. Glenn Hilliard
Legal Vice President & Secretary

RGH:scg

The Liberty Corporation / GREENVILLE, SOUTH CAROLINA 29602
POST OFFICE BOX 789 ~~(803) 244-5210~~ 803-268-9111

LEGAL DEPARTMENT
DAVID W. ROBINSON, II
ROBERT R. SCALES, JR.
NICHOLAS P. MITCHELL, III
HARRY L. EDWARDS
R. GLENN HILLIARD
MARTHA G. WILLIAMS

September 19, 1974

Gentlemen:

Please find enclosed copies of Bylaws and organizational minutes for the Foothills Trail Conference. I apologize for the delay in getting these out, but I imagine most of you have had fairly busy summers also.

Hopefully, this fall we will be able to have a directors meeting to get the organization moving toward the attainment of its goals. I will try to give at least one-month's notice of the meeting date.

Hope you have all had nice summers. I look forward to seeing you soon.

Yours very truly,

R. Glenn Hilliard
Assistant Secretary

RGH:scg

Enclosures

Charter

MINUTES OF MEETING
OF
FOOTHILLS TRAIL CONFERENCE

May 22, 1974

The organizational meeting of the Foothills Trail Conference was convened at 2:00 p.m. on May 22, 1974, at Greenville, South Carolina, in the Board Room of The Liberty Corporation. The organizing members present were:

Jim Barrett, USFS
Don Bessinger, SC
Larry Bloomer, CLT
Charles J. Borawa, DPC
Ronald M. Bost, CLT
Miles J. Boyer, CLT
Tom L. Brown, SC
Hank Cheney, DPC
Gene Cocke, USFS
Frank F. Couch, Jr., PRT
Mike Despeaux, SC
Charles Dewey, DPC
Jim Furman, BSC
H. M. Hermelink, CLT
Glenn Hilliard, SC
Wm. K. Marsh, PRT
John B. May, PRT
Dave Robinson, TLC
Jimmy J. Sevic, DPC
Mike Sheriff, SC
Joe F. Watson, PRT

The meeting was called to order by the Acting Chairman, Glenn Hilliard. Members present were introduced. These members included persons affiliated with Crescent Land and Timber Company; Duke Power Company; the Sierra Club; South Carolina Department of Parks, Recreation and Tourism; the United States Forest Service (Sumter National Forest); and the Boy Scouts of America. Invited representatives from Clemson University Department of Recreation and Parks Administration had been unable to attend due to conflicts. Other groups identified as possibly interested in future representation included the Pendleton District Historical Society; the South Carolina Department of Wildlife and Marine Biology; United States Department of Interior, who manages the fish hatchery; and Forest Service representatives from Nantahala National Forest.

The Chairman stated the purpose of the meeting and the proposed Foothills Trail Conference as being the coordination of groups and individuals interested in advancing the completion, maintenance, and proper use of the Foothills Trail. There was general agreement that such a conference was desirable and that the Foothills Trail Conference be organized.

bec. inactive
Glenn in off Duke

Copies of proposed bylaws had been distributed prior to the meeting. After discussion, it was moved, seconded and passed that the bylaws as amended at the meeting be adopted and that said bylaws be attached to the minutes of this meeting as Exhibit A. During the discussion of bylaws, it was agreed that Duke Power Company and Crescent Land and Timber Company are recognized as separate entities.

Election of directors was then carried out. It was suggested that two vacancies be left to allow for possible future representation of other groups, which vacancies may be filled by the Board of Directors. The following were elected directors:

Jim Barrett
Dr. C. D. Bessinger, Jr., M.D.
Larry Bloomer
Charles Borawa
Hank Cheney
Mike Despeaux
Jim Furman
Glenn Hilliard
Dr. William K. Marsh
Jim Sevic
Mike Sheriff
Sam Stokes
Joe F. Watson

Maps of the proposed project corridor were then displayed. Approximately twenty miles of developed trail have already been completed by the Forest Service in Sumter National Forest. It is recognized that some additional corrections of route may be necessary subject to local conditions, but there is a consensus as to the general corridor as presented. A side trail to Horse Pasture Gorge is also contemplated, though Rainbow Falls is not on public land. CLT indicated its plans to designate a natural area around Windy Falls area and either the side trail or the main trail would traverse that area, depending on the site of best crossing of the river there. Dr. Marsh suggested that it would be desirable to have a side trail to the new Keowee State Park under development on S. C. 11 on the eastern shore of Lake Keowee. It was noted that the trail as shown has been routed to avoid known rare botanical specimens. A botanist should examine the route to rule out the presence of rare specimens which would not be able to survive expected trail impact.

Agreements with landowners were then discussed. Members will circulate copies of sample agreements between the Appalachian Trail Conference and its maintenance groups and landowners. Agreements will necessarily vary with the respective owners, and no standard form will be appropriate. Most land along the corridor is currently in multiple use management, and no agreement contemplates alteration of existing rights and authorized uses, though it is hoped that there can be satisfactory control of unauthorized motorized trail use. CLT indicates that it may be necessary to occasionally use certain sections for access for logging, administrative, and fire control purposes where no other corridors are available. Such reservations already apply on existing sections of trail in Forest Service lands.

Duke Power Company indicated that its actions regarding the trail corridor are necessarily tied to the specifications in its Bad Creek Project application now pending before the Federal Power Commission. It was noted that it may be possible to obtain advance approval of the recreation portion of the project application, to permit early construction by Duke Power Company.

There was then discussion of trail standards. It is recognized as desirable to have stated recommended or "ideal" standards which would govern construction, design and placing of signs and blazes, development of limited interpretative program, and camping policy. The Bad Creek Project application, existing Forest Service trail construction standards, agreements between the Forest Service and the State PRT, and other considerations bear upon the adoption of uniform standards. Thus, standards will be further researched by the board.

Development of Trail brochure and other informational materials were then discussed. The Forest Service already has a brochure under development. The Boy Scouts of America is developing materials promoting the eastern portion of the trail as a national historic trail recognized under the Scouting program. Duke

Power Company anticipates a brochure on its section, and sees no problem in incorporating the entire trail concept in a single brochure.

The meeting was then adjourned at approximately 4:30 p.m.

C. D. Bessinger, Jr., M. D.
Acting Secretary

APPROVED:

R. Glenn Hilliard
Acting Chairman

Appendix C

This Appendix consists of an agreement between Duke Power Company and Crescent Land and Timber Corporation which covers the following subjects.

1. Coordination with timber management.
2. Buffer zones along streams, etc.
3. Trail easement (or other instrument).
4. Backcountry access.
5. Use of roads.
6. Camping.
7. Hunter management.
8. Side trails.

CRESCENT LAND & TIMBER CORP.
224 WEST SECOND STREET
P. O. BOX 30817
CHARLOTTE, N. C. 28230

H. M. HERMELINK
PRESIDENT

July 2, 1980

Mr. Charles Borawa
Supervisor of Project Recreation
Duke Power Company
Charlotte, NC

Dear Mr. Borawa:

Crescent Land & Timber Corporation has reviewed the Bad Creek Exhibit R and agrees the hiking trail will be a fine recreation facility for the public.

The entire thirty-five mile section of trail Duke proposes to construct will be located on CL&T property. CL&T will lease Duke a six foot wide trail corridor for the period of the Bad Creek license.

CL&T representative's will work closely with Duke personnel during the construction and operation of the trail. Assistance will be given in the closing of logging roads and the location of camping and access facilities. In addition, CL&T will inform Duke when logging operations or other factors necessitate the relocation of portions of the trail.

CL&T supports the construction of the trail and will cooperate by means of a lease agreement.

Very truly yours,

H. M. Hermelink

HMH:ae

STATE OF NORTH CAROLINA)
:
COUNTY OF TRANSYLVANIA)

STATE OF SOUTH CAROLINA)
)
COUNTY OF PICKENS and)
COUNTY OF OCONEE)

L E A S E

THIS LEASE, Made and entered into as of the 24TH day of JULY, 1981, by and between CRESCENT LAND & TIMBER CORP., a corporation organized under the laws of the State of South Carolina, Lessor, and DUKE POWER COMPANY, a corporation organized under the laws of the State of North Carolina, Lessee;

W I T N E S S E T H :

That Lessor, for and in consideration of the rents to be paid and the covenants and agreements hereinafter expressed, to be kept and performed by Lessee, hereby leases to Lessee and Lessee hereby leases from Lessor, subject to the exceptions and reservations and upon the terms and conditions and for the purpose in this instrument set out, the following property located in Transylvania County, North Carolina, and Pickens and Oconee Counties, South Carolina, described as follows:

Trail: That strip of land six (6) feet in width lying along a line beginning in Pickens County at the property line of Lessor common to Table Rock State Park and meandering in a generally westerly direction approximately 43.3 miles through Pickens and Oconee Counties, South Carolina, and Translyvania County, North Carolina, terminating at the Whitewater River, as shown on map thereof designated Keowee-Toxaway Project, Bad Creek Development, EXHIBIT R, Foothills Hiking Trail, Sheet 1, dated May, 1980, which is attached hereto and made a part hereof.

Access Area No. 1: That lot of land lying in Pickens County, South Carolina, containing 1.1 acres, bounded on all sides by remaining lands of Lessor, as shown on map thereof designated Exhibit B, dated April 3, 1981, marked Dwg. No. K-895-O, copy of which is attached hereto and made a part hereof.

Access Area No. 2: That lot of land lying in Pickens County, South Carolina, containing 0.5 acre, bounded on the east by County Road No. 199, and on all other sides by remaining lands of Lessor, as shown on map thereof designated Exhibit C dated April 3, 1981, marked Dwg. No. K-895-Q, copy of which is attached hereto and made a part hereof.

Access Area No. 3: That lot of land lying in Pickens County, South Carolina, containing 17.1 acres, bounded on the west and north by lands of Champion Paper Corp., on the east and south by the center line of County Road No. 199, as shown on map thereof

designated Exhibit D, dated April 6, 1981, marked Dwg. No. K-895-R, copy of which is attached hereto and made a part hereof.

Access Area No. 4: That lot of land lying in Transylvania County, North Carolina, containing 1.8 acres, bounded on the south by Lake Jocassee, and on all other sides by remaining lands of Lessor, as shown on map thereof designated Exhibit E, dated April 3, 1981, marked Dwg. No. K-895-S, copy of which is attached hereto and made a part hereof.

1. Term: This lease shall begin on August 1, 1981, and shall terminate on July 31, 2027.

2. Annual Rental: Lessee shall pay to the Lessor an annual rental of $355.61 , payable in advance.

Effective August 1, 1986, and on August 1 in every fifth year thereafter, the annual rental shall be adjusted to reflect any increase or decrease in the Consumer Price Index, Urban Wage Earners & Clerical Workers, Southern Region (December 1977 = 100), All Items, published by the United States Department of Labor, Bureau of Labor Statistics. The following formula shall be used:

$$\frac{\text{Current CPI}}{\text{Base CPI}} \times \text{Base Rent } (\$355.61) = \text{Adjusted Base Rent}$$

The Base CPI used shall be the latest bimonthly index published prior to the beginning of the original term of this lease. The Current CPI shall be established as the most recent bimonthly index published prior to the date a rent adjustment goes into effect. If the CPI hereinabove set forth is discontinued and no similar index is substituted therefor, in that event the most nearly comparable index issued by the United States Government or any agency thereof with respect to consumer prices shall be used hereunder. In no event shall the annual rental payable hereunder be less than $355.61 per annum after August 1, 1986.

3. Permitted Uses: The leased premises may be used by Lessee for the construction, operation and maintenance of a hiking trail, parking lots and other associated recreation facilities.

4. Timber Cutting: Lessor agrees to notify Lessee annually of its timber cutting schedule along the trail. Lessor agrees to conduct its timber cutting operations in a manner so as to cause the least disturbance to the leased premises as is practicable. Lessee acknowledges that Lessor shall continue all phases of its intense commercial forest management program on all

of its lands through which the leased premises traverse, excepting only the leased premises from said management program. Lessor specifically reserves the right to build, maintain and use logging roads and skid trails crossing the trail.

5. Relocation: Lessor reserves the right to require relocation by Lessee of any portion of the trail that conflicts with Lessor's use of its property for timber production, development or sale. Lessee, at its expense and within one year from the date of Lessor's request, shall relocate any portion of the trail specified by Lessor and shall close the abandoned portion of the trail to public use.

6. Maintenance: The Lessee will, during the period of this lease, at its own expense, keep the leased premises in a clean and healthy condition. Lessee must comply with all rules, regulations or standards of the South Carolina Department of Health and Environmental Control and any other local, state or federal agency.

7. Transfer or Assignment: The Lessee may not transfer nor assign this lease nor let nor sublet the whole or any part of the leased premises to anyone without the prior written consent of the Lessor.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed, this the day and year first above written.

Signed, Sealed and Delivered
in the Presence of:

Carol Boone

CRESCENT LAND & TIMBER CORP.

By _____
President

Signed, Sealed and Delivered
in the Presence of:

Richard M. Parris

DUKE POWER COMPANY

By _____
Vice President

STATE OF NORTH CAROLINA)
:
COUNTY OF MECKLENBURG)

PERSONALLY appeared before me WAYNE McGEE and made oath that he saw the within named CRESCENT LAND & TIMBER CORP. by H.M. HERMELINK, ___ President, sign, seal and as its act and deed deliver the within written instrument, and that he with HAROLD BOONE witnessed the execution thereof.

SWORN to before me this 24TH)
day of JULY, 1981.)
Sammy W. Cross)
Notary Public for North Carolina)

My Commission Expires 8-6-81

SAMMY W. CROSS NOTARY PUBLIC MECKLENBURG COUNTY, N.C.

STATE OF NORTH CAROLINA)
:
COUNTY OF MECKLENBURG)

PERSONALLY appeared before me H. K. Sledge, III and made oath that he saw the within named DUKE POWER COMPANY by P. H. Mann, Jr., Vice President, sign, seal and as its act and deed deliver the within written instrument, and that he with Richard M. Parris witnessed the execution thereof.

SWORN to before me this 24th)
day of July, 1981.)
Susan S. Davidson)
Notary Public for North Carolina)

My Commission Expires March 21, 1982

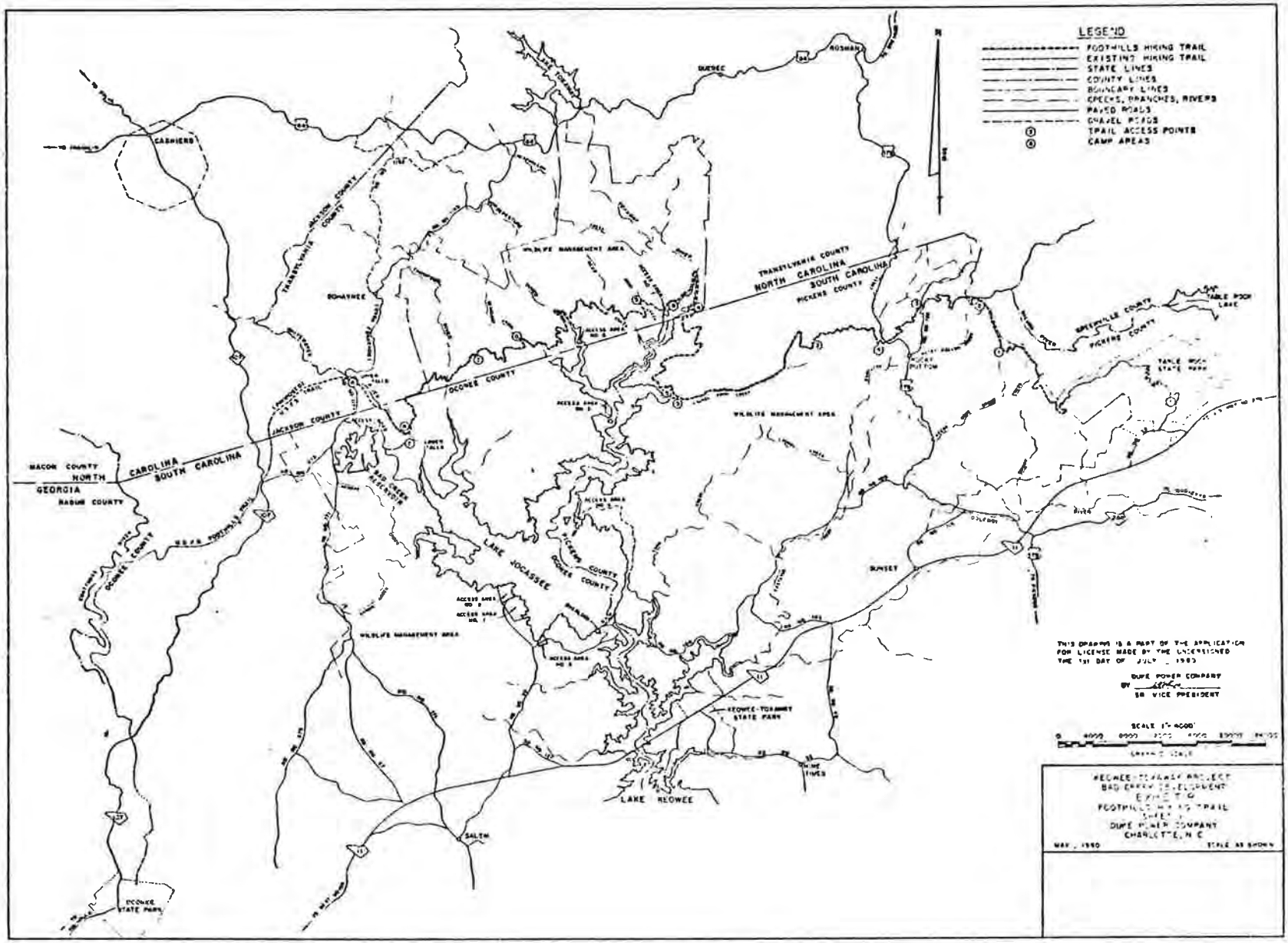
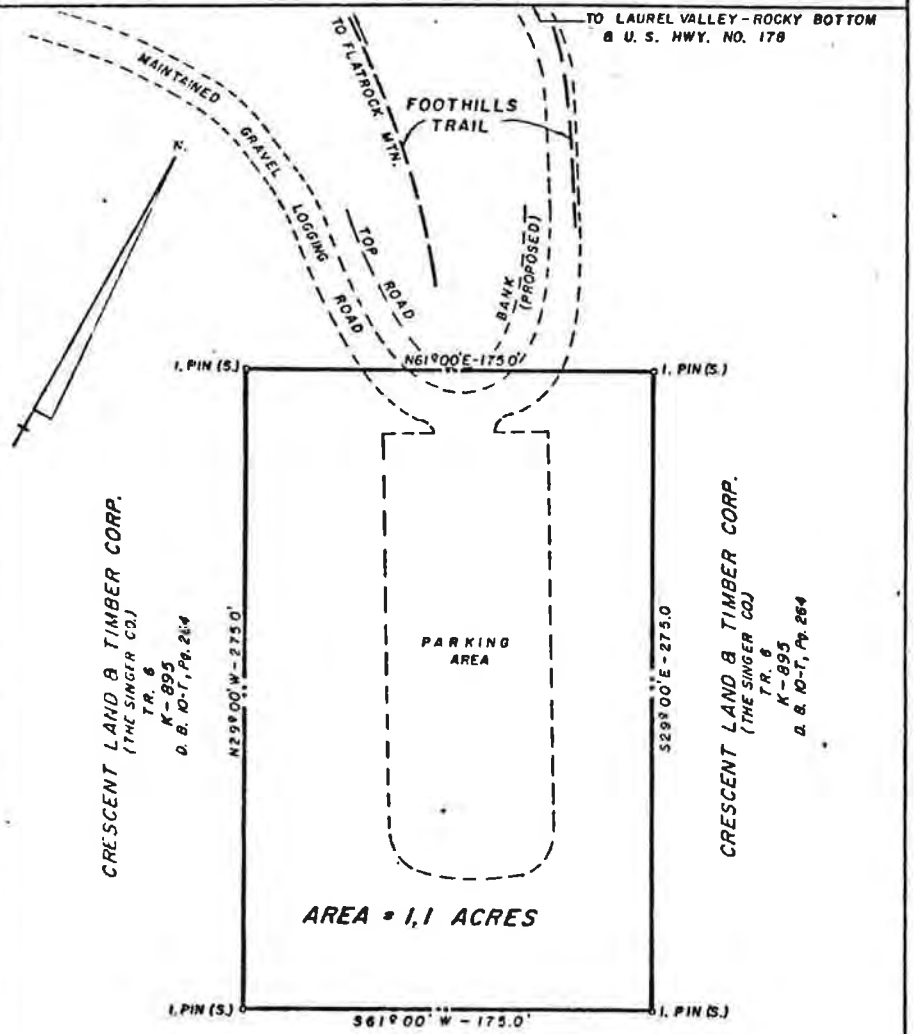

LEGEND
FOOTHILLS HIKING TRAIL
EXISTING HIKING TRAIL
STATE LINES
COUNTY LINES
BOUNDARY LINES
CREEKS, BRANCHES, RIVERS
PAVED ROADS
GRAVEL ROADS
TRAIL ACCESS POINTS
CAMP AREAS
CASHIERS
SAPPHIRE
SCALE 1" = 4000'
DUKE POWER COMPANY
SR VICE PRESIDENT
DUKE POWER COMPANY
CHARLOTTE, N C
MAY , 1980
SCALE AS SHOWN

EXHIBIT B



NOTE:

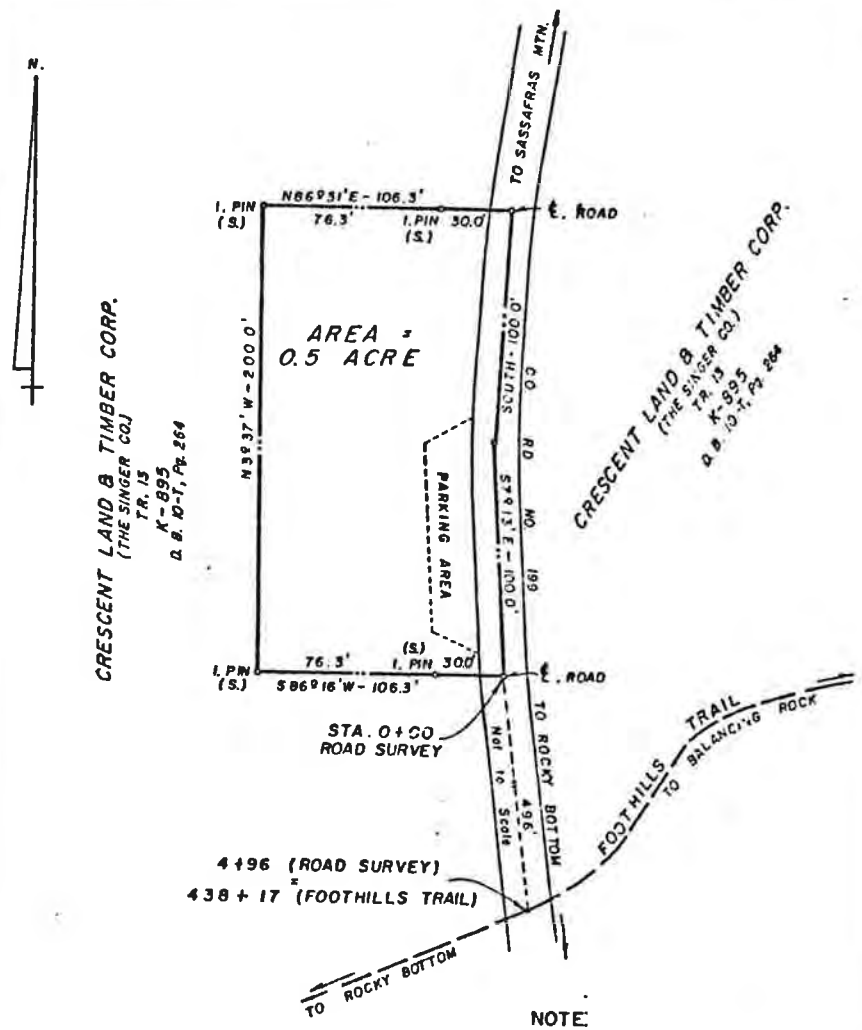
MILL POWER SUPPLY CO. TO CRESCENT LAND & TIMBER CORP. D. B. 12-B, Pg. 122, DATED DECEMBER 23, 1969.

"I Hereby" Certify that the Ratio Of Precision of the field survey is 1: [illegible] as shown and the Area was determined by D.M.D. method of Area Calculation.

Ronald M. Lemmond
S.C., R.L.S. No. 5387
Duke Power Co.
Charlotte, NC

DUKE POWER COMPANY
KEOWEE - TOXAWAY PROJECT
LAUREL VALLEY
FOOTHILLS TRAIL ACCESS
PROPERTY LEASED FROM
CRESCENT LAND & TIMBER CORP.
PICKENS COUNTY, S. C.
SCALE: 1" = 50' APRIL 3, 1981
MISC. BOOK NO 613 DWG. NO. K-895-0

EXHIBIT C



NOTE:

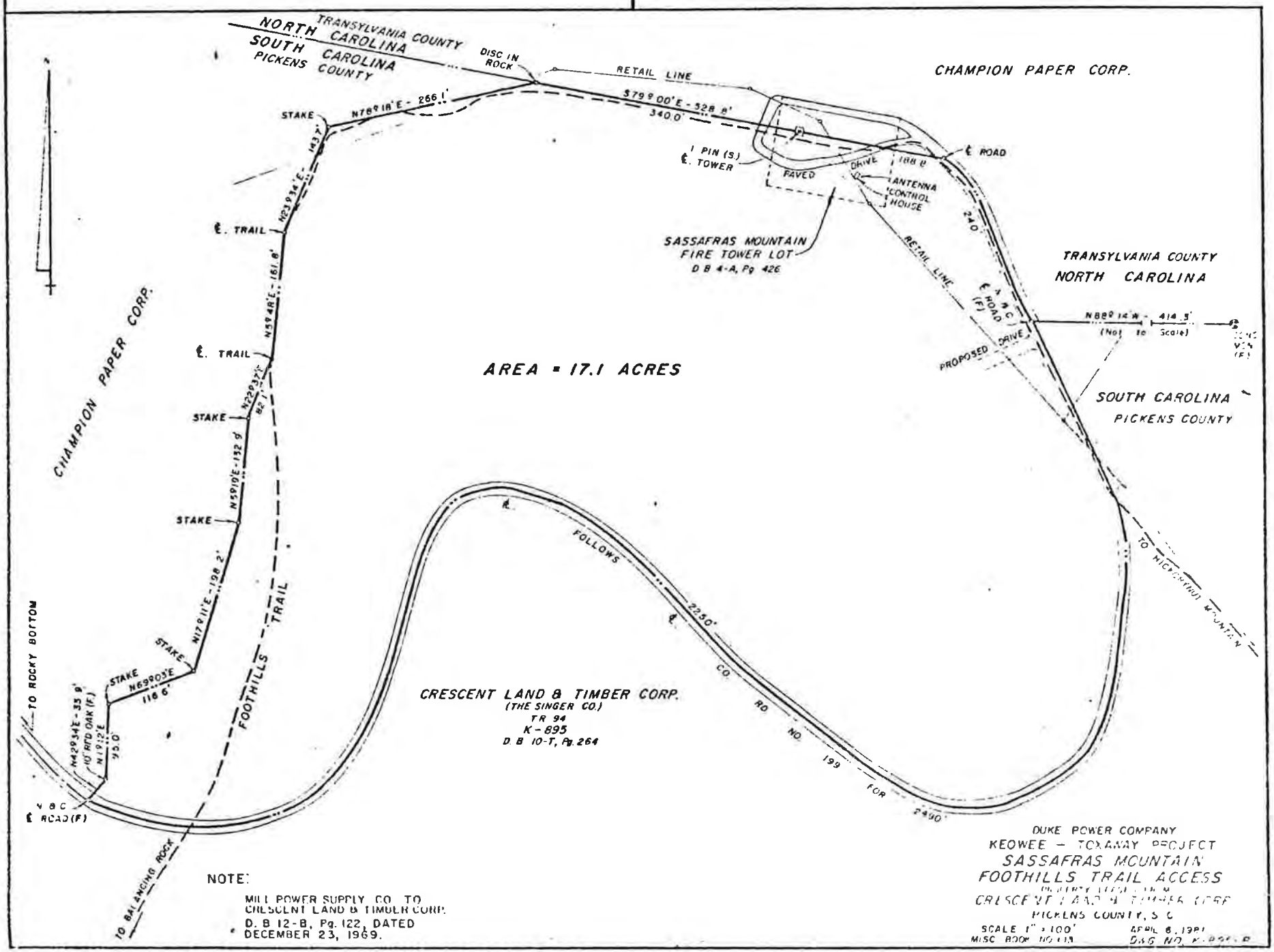
MILL POWER SUPPLY CO. TO CRESCENT LAND & TIMBER CORP. D. B. 12-B, Pg. 122, DATED DECEMBER 23, 1969.

"I Hereby" Certify that the Ratio Of Precision of the field survey is 1: 10,000 as shown and the Area was determined by D.M.D. method of Area Calculation.

Ronald M. Lemmond
S.C., R.L.S. No. 5387
Duke Power Co.
Charlotte, NC

DUKE POWER COMPANY
KEOWEE - TOXAWAY PROJECT
CHIMNEYTOP GAP
FOOTHILLS TRAIL ACCESS
PROPERTY LEASED FROM
CRESCENT LAND & TIMBER CORP.
PICKENS COUNTY, S. C.
SCALE: 1" = 50' APRIL 3, 1981
MISC. BOOK NO. 613 DWG. NO K-895-C

EXHIBIT D

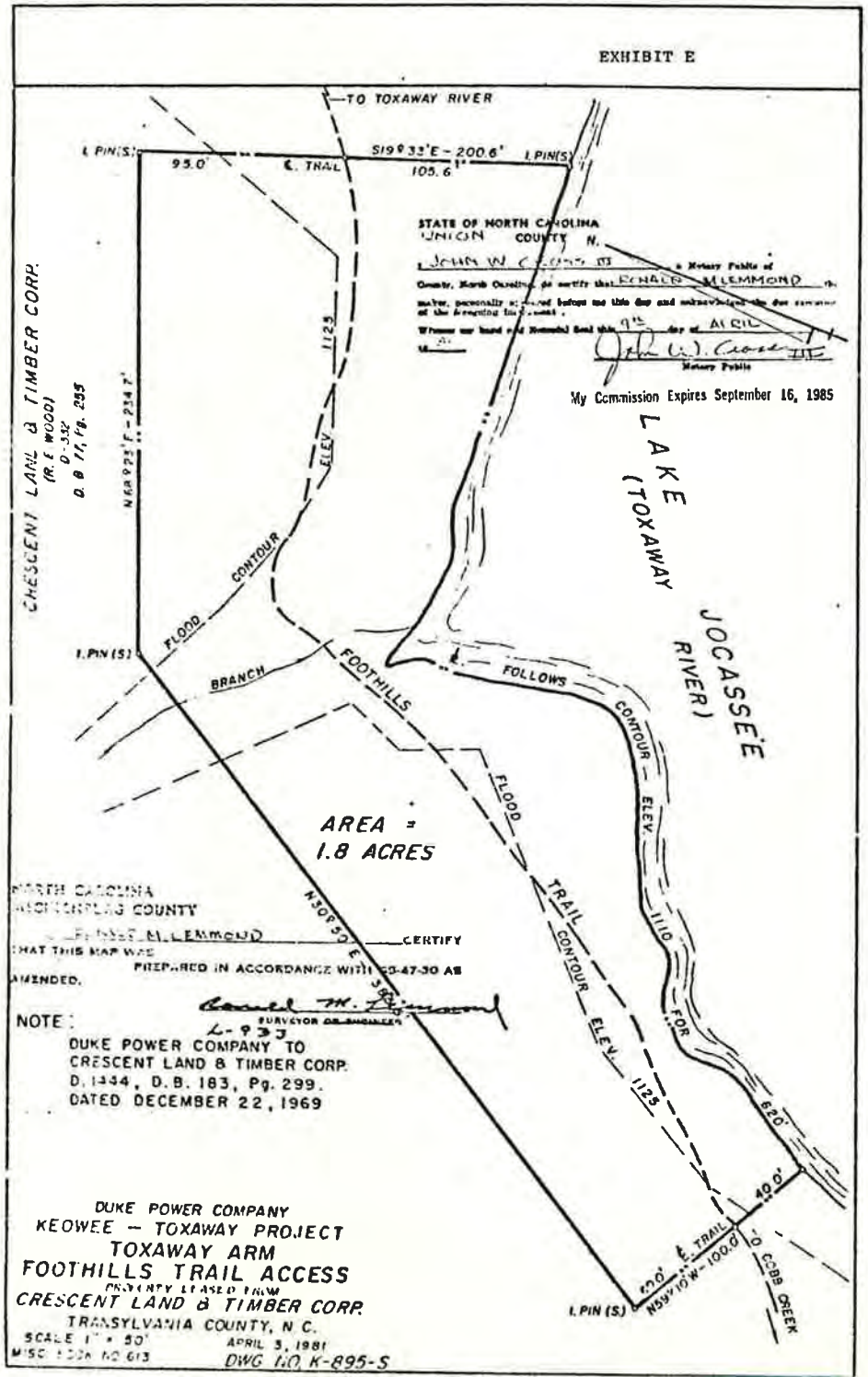


NOTE:

MILL POWER SUPPLY CO. TO CRESCENT LAND & TIMBER CORP. D. B 12-B, Pg. 122, DATED DECEMBER 23, 1969.

DUKE POWER COMPANY
KEOWEE - TOXAWAY PROJECT
SASSAFRAS MOUNTAIN
FOOTHILLS TRAIL ACCESS
PROPERTY LINE SURVEY OF
CRESCENT LAND & TIMBER CORP.
PICKENS COUNTY, S. C.
SCALE 1" = 100' APRIL 6, 1971
MISC. BOOK NO. 13 D&S NO. K-824-B

EXHIBIT E


TO TOXAWAY RIVER
I. PIN(S)
95.0'
℄ TRAIL
S19°33'E - 200.6'
105.6'
I. PIN(S)
STATE OF NORTH CAROLINA
UNION COUNTY
My Commission Expires September 16, 1985
CRESCENT LAND & TIMBER CORP.
(R. E. WOOD)
D-332
D. B. 11, Pg. 235
N88°23'E - 234.2'
1125
ELEV.
CONTOUR
FLOOD
I. PIN(S)
BRANCH
FOOTHILLS
FOLLOWS
CONTOUR
ELEV.
1110
FOR
LAKE
(TOXAWAY
JOCASSEE
RIVER)
AREA =
1.8 ACRES
FLOOD
TRAIL
CONTOUR
ELEV.
1125
620'
40.0'
℄ TRAIL
N10°W - 100.0'
TO COBB CREEK
620'
N50°30'E
I. PIN(S)
NORTH CAROLINA
TRANSYLVANIA COUNTY
CERTIFY
THAT THIS MAP WAS
PREPARED IN ACCORDANCE WITH
AMENDED.
SURVEYOR OR ENGINEER
L-933
NOTE:
DUKE POWER COMPANY TO
CRESCENT LAND & TIMBER CORP.
D. 1434, D. B. 183, Pg. 299.
DATED DECEMBER 22, 1969
DUKE POWER COMPANY
KEOWEE – TOXAWAY PROJECT
TOXAWAY ARM
FOOTHILLS TRAIL ACCESS
PROPERTY LEASED FROM
CRESCENT LAND & TIMBER CORP.
TRANSYLVANIA COUNTY, N. C.
SCALE 1" = 50'
APRIL 3, 1981
MISC. BOOK NO 613
DWG. NO. K-895-S

Appendix D

This Appendix consists of correspondence between Duke Power Company and the USDA Forest Service which addresses the following points.

1. Connections between Duke and Forest Service sections.
2. Coordination in management of the Trail.
3. Participation in the Foothills Trail Conference.
4. Side Trails.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

P.O. Box 749
Highlands, N. C. 28741

REPLY TO: 2353 - Development Trails

May 16, 1980

SUBJECT: Foothills Trail

TO: Mr. Richard K. Thompson
Recreation Assistant
Health & Recreation Services
Operating Department
Duke Power Company
P.O. Box 33189
Charlotte, N. C. 28242

Dear Mr. Thompson:

Regarding the Foothills Trail, the USFS will cooperate with Duke Power Company where the trail crosses National Forest land. The USFS is interested and committed to seeing this trail constructed. At this time, due to budget constraints and other trail priorities we cannot establish a time table for our construction. However, we will try to provide resource assistance when possible.

Sincerely,

BRISCOE PRICE
District Ranger
Highlands District

cc: Forest Supervisor

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
P.O. Box 749
Highlands, N. C. 28741

REPLY TO: 2353 - Development Trails

May 19, 1980

SUBJECT: Foothills Trail

TO: Richard K. Thompson
Duke Power Company
P. O. Box 33189
Charlotte, N. C. 28242

Dear Richard:

Looks like our scouting efforts on the Foothills Trail are receiving favorable attention despite our frustrated marking attempts last Wednesday. As you know, we are presently considering 2 alternatives in connecting to Duke's portion of the trail. The best looking alternative is to connect near Coon Branch and continue upstream along Whitewater River and up the steep slope or river out to the Whitewater Falls Trail. The other alternative is to start at the NC/SC state line between the Thompson and Whitewater rivers.

After talking with District Ranger, Briscoe Price and Melinda Waldrip in our Supervisor's Office, they agree with me in trying to work out the first alternative despite the costs of a major bridge span and approximately 300 yards of steep steps. Seems these structures' cost might be offset by decreased trail construction costs due to a shorter length. This could also be tied to a Whitewater Falls Development Plan.

After reviewing the Exhibit R, I find it thorough and well planned. The USFS recommends that it be approved and trail construction begin as soon as possible. The parts that we hiked, with the exception of the steep area and cliffs near Coon Branch, are well laid out and acceptable to USFS standards.

We are checking into our transportation plan to see if part of the Long Spur Ridge road could be closed as you requested. At this writing no decision has been reached.

Wherever the trail crosses the National Forest, an Environmental Analysis Report (E.A.R.) must be prepared by the USFS prior to any construction by Duke or us. Also, the Foothills Trail can not preclude any USFS management policies. Timber, wildlife, waterm soil control, and recreation will continue to be managed. The USFS will help maintain the trails' integrity and cooperate with Duke on any changes.

We would also like to work with you to encourage the Foothills Trail Council to stay involved and active. A trail logo and blaze need to be designed; this would be an early project to consider.

The USFS is interested and committed to completion of the Foothills Trail as monies become available and priorities allow. We will also work toward establishing it as a National Recreation Trail.

Sincerely,

Terri Sizemore

TERRI SIZEMORE
Outdoor Recreation Planner
Highlands District

c.c. Larry Bloomer
Melinda Waldrep

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
National Forests in North Carolina
P. O. Box 2750, Asheville, N. C. 28802

2300
May 22, 1980

Mr. Richard Thompson
Duke Power Company
P. O. Box 33189
Charlotte, NC 28242

Dear Mr. Thompson:

We have reviewed the proposed route of the Foothills Trail as described in the draft Exhibit R of the Bad Creek Project and find it acceptable. We will continue working with you with the on-the-ground location of the trail segments that cross National Forest land and urge that you begin construction of this trail as soon as possible.

We look forward to our continued participation in the Foothills Trail Council.

Sincerely,

GEORGE A. OLSON
Forest Supervisor

6200-11 (1/69)

Appendix E

This Appendix consists of correspondence between Duke Power Company and the S. C. State Parks Division concerning the connection of Duke's section of Trail and the trail already established within Table Rock State Park at Pinnacle Mountain.

FORM SP-24

SOUTH CAROLINA DEPARTMENT OF PARKS, RECREATION AND TOURISM

MEMO TO: RICHARD THOMPSON **FROM:** MIKE HENDRIX **DATE:** 7/7/80

Mr. Thompson,

In checking over the pamphlet that was sent to me on the Foothills Trail, from Pinnacle mountain to Whitewater Falls, I believe that this will be one of the finest trails in the southeast and a great asset to all hikers. As far as the trail that is to be built from Pinnacle trail that will adjoin your trail I foresee no immediate problems. I appreciate the opportunity to have a small part in this project.

Kindest regards,

Mike Hendrix
Superintendent, Table Rock State Park

cc: Joe F. Watson
Horace Craig
Files

APPENDIX F

Date May, 1980

Type and Number of Recreational Facilities

Actually Installed

Lake Keowee Access Areas

Access Area No.	Acres in Project	No. Launching Ramps	No. Wells	No. Camp Sites	No. Picnic Sites	No. Overlooks	No. Latrines	No. Toilets	No. Toilet Washhouse	No. Swim Areas	No. Bathhouse Toilets	Other
1	63	3	3	0	0	1	0	0	0	0	0	
2	45	2	0	94	2	0	0	0	2	1	1	1 Park Ranger's house
3	30	2	1	0	0	1	0	0	0	0	0	
4	34	2	1	65	34	0	0	1	2	1	1	1 Park Ranger's house
5	27	2	1	0	0	0	0	0	0	0	0	
6	21	2	1	0	0	1	0	0	0	0	0	
7	155	5	2	0	0	2	0	0	0	1	0	
8	88	3	2	0	0	1	0	0	0	0	0	
Totals	463	21	11	159	36	6	0	1	4	3	2	

Date May, 1980

Type and Number of Recreational Facilities

Actually Installed

Lake Jocassee Access Areas

Access Area No.	Acres in Project	No. Launching Ramps	No. Wells	No. Camp Sites	No. Picnic Sites	No. Overlooks	No. Latrines	No. Toilets	No. Toilet Washhouse	No. Swim Areas	No. Bathhouse Toilets	Other
1	100	3	0	0	0	0	0	0	0	0	0	0
2	100	2	0	0	0	0	0	0	0	0	0	0
3	25	4	0	0	0	0	0	0	0	0	0	0
4	20	2	0	0	0	0	0	0	0	0	0	0
5	10	0	1	50	0	0	1	0	0	0	0	0
6	5	0	0	0	0	0	0	0	0	0	0	0
7	5	0	0	0	0	0	0	0	0	0	0	0
Totals	265	11	1	50	0	0	1	0	0	0	0	0

Type and Number of Proposed Recreational Facilities

Shown on Keowee Exhibit R Maps Dated January 23, 1970

Revised February 1, 1971

Lake Keowee Access Areas

Access Area No.	Acres in Project	No. Launching Ramps	No. Wells	No. Camp Sites	No. Picnic Sites	No. Overlooks	No. Latrines	No. Toilets	No. Toilet Washhouse	No. Swim Areas	No. Bathhouse Toilets	Other
1	63	3	2	100	0	1	4	0	1	0	0	
2	37	3	2	0	40	0	1	1	0	1	1	5 Picnic Shelters
3	30	2	1	0	130	1	1	1	0	0	0	
4	34	2	0	10	20	0	0	0	0	1	1	
5	27	2	1	0	130	0	1	1	0	0	0	
6	21	2	1	0	30	1	1	0	0	0	0	
7	135	5	3	386	0	2	1	1	3	1	1	
8	88	3	1	154	50	1	3	1	2	0	0	1 Picnic Shelter
	—	—	—	—	—	—	—	—	—	—	—	
Totals	455	22	11	650	400	6	12	5	6	3	3	

Amendment 1
(Entire Page Revised)

Type and Number of Proposed Recreational Facilities

Shown on Jocassee Exhibit R Maps

Lake Jocassee Access Areas

Access Area No.	Acres in Project	No. Launching Ramps	No. Wells	No. Camp Sites	No. Picnic Sites	No. Overlooks	No. Latrines	No. Toilets	No. Toilet Washhouse	No. Swim Areas	No. Bathhouse Toilets	Other
1	100	3	2	200	100	0	5	0	1	0	0	0
2	100	2	0	0	0	0	1	0	0	0	0	0
3	25	4	0	0	0	0	1	0	0	0	0	0
4	20	2	0	0	0	0	1	0	0	0	0	0
5	10	0	1	50	0	0	1	0	0	0	0	0
6	5	0	1	25	0	0	1	0	0	0	0	0
7	5	0	1	25	0	0	1	0	0	0	0	0
Totals	265	11	4	300	100	0	11	0	1	0	0	0

Amendment 1
(Entire Page Revised)

Appendix G

This Appendix consists of an agreement between Duke and the S. C. Department of Wildlife and Marine Resources which addresses the following points.

1. Hunter management and safety.
2. Reporting and communications.
3. Enforcement.
4. Emergency procedure.
5. Publications.

P. O. BOX 33189

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

TELEPHONE: AREA 704
373-4011

June 27, 1980

Bill Chastain, Chief
Enforcement Division
SOUTH CAROLINA WILDLIFE & MARINE RESOURCES DEPARTMENT
P.O. Box 167
Columbia, S. C. 29210

Dear Mr. Chastain:

The purpose of this letter is to clarify management responsibilities relative to the Foothills Trail, a 35 mile section of backpacking trail Duke Power Company (Duke) proposes to construct on lands owned by Crescent Land and Timber Corporation (Crescent). These lands form the watershed of Lake Jocassee, and the areas in South Carolina are presently managed by the South Carolina Wildlife and Marine Resources Department (The Department) through an existing game management lease agreement between this agency and Crescent. The intent of the Trail Management Agreement proposed herein is to avoid conflict between wildlife, hunting or timber management, and use and management of the hiking trail corridor. Any actions specified in this agreement should therefore be coordinated with Crescent's timber management program and the existing game management activities.

Duke will appreciate your acceptance of the following proposal as a step in accomplishing these goals.

1. Duke Power Company and the Department agree that each will work with the other, insofar that finances and manpower permit, to ensure the safety of hikers on the Trail and prevent the deterioration of the Trail, campsites, access points, access roads and surrounding area. In accomplishing these tasks the following actions are proposed:

   a. A safety alert will be established along the Trail, and educational efforts to make hunters and hikers aware of each others' presence will be instituted.

   b. Camping will be prohibited except at designated camping areas.

   c. Vehicles and horses will be prohibited from using the Trail.

d. Certain access roads (to be identified) will be closed to vehicular traffic and stabilized to prevent erosion.

2. In order to publicize and enforce the actions in paragraph 2., above, Duke will:

   a. Publish (in cooperation with the Foothills Trail Conference) a guidebook specifying camping sites and rules, solid waste handling instructions, foot traffic only policy, safety data and other rules and laws as requested by the Department.

   b. Erect and maintain information signs containing the data listed in "a." above at all the Trail Access Points.

   c. Produce a slide/tape show incorporating applicable Duke and Wildlife policy and regulations, and make this presentation available to local groups.

   d. Erect and maintain gates to close certain backcountry roads.

   e. Stabilize these roads with plantings of wildlife food.

   f. Lock these gates with "keyed alike" locks, and provide the Department with a key.

3. Duke requests that the Department:

   a. Provide signs at the proposed gates prohibiting all but foot traffic beyond the gates.

   b. Enforce rules concerning camping, litter, unauthorized vehicular use of certain roads and applicable fish and game regulations.

   c. Include the Trail on gamelands maps and include the rules and safety notes in paragraph 1., above in the gamelands booklets.

4. Duke requests the Department's cooperation in efforts to:

   a. Develop an interagency communications system to facilitate management of the various uses of these lands.

   b. Coordinate emergency action plans.

   c. Report maintenance, enforcement or other needs to each other.

   d. Work with the Foothills Trail Conference to identify and administer future management needs relative to the Trail.

Duke is very happy with past associations the Company has had with the Department, and we look forward to a continued productive working relationship. Thank you for your consideration of this proposal.

Very truly yours,

R. D. Andrews
Project Recreation

Duke has talked with Mr. Bill Chastain, Chief of Enforcement with the South Carolina Wildlife and Marine Resources Department, concerning the agreement between Duke and the Department. Although a verbal agreement has been reached, no written correspondence has been received to date from the Department.

Appendix H

This Appendix consists of an agreement between Duke and the N.C. Wildlife Resources Commission which addresses the following points.

1. Hunter management and safety.
2. Reporting and communications.
3. Enforcement.
4. Emergency procedure.
5. Publications.

P. O. BOX 33189

DUKE POWER COMPANY
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28242

TELEPHONE: AREA 704
373-4011

June 27, 1980

Richard B. Hamilton
Assistant Executive Director
NORTH CAROLINA WILDLIFE RESOURCES COMMISSION
512 N. Salisbury Street
Raleigh, N. C. 27611

Dear Mr. Hamilton:

The purpose of this letter is to clarify management responsibilities relative to the Foothills Trail, a 35 mile section of backpacking trail Duke Power Company (Duke) proposes to construct on lands owned by Crescent Land and Timber Corporation (Crescent). These lands form the watershed of Lake Jocassee, and the areas in North Carolina are presently managed by the North Carolina Wildlife Resources Commission (The Commission) through an existing game management lease agreement between this agency and Crescent. The intent of the Trail Management Agreement proposed herein is to avoid conflict between wildlife, hunting or timber management, and use and management of the hiking trail corridor. Any actions specified in this agreement should therefore be coordinated with Crescent's timber management program and the existing game management activities.

Duke will appreciate your acceptance of the following proposal as a step in accomplishing these goals.

1. Duke Power Company and the Commission agree that each will work with the other, insofar that finances and manpower permit, to ensure the safety of hikers on the Trail and prevent the deterioration of the Trail, campsites, access points, access roads and surrounding area. In accomplishing these tasks the following actions are proposed:

   a. A safety alert will be established along the Trail, and educational efforts to make hunters and hikers aware of each others' presence will be instituted.

   b. Camping will be prohibited except at designated camping areas.

   c. Vehicles and horses will be prohibited from using the Trail.

d. Certain access roads (to be identified) will be closed to vehicular traffic and stabilized to prevent erosion.

2. In order to publicize and enforce the actions in paragraph 2., above, Duke will:

   a. Publish (in cooperation with the Foothills Trail Conference) a guidebook specifying camping sites and rules, solid waste handling instructions, foot traffic only policy, safety data and other rules and laws as requested by the Commission.

   b. Erect and maintain information signs containing the data listed in "a." above at all the Trail Access Points.

   c. Produce a slide/tape show incorporating applicable Duke and Wildlife policy and regulations, and make this presentation available to local groups.

   d. Erect and maintain gates to close certain backcountry roads.

   e. Stabilize these roads with plantings of wildlife food.

   f. Lock these gates with "keyed alike" locks, and provide the Commission with a key.

3. Duke requests that the Commission:

   a. Provide signs at the proposed gates prohibiting all but foot traffic beyond the gates.

   b. Enforce rules concerning camping, litter, unauthorized vehiclar use of certain roads and applicable fish and game regulations.

   c. Include the Trail on gamelands maps and include the rules and safety notes in paragraph 1., above in the regulations booklets.

4. Duke requests the Commission's cooperation in efforts to:

   a. Develop an interagency communications system to facilitate management of the various uses of these lands.

   b. Coordinate emergency action plans.

   c. Report maintenance, enforcement or other needs to each other.

   d. Work with the Foothills Trail Conference to identify and administer future management needs relative to the Trail.

Duke is very happy with past associations the Company has had with the Commission, and we look forward to a continued productive working relationship. Thank you for your consideration of this proposal.

Very truly yours,

R. D. Andrews
Project Recreation

North Carolina
Wildlife
Resources Commission
Street, Raleigh, North Carolina 27611

July 2, 1980

Mr. R. D. Andrews
Project Recreation
Duke Power Company
General Offices
P. O. Box 33189
Charlotte, North Carolina 28242

Dear Mr. Andrews:

This is to acknowledge receipt of the proposed trail management agreement contained in your letter of June 27, 1980. The Commission agrees to participate in management of the trail as specified in sections 3 and 4 of the proposal.

A trail of this type should be an asset to hunters and fishermen by providing additional access to backcountry areas. The Commission looks forward to your completion of the trail.

Please coordinate through Grady Barnes, Assistant Chief, Division of Game, as you implement the various steps within the agreement.

Sincerely,

Richard B. Hamilton

Richard B. Hamilton
Assistant Executive Director

RBH/bbp

Daniel R. Duncan, Jr., Stoneville
Kitchin, Rockingham
Thomasville
Powers, Lake Lure
Clinton

Appendix I

This Appendix consists of a copy of the Appalachian Trail Standards and a letter authorizing their use by Duke and the Foothills Trail Conference.

P. O. BOX 236
HARPERS FERRY, W. VA. 25425
TELEPHONE (304) 535-6331

APPALACHIAN TRAIL
MAINE TO GEORGIA

December 12, 1977

Charles J. Borawa
Supv., Project Recreation
Duke Power Company
422 South Church Street
Charlotte, NC 28201

Dear Mr. Borawa:

Thank you for your letter of November 21, 1977. You may certainly have our permission to use information contained in the Location and Design Criteria for the Appalachian Trail. Please include our address in the credit line.

Best wishes in your endeavor.

Sincerely yours,

Lyn Anderson

Lyn Anderson
Editor

LA/de

George M. Zoebelein
Chairman of the Board
Stephen Clark
Thurston Griggs
Charles L. Pugh
Vice-Chairmen

William R. Nelson
Treasurer
Charles Sloan
Secretary
Norman A. Greist
Corresponding Secretary

Robert D. Proudman
Emerson L. Harrison
Laurence R. Van Meter
Elizabeth D. Levers
Donald B. Derr
Timothy J. Sullivan

Malcolm L. White
Henry J. Finerfrock
Robert E. Reinhard
Ruth E. Blackburn
Raymond H. Fadner
Edward B. Garvey

Arch Nichols
Hollyce Highfill
Edwin R. Page
W. Alfred Thompson
James L. Botts
Julian R. Little

Henry W. Lautz
Executive Director

A Volunteer, Non-Profit Corporation Dedicated To The Maintenance And Preservation Of The Appalachian Trail.

100% Recycled Paper

DUKE POWER COMPANY
P. O. BOX 2178
GENERAL OFFICES
422 SOUTH CHURCH STREET
CHARLOTTE, N. C. 28201
TELEPHONE: AREA 704
374-4011

November 21, 1977

The Appalachian Trail Conference
P. O. Box 236
Harpers Ferry, West Virginia 25425

Dear Sirs:

I am writing in behalf of the Cherokee Foothills Trail Conference. This conference was formed to coordinate the different groups involved in building the partially completed Cherokee Foothills Trail in North and South Carolina.

In conjunction with the conference it was decided to develop trail criteria and standards. The information contained in the Location and Design Criteria for the Appalachian Trail is very complete and can be applied to the Cherokee Foothills Trail.

With your permission the Cherokee Foothills Trail Conference would like to utilize much of the information in your publication for our Guidelines for the Location and Design of the Cherokee Foothills Trail pamphlet. In some cases only the trail name will be changed.

I believe using proven existing design will benefit the user and be more efficient.

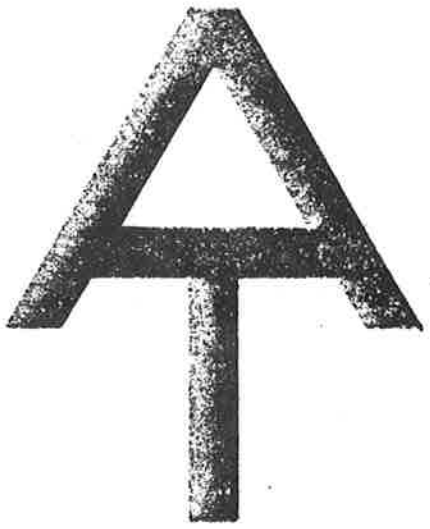
I will be available to answer any questions you may have.

Yours very truly,

Charles J. Borawa
Supv., Project Recreation

CJB/bkt

LOCATION AND DESIGN CRITERIA



DEVELOPED BY
DIVISION OF ENGINEERING
U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SOUTHERN REGION
1970

CONTENTS

	Page
POLICY	1
PLANNING	2
Philosophy	2
Magnitude of Planning	2-3
Trail Class	3
Actual Planning (first stage)	3-4
Actual Planning (second stage)	4
LOCATION CRITERIA	5
Specific Location Criteria	
General Situation	6
Scenic Considerations	6
Cultural Features	6
Large River, Highway and Railroad Crossings	6-7
Small River and Stream Crossings	7
Provisions for User Facilities	7
DESIGN CRITERIA FOR CONSTRUCTION AND MAINTENANCE	8
Tread	8
Alignment	8-9
Grade	9-10
Drainage	10
Clearing	10-11
Road Crossings	11
Signs	11
Appalachian Trail Route Marking	12
Entrance Signs	12
Topography signs, features and places	12
Directional Signs	12
Shelter Signing	12
Facility Signing	12
Facilities	13
Sanitation	13
TITLE 2300 - RECREATION MANAGEMENT	14

LOCATION AND DESIGN CRITERIA FOR THE APPLACHIAN TRAIL

Policy

For a trail 2000 miles long, passing through a wide variety of forest growth and over widely differing terrain, there can be few absolute maximums. Guidelines must be sufficiently flexible so that the desired objectives of providing the trail traveler with the highest quality recreation experience feasible over the entire length of the trail is assured.

The Appalachian Trail shall be located, constructed and maintained to protect the national scenic criteria as outlined in Public Law 90-543, and not allowed to deteriorate. Scenic, historical and natural qualities, within the influence zone, must be maintained to assure an optimum outdoor recreation experience. The location and design guidelines will assure that the trail blends harmoniously with the topography and vegetative cover and provides maximum scenic quality.

It is not the purpose of design criteria to make every section of the Appalachian Trail look like every other section. On the contrary, variety in the way the trail lies on the land and in the way it is built is desirable, provided that the overall character of the trail is not damaged.

Cherokee Foothills [redacted] TRAIL PLANNING

C. F

The ~~Appalachian~~ Trail has been in existence for many years, but there is still a great need for planning the management of the trail.

There are sections of the trail where the level of recreation experience has deteriorated due to incompatible uses. There are sections where the experience level could deteriorate due to encroachment of incompatible uses within the influence zone.

Some sections may need to be relocated. We must study the need for establishing side and connecting trails as part of the forest development trail system or as components to the Appalachian Trail. On sections of the trail where no relocation is needed there is a need to determine the level of recreation experience the trail now offers and establish rules of use and management practices that will assure this level of experience will not deteriorate.

Recreation experience levels are discussed in FSM 2330.5--3 exhibit 1.

Philosophy

A. Why plan a trail system?

1. Provide for levels of recreation experience on the National Forests that could not be provided for without a trail system.

2. To service the need of the public.

3. To control and properly administer the use of the National Forests.
   a. To protect the resources
   b. For the safety of the public using the National Forests
   c. To improve public relations
   d. To coordinate with other uses

4. Provide access for the public to use and enjoy large areas of the National Forests that are not served by roads and areas where roads would be detrimental.

5. Control incompatible uses on National Forest lands.

6. To give guidance to the trails program to meet present and future needs.

MAGNITUDE OF PLANNING AND SOURCES OF INFORMATION THAT MAY AID IN DOING THE APPALACHIAN TRAIL PLANNING JOB

A. Determine present needs and type or types of use for each section of the trail or proposed side or connecting trail.

Sources of information that may be helpful are:

1. Forest Service multiple use guidelines and plan.

2. Forest Service resource plans such as Timber, Recreation and Wildlife.

3. Contacts with public and other agencies.
   a. Local, State and National Clubs and organizations
   b. Key individuals
   c. State Parks Department
   d. National Park Service and other Federal Agencies
   e. Bureau of Outdoor Recreation
   f. Youth organizations at District and State levels

4. National scenic trails act and supporting documents.

B. Determine if the Forest has suitable resources to serve the needs developed in "A" above. If the National Forest can serve these needs then a side, loop, or connector trail should be considered.

DETERMINE THE CLASS OF TRAIL THAT WILL SERVE THE INTENDED USE

For the Appalachian Trail this is established as primarily a hiker trail. Therefore, the class or guidelines for the trail is established under location criteria.

Actual Planning

A. First Stage

1. Assign recreation experience levels to each section of the existing trail.

2. Based on type of trail needed consider the following: (We propose the method of planning as basically outlined in "Design with Nature" by Ian L. McHarg.)

Positive values

a. Historic sites
b. Water falls
c. Mountain peaks
d. Old house places
e. Special vistas
f. Views of lakes or streams
g. Unusual species of trees and plants
h. Existing trails
i. Trees with unusual character

Negative values

a. Safety of users
b. Damage to resources such as soil, water, timber, wildlife recreation development, etc.
c. Construction problems
d. Rights-of-way
e. Maintenance problems
f. Regulation of use problems
g. Lack of sources of water along trail
h. Clean up problems
i. Disturbance of ecology
j. Steep grades
k. Conflicting uses

Consider all values whether negative or positive for use in developing the overlay system. Negative values should be plotted on overlays first and a general corridor established. Positive values and points of interest will be plotted on the general corridor to determine final corridor. Establish corridor on "A" map (1/2 scale).

B. Second Stage

1. Use information on "A" map, overlays, design criteria, aerial photos, and contour maps for making schematic drawing of the trails as "B" maps.

2. Prepare construction or reconstruction cost estimates.

3. Funding - Funds for trail construction and maintenance are programmed on the same basis as road funds (see FSM 6510.43a)

4. Put trail data on inventory record forms 7700-9t.

C. Trail planning will include trail related facilities such as: shelters, parking areas, water supply and sanitation facilities. Shelters and other camping sites should be located near a source of water. The shelter must be at least 1.0 miles and preferably further from the nearest road crossing. Except and where the shelter locations are influenced by a road crossing, they should be located about one days journey (6 to 9 miles) apart.

LOCATION CRITERIA

The present trail is a composite of various trail types: old abandoned logging roads, graded forest and park trails, roughly graded and cleared trails. The trail passes through a variety of situations from the top of scenic mountains to the center of towns.

It is considered neither necessary nor desirable to attempt complete standardization through extensive relocation. Relocation of the trail should be made only after consideration of possible alternatives and if the recreation experience can be improved above the already established level.

The use of side, connecting and loop trails that are components of the Appalachian Trail will also be governed by this criteria.

Trail sections following old roads which have become badly eroded and which are not aesthetically pleasing should be relocated or the erosion corrected.

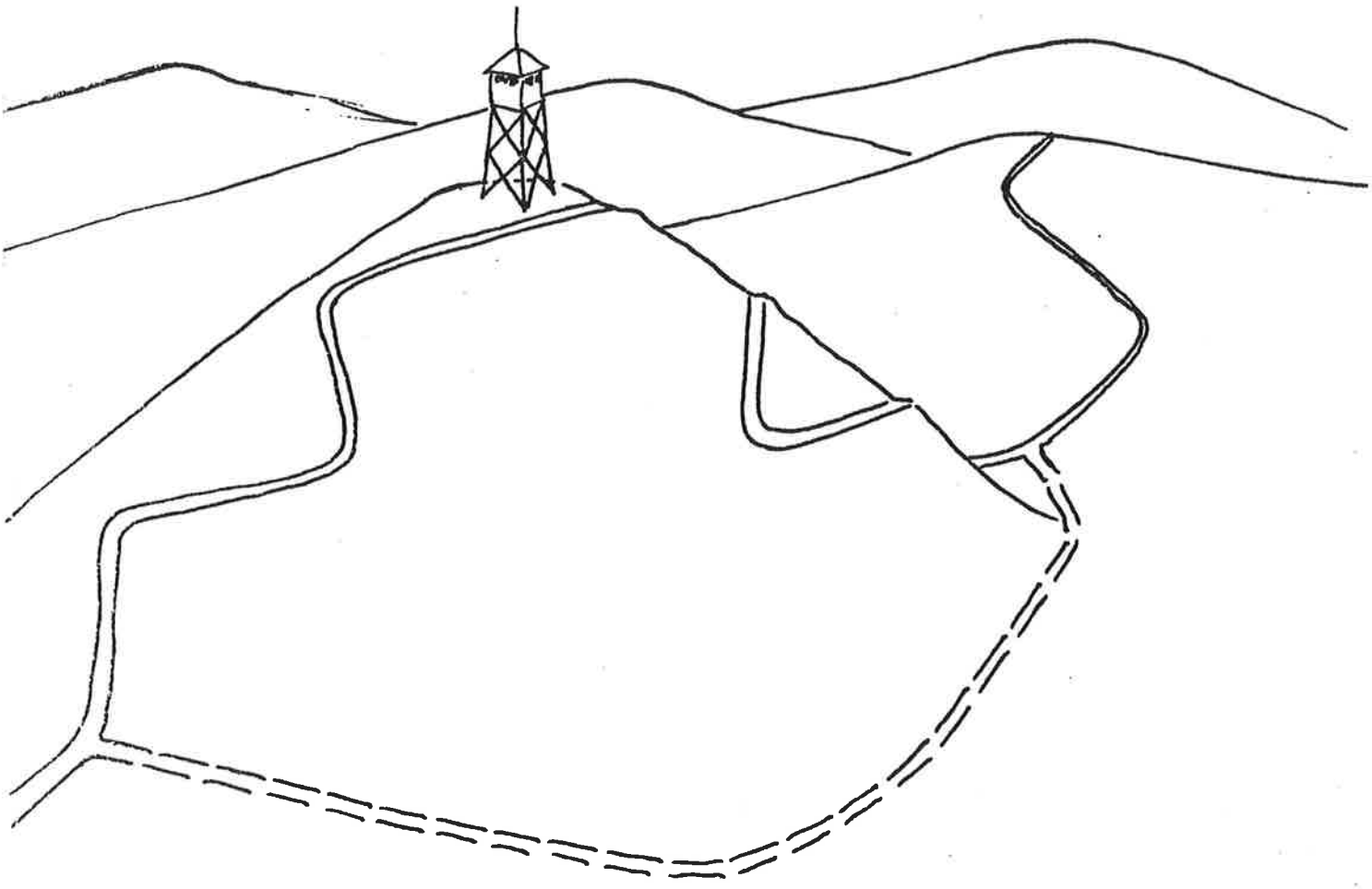
Sections passing through residential or commercial areas should, in general, be relocated provided there are better locations available. Exceptions may be made when the existing commercial establishments are deemed of benefit to the trail traveler.

The trail is meant to be a foot-path in a near natural environment. This means there will be some rough spots, some sections difficult to traverse. It would be a mistake to attempt to eliminate all such places. In some cases, side trails should be provided to by-pass difficult areas at the hiker's discretion. As an example, the main trail should still be located over the top of a rough peak giving a scenic view, while the side trail could contour around the peak allowing the hiker an alternate route.

The most desirable relocation will avoid roads, mining areas, power and telephone lines, commercial and industrial developments, fences, and other features incompatible with the natural conditions of the trail. Where the trail encounters these developments, the relocation should be planned so as not to adversely affect or conflict with the purpose of the development or the trail.

Natural vegetation, topography, or plantings should be used to screen objectionable features or activities from the view of the trail user.

The choice between the crestline ungraded trail, with numerous ascents and descents, and a non-crestline trail, graded around minor summits in order to provide a more gentle and continuous ascent, depends on several things. If there are few views or other attractions, the latter may be preferred. On the other hand, the hiker may feel short-changed if the trail fails to lead to a major summit. Views or interesting geology will almost always dictate the crest route. Most hikers will accept additional effort when so rewarded, but would greatly prefer not to go repeatedly up and down for no obvious reason. An artful blending of a crestline and noncrestline trail is best.



In some cases, side trails should be provided to by-pass difficult areas at the hikers discretion

Specific Location Criteria

General Situation. The trail should be located to:

_____ fit the land.
_____ give the feeling the land mass is below rather than above the traveler.
_____ prevent monotony and provide seclusion by curving with the land rather than cutting across the land, and have a gently undulating grade as opposed to a long uniform grade.
_____ complement the current or planned use of the land.
_____ avoid, or lead users away from heavily used areas or those of potential concentration when desirable.
_____ provide for maximum outdoor recreational potential.
_____ give consideration of the total cost of providing and operating the trail.
_____ avoid, if practical, areas of unstable soil or geology.

Scenic Considerations. The trail should be located to:

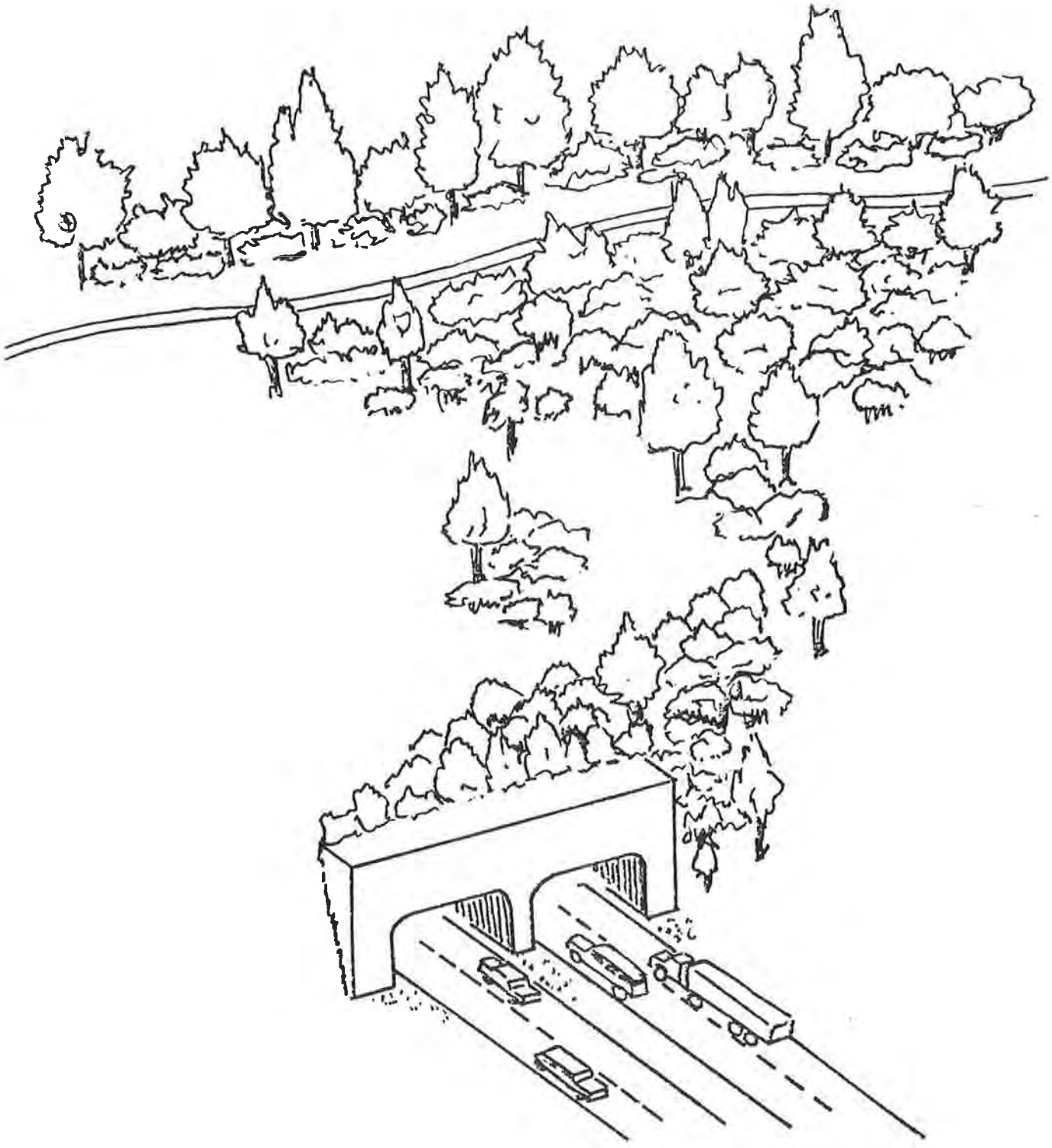
_____ display a great variety of natural beauty and expanses of panoramic scenery from a position of height.
_____ blend with the terrain by taking full advantage of the natural topography and vegetation and harmonize with the environment.
_____ present distant views by traversing ridge tops, through sparsely timbered areas, and alongside natural openings.
_____ encounter a variety of vegetative types.
_____ provide occasional views of the mountain crest, when the trail is located a considerable distance from the crest.
_____ provide the most favorable and impressive approach to special scenic attractions.

Cultural Features. The trail should be located to:

_____ when appropriate, and will add to the trail's value, provide views and sounds of mans' activities such as, raising and harvesting crops, livestock ranching, and timber harvesting.
_____ have a natural or planned screen, such as topography or vegetation, protecting the user from viewing some aesthetically objectionable activities.
_____ route side, loop and connector trails through new vegetative growth in cut-over timber areas if the location passes logically through these areas. Provide for good explanations of the reason for new growth or cut-over areas.

Large River, Highway and Railroad Crossings. (Where a grade separation must be used) The trail should be located to:

_____ coordinate plans with future highway construction to make the crossings aesthetically pleasing as possible, and to maintain



Coordinate plans for future highway construction, to maintain the recreation experience by the use of grade separation designs

the recreation experience by the use of special grade separation designs.

_____ provide safe crossings by means of bridges or underpasses except at low volume roads or railroads that can be safely crossed on grade.

_____ provide adequate visibility when roads or railroads of low traffic volume are crossed at grade.

_____ take advantage of natural or existing features to afford an easy crossing without breaking the continuity of the trail.

_____ utilize, where practical, existing crossings of multi-laned freeways or major rivers, where the cost of providing an exclusive crossing would be prohibitive.

_____ cross man-made features such as roads, aqueducts, and power transmission lines in such a fashion as to avoid prolonged visual contact with this type of environmental feature.

_____ provide parking areas, and solid waste collection facilities and access where the trail crosses roads or other transportation facilities.

Small River and Stream Crossings

_____ The trail should be located to take advantage of natural crossing of small streams.

_____ If there is a choice between stepping stones made of native rock or a bridge, the stepping stones are preferred.

_____ If a bridge is required it should be designed to fit the surrounding topography and made of materials that will blend with surrounding environment.

Provisions for User Facilities: The trail should be located to:

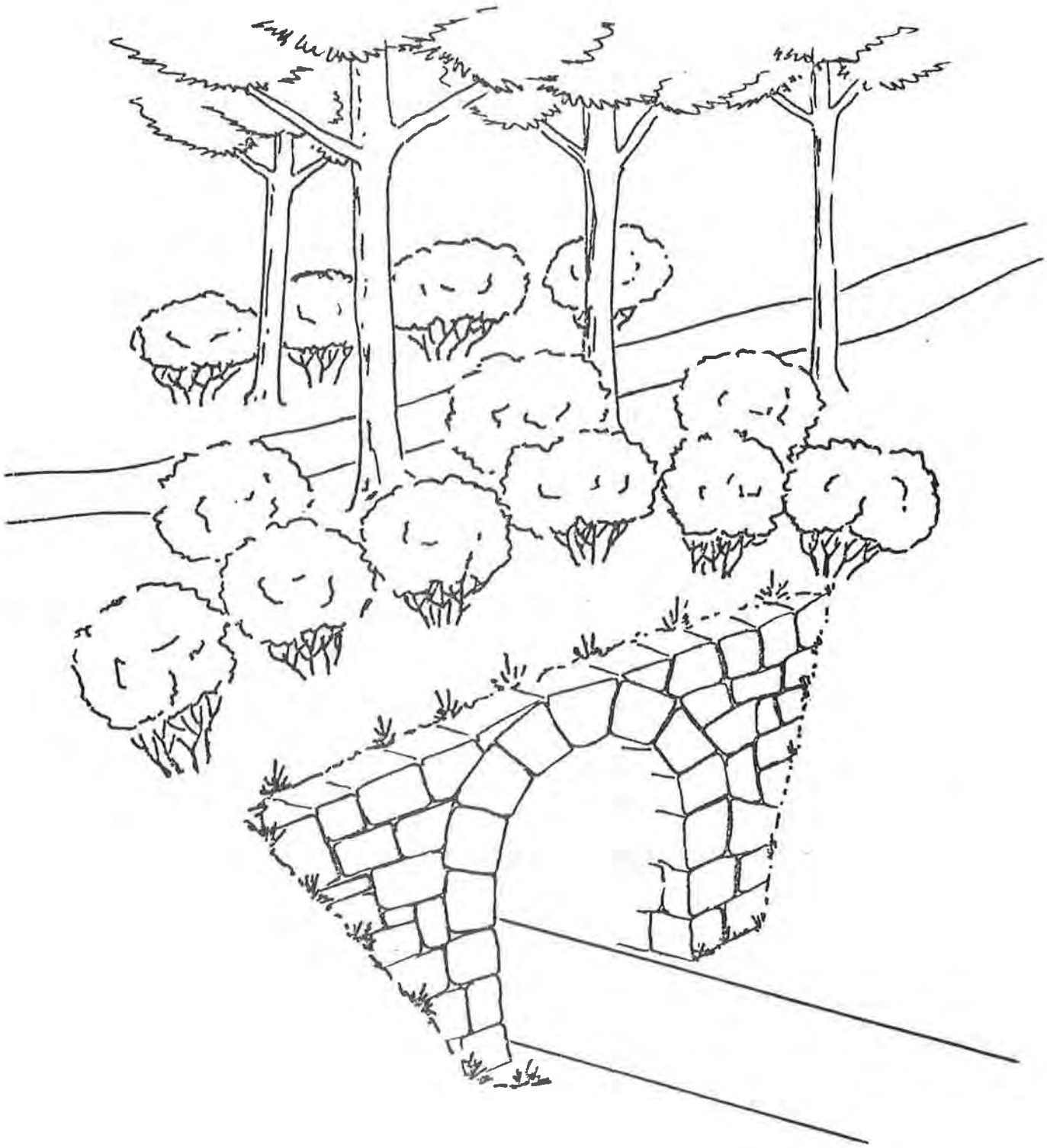
_____ take advantage of opportunities to provide drinking water to users.

_____ take advantage of nearby areas where trailhead facilities can be located. These include parking lots, and small roadside picnic areas.

_____ provide garbage collection facilities at road crossings where feasible.

_____ be near areas where adequate sanitary facilities can be provided along the more heavily used portions of the trail.

_____ properly sign the trail to provide the hiker with adequate information and direction.



Provide safe crossing by means of bridges or underpasses on high volume roads

DESIGN CRITERIA FOR CONSTRUCTION AND MAINTENANCE

The trail should be designed, constructed and maintained so as to have as little impact as possible on the environment.

It must provide for protection of the adjoining resources, safety of the user and consideration of volume of traffic.

Tread

A natural footpath made by the tread of those walking on it is preferable to grading or other physical disturbance of the ground cover. On steep side slopes where excavation of tread is required, the tread width will be the minimum required for safety of the hiker and protection of resources.

It should be recognized that wide trails encourage conflicting uses by motor bikes, horses, and jeeps and should be avoided wherever possible.

Much of the trail will be a graded trail due to steep side slopes. Here grading accomplishes three things:

1. It defines the trail route.
2. It minimizes erosion.
3. It makes a more level footway, so that the hiker is not walking on the sides of his feet.

Grading should not, in general, be used when:

a. The trail follows the top of the ridgecrest.
b. through fields and meadows, and
c. the slope at right angles to the trail is 20% or less

The trail should be constructed of in-place material as much as possible. Gravel and paving should be used only as a last resort for construction material. When grading is required, the tread width is normally constructed to a width of 18" to 24".

When a mechanical trail grader is used, special care must be taken not to overbuild the trail. The tendency is to over excavate with mechanical graders. Therefore, twenty-four inches should be held as the maximum width when machinery is used unless a wider width is needed for safety of the hiker. The trail will not be overbuilt to make use of existing equipment or for economical reasons.

Alignment

The alignment must fit the ground. Sharp angular turns that conflict with the ground topography shall be avoided.

Long tangents or straight sections of the trail will be avoided. (On flat ridges the trail should be "snaked" to take care of vistas on either side of the ridge.)

A natural footpath made by the tread of the hiker is preferable to grading on flat slopes (20% or less)

24 inches should be the maximum width when machinery is used unless a wider width is needed for the safety of the hiker.

The trail should be located to allow drainage of water to flow off the trail and not run along the tread.

Switchbacks afford many problems and unless they are constructed properly they do not fulfill their purpose. On a hiking trail the biggest problem is short-cutting the switchback.

Switchbacks should be so designed that short-cutting them is neither easy nor obvious. This means that closely-spaced short switchbacks must be avoided. Placing the switchback around large boulders, locating them in thick vegetation growths, and using small ridges and knolls to swing the trail around, are all suggestions that could be used. Generally, it is best to locate the switchbacks first and then locate the trail to it.

A general rule of thumb: If the hiker first sees the back trail, three steps away from the switchback, from either direction, it is a good location.

The purpose of a four foot radius of the switchback is not for negotiating the turn, but to get as much distance between the legs of the turn as possible.

Grades should not be flattened near switchbacks.

Grade

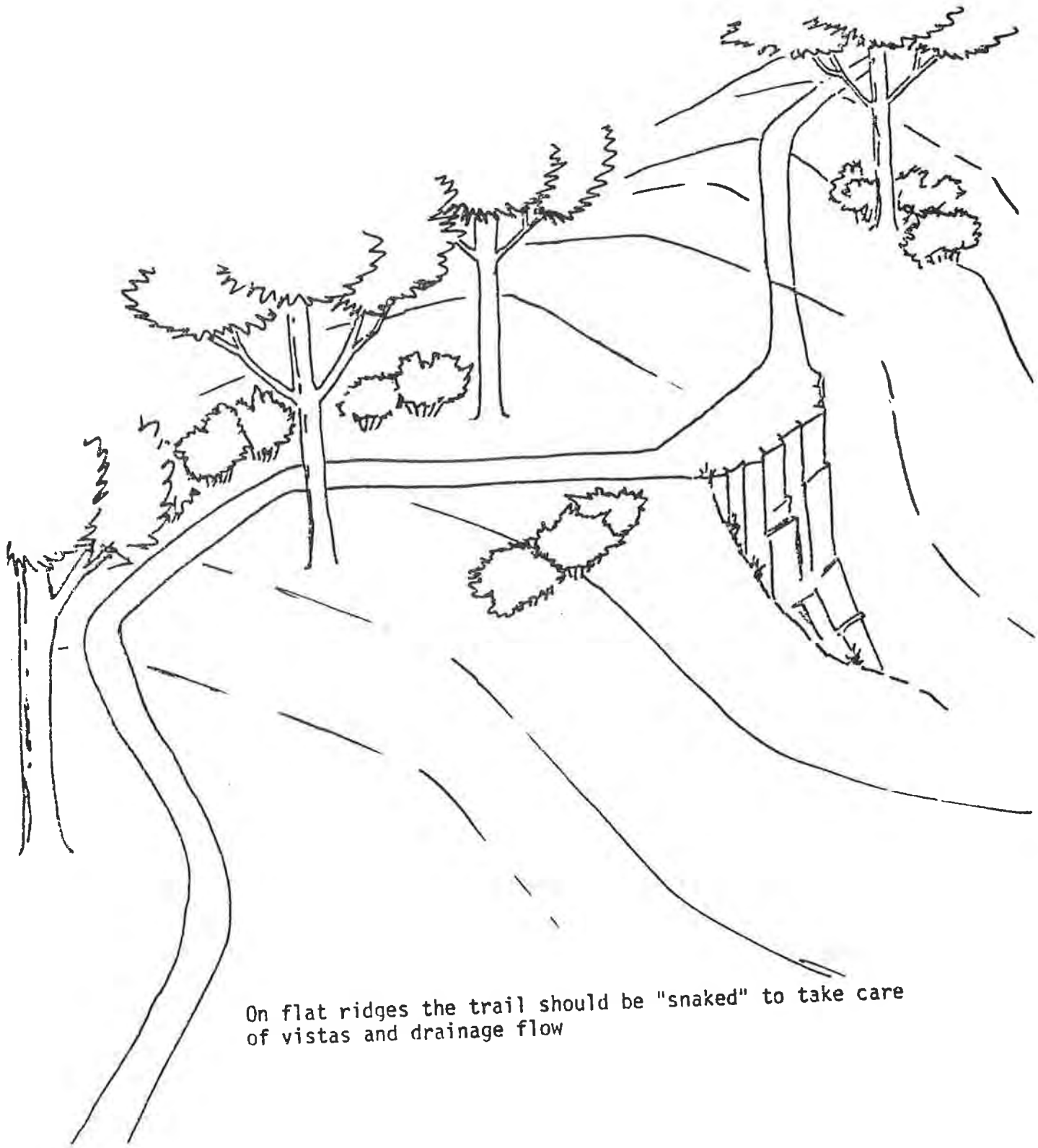
The acceptable grade depends, to a high degree, on the terrain and other local circumstances. In places where the soil structure and ground cover are not susceptible to erosion, the generally steeper grades may be expected, or even preferred. The alternatives to a "straight up" steep trail with no erosion are short legged switchbacks, and extensive re-routing.

In no case will the grade be steeper than the soil structure will allow. No visual erosion will be permitted.

There are existing grades on the Appalachian Trail that for short sections reach 30% and over. There is no erosion and the relocation or adding switchbacks is impractical. These grades are acceptable.

There are other sections where the grades are relatively flat but there is erosion. These sections must be relocated or the erosion corrected by other means.

It is impractical to set a maximum grade since the whole section of the trail must be considered in the grade concept. A section 100 feet long at 45% slope, may be perfectly acceptable. However, for a long pull any grade over 15% must be critically reviewed to assure we are not wearing the trail hiker out by not allowing flatter grades that would allow the hiker a chance to rest without stopping.



On flat ridges the trail should be "snaked" to take care of vistas and drainage flow

If extremely steep sections are justified for developing variety in the trail, or reaching a scenic peak, an alternate route should be provided that would allow the hiker the option of relatively flat grade.

The grade should be undulating with the natural ground. This helps to assure that water will flow off the trail rather than along the tread.

Stone steps made from local rocks may be used at unusually steep ascents. It may be assumed that the Appalachian Trail hiker can handle an occasional step as high as 18" without the assistance of steps. In certain places, even higher natural steps or some scrambling may be permitted as a part of the trail route, if the naturalness, beauty, or historic value of the trail would otherwise be depreciated.

Use of concrete on the footway should be avoided except in conjunction with highways, bridges, retaining walls, and similar structures and where there is no other feasible alternative. Where concrete is used it must be as inconspicuous as possible.

Drainage

Where the trail is located along relatively flat ridges it will be located so as to cross from one side of the ridge top to the other and thus provide outslope drainage of the trail tread.

On sidehill sections the tread should be outsloped. Dips in grade will be provided to assure that surface water will not be carried for long distances along the trail tread.

Water bars constructed of native stone or small logs will be provided on sidehill sections where erosion is a problem.

Puncheons may be used on short swampy sections where the bearing capacity of the soil will not support the hiker. Turnpike sections may be constructed across stretches of flat, wet lands to raise the trail above the water table.

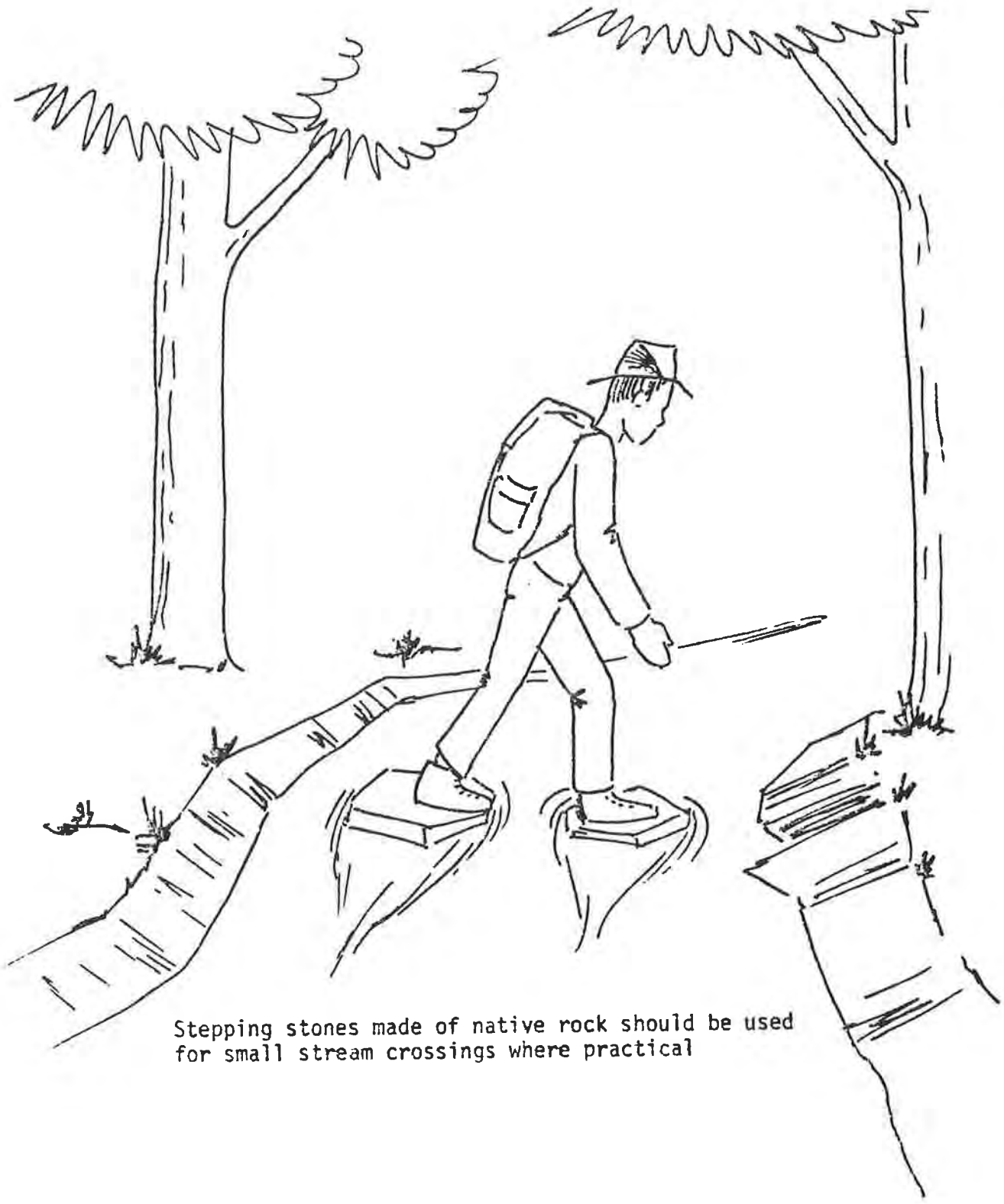
Swamps will not be drained to lower the water table on lands adjacent to the trail.

Stepping stone made of native rock should be used for small stream crossings where practical.

Bridges should be provided for larger stream crossings where erosion of the stream banks is a problem and safety of the hiker must be protected. To assure protection of the scenic value along the trail, bridges should be designed to fit the particular site and environment where it is to be built.

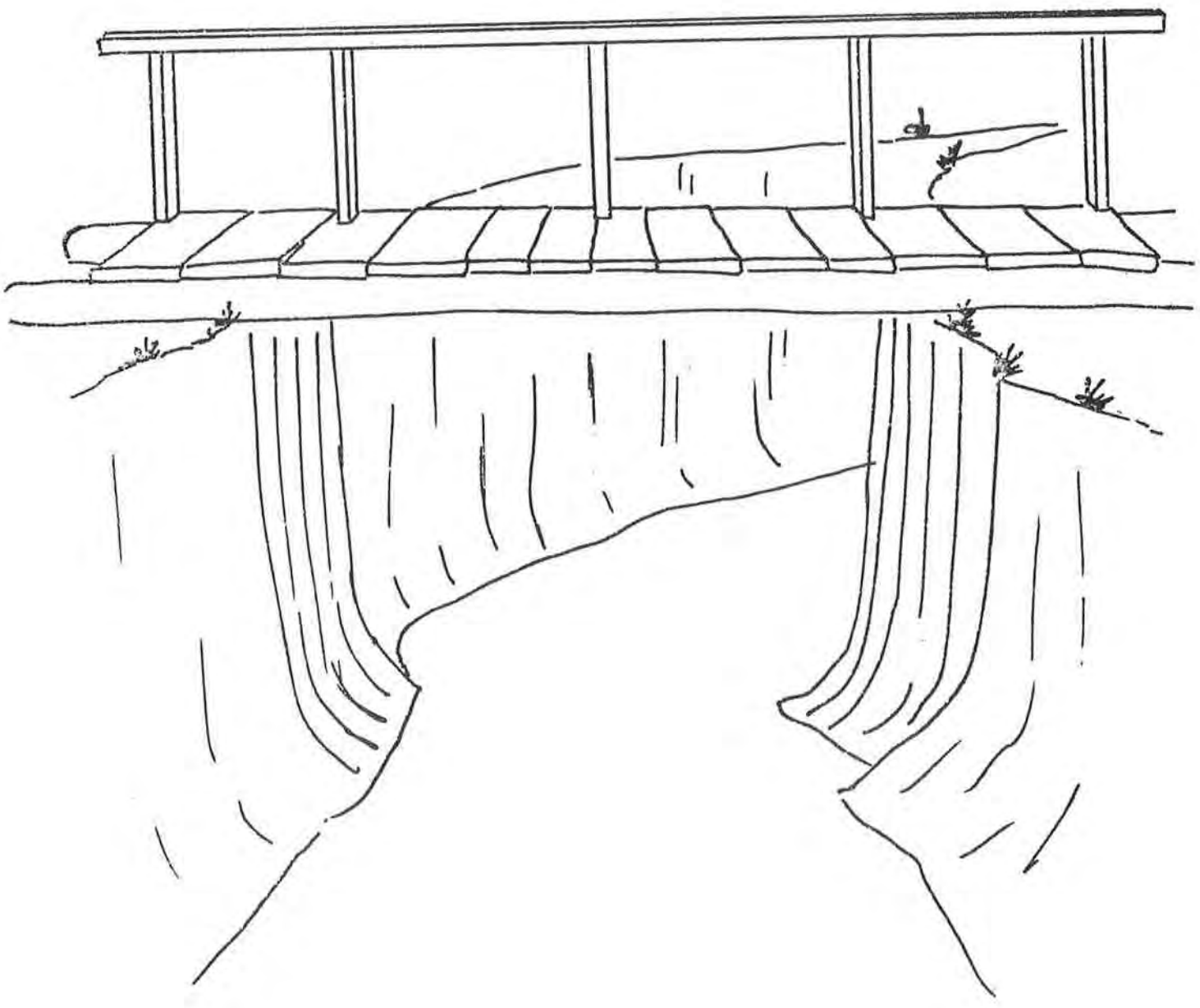
Clearing

The width and height of clearing will be such as to provide free passage by the hiker, even in rain, between regular scheduled brushing intervals.

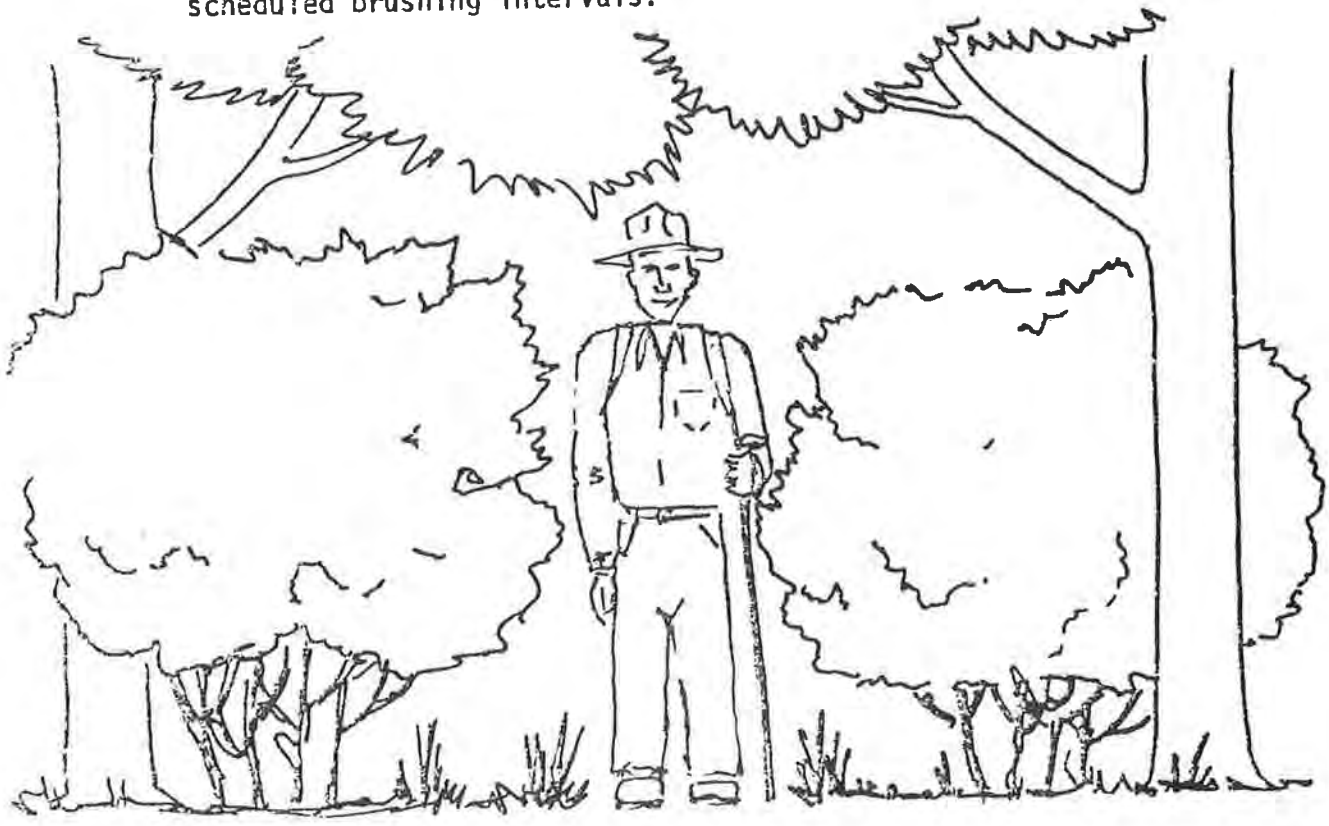


Stepping stones made of native rock should be used for small stream crossings where practical

Bridges should be provided for large stream crossings



Width and height of clearing will be such as to provide free passage by the hiker, even in rain, between regular scheduled brushing intervals.



Clearing is normally widest at the ground level with the branches arching together overhead. A shaded trail will have less undergrowth and require less maintenance.

Logs that are 18" or lower to the ground should not be cleared from the trail except in case of blowdown where numerous logs have been felled across the trail. Near road and multi-use trail crossing an occasional 24" high log may be left to discourage jeeps, motor bikes, etc. Over clearing welcomes conflicting uses to the trail. Larger logs should not be cut wider than three feet. Where motor bike use is a problem, large trees may be notched three feet wide and 18" from the ground.

The minimum width between large trees will be three feet. Any tree larger than eight inches in diameter should not be cut unless it is to be completely removed for construction. Before cutting large trees all possible alternatives, such as moving the trail, must be exhausted.

Selective clearing of new growth should be practiced. This means cutting out young tree and bush seedlings, as well as briars and high, dense, or bonoxious types of annual growth (such as needles), and leaving ferns, low grass and wildflowers. Several consecutive years of this type of selective maintenance will result in a beautiful trail bed.

Occasional "windows" may be cleared to provide views. Care should be taken that the cut trees and branches are disposed and the window is made as natural looking as possible. For clearing of windows and vistas large trees will be cut. Here, care must be taken to dispose of undesirable debris.

It is preferable to route the trail to a natural overlook, rather than to make one, but even those which are "natural" may need maintenance as tall trees may eventually obscure the view. Frequent use of short side trails to views is good practice. This gives the hiker an opportunity to set his pack down and rest while walking the short distance to the view.

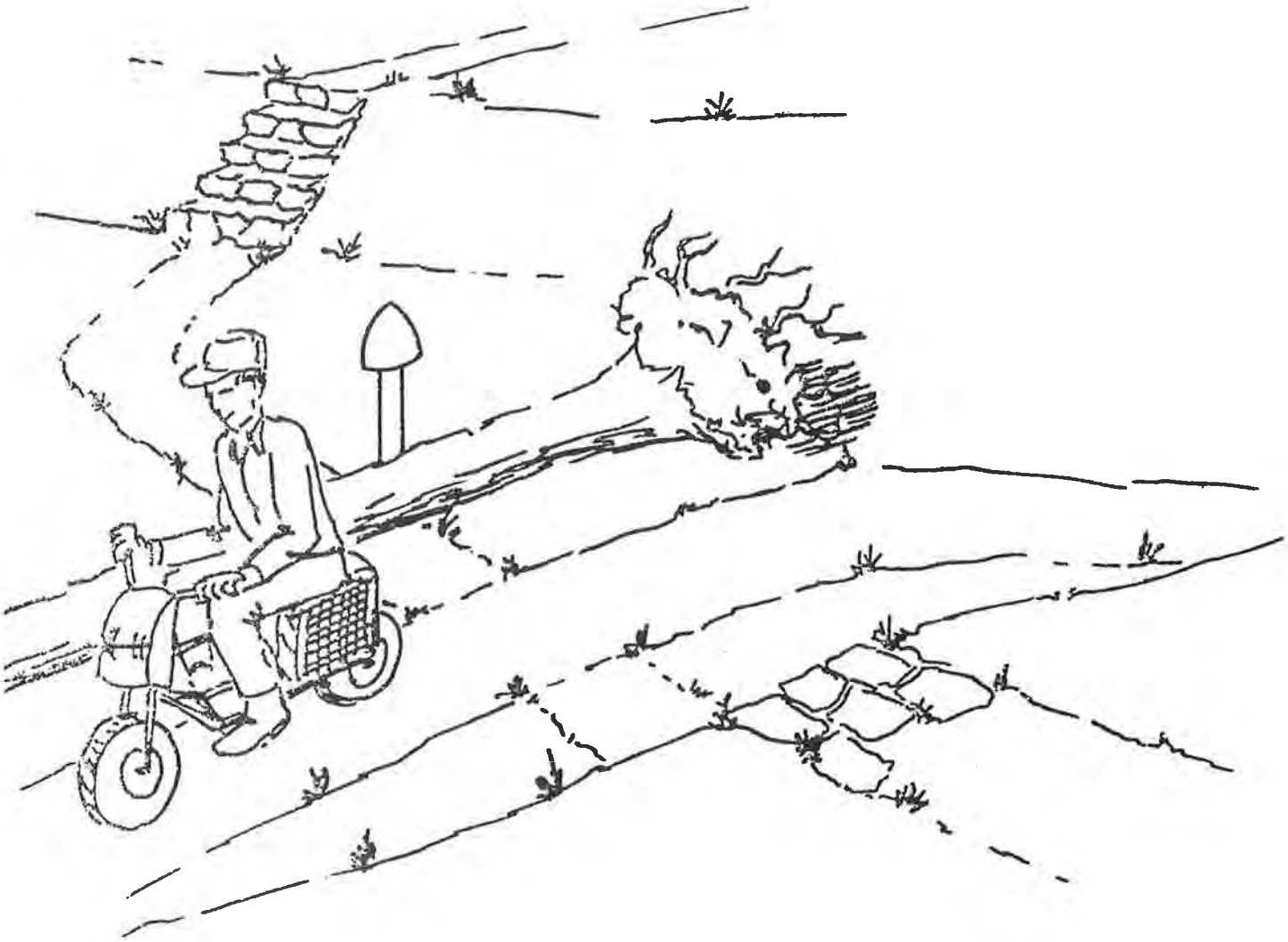
Road Crossings

Suitable areas for parking should be provided and maintained at highway and Forest Development road crossings. Such areas may be combined with small developed roadside picnic areas. Garbage collection facilities aesthetically located and properly maintained, should be provided at every crossing of a state highway or forest road. This will provide a place for the hiker to dispose of the waste he has packed out.

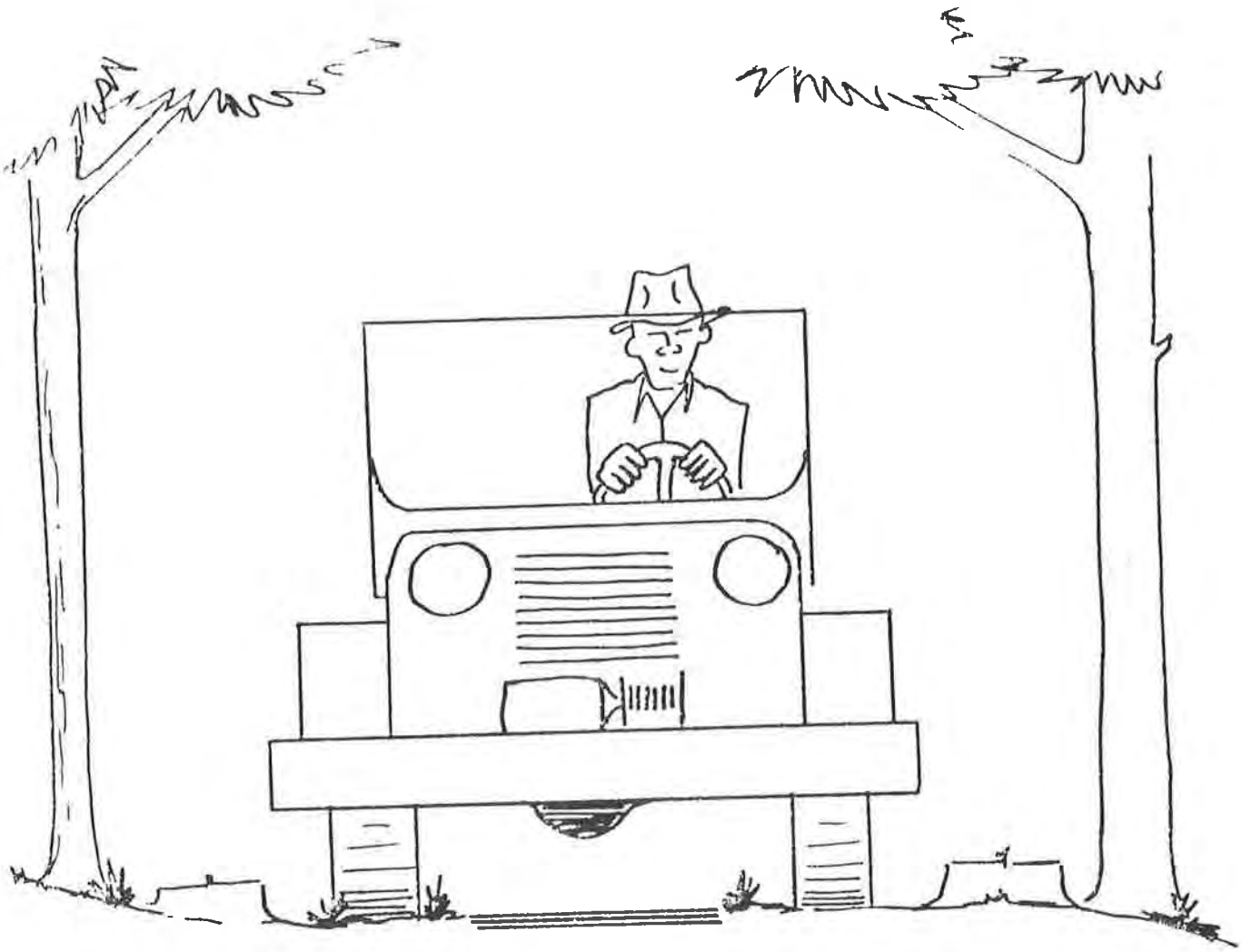
At road or highway crossings, care must be taken to avoid providing access for vehicles or horseback riders to leave the road or highway on the trail. Suitable constructed steps made of native stone are desirable. Sight distance should be adequate to provide a safe crossing for the hiker.

Signs

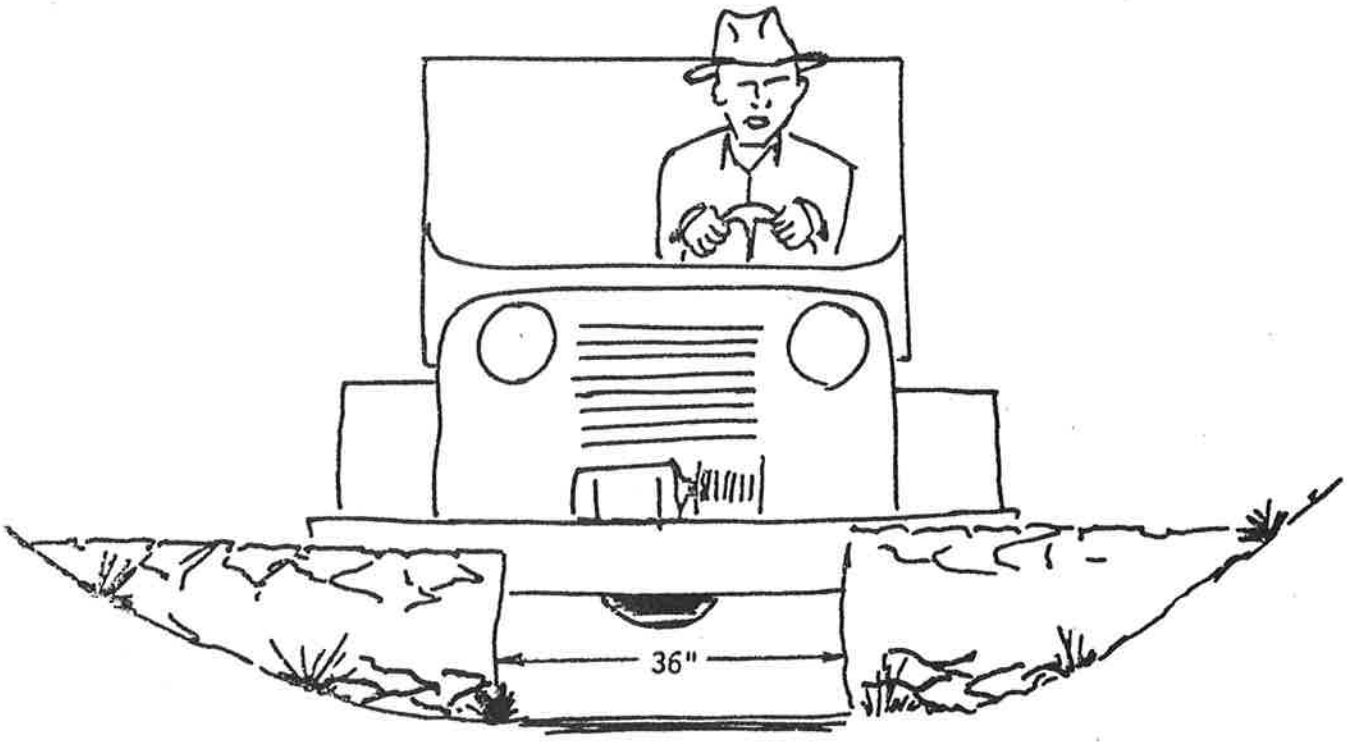
The signs should be in keeping with the scenic aspect of the trail. We must not over sign the trail, however, we must be able to give simple information



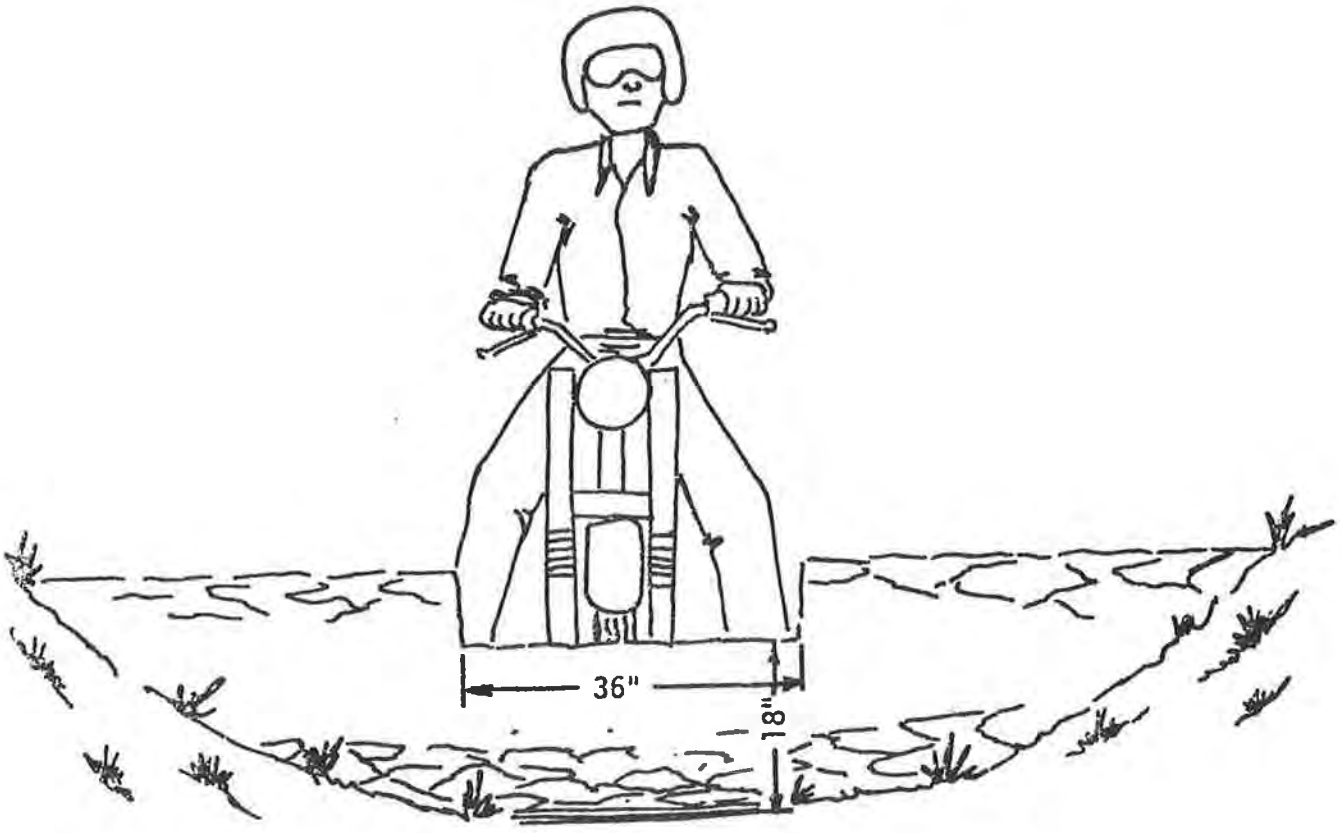
Near multiple use trail crossings an occasional 24 inch high log may discourage conflicting uses



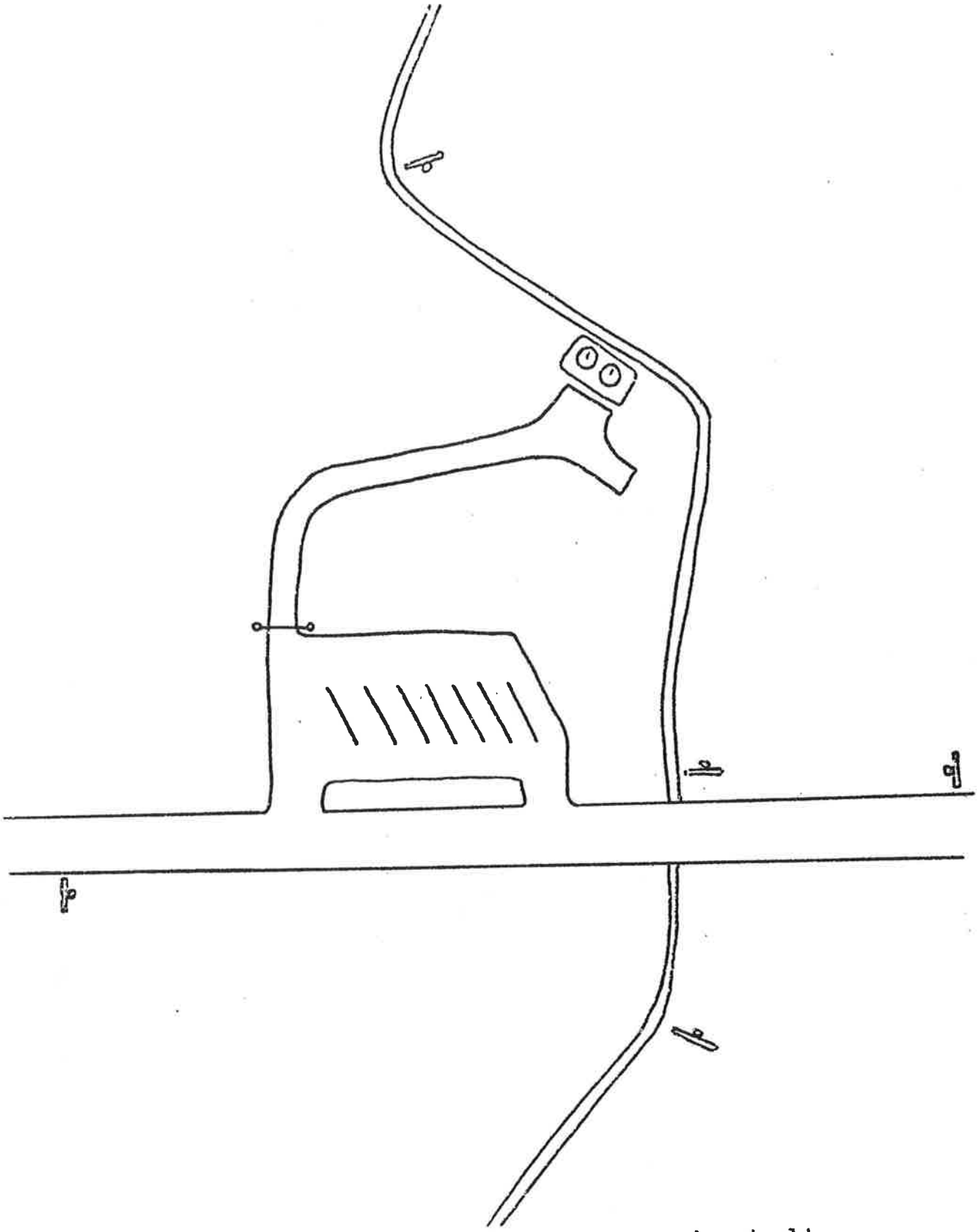
Overclearing welcomes conflicting uses to the trail



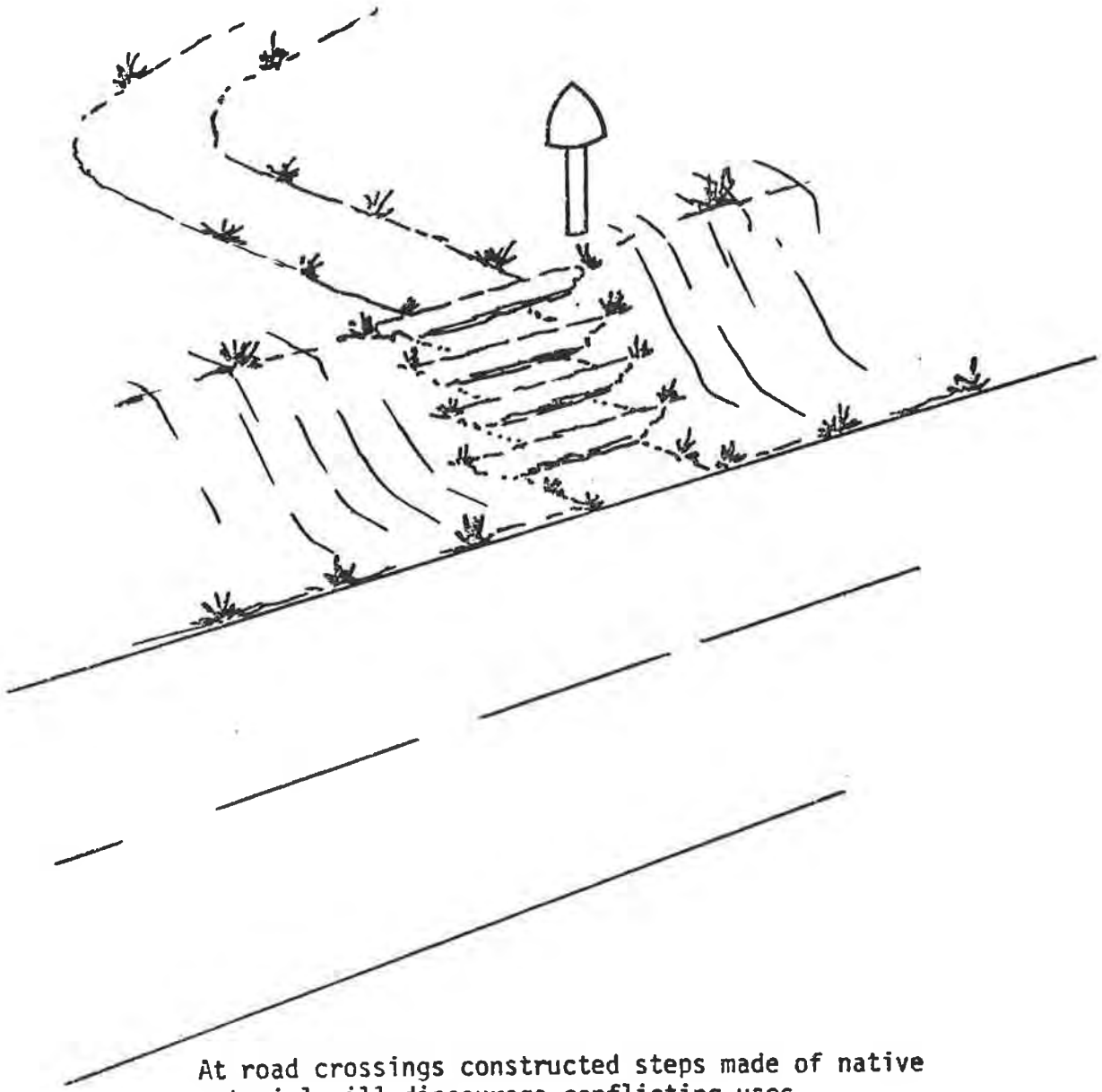
Large logs should not be cut wider than 36 inches



Where motor bike use is a problem, large logs can be notched



Suitable areas for parking at some road crossing should be provided



At road crossings constructed steps made of native material will discourage conflicting uses

to the hiker. All signs will have a rustic or primitive finish. (Attached are all our proposals for signing shapes and wordings.)

Appalachian Trail Route Marking

The standard Appalachian Trail diamond sign or white blaze will be used along the trail to identify the route. The blue blaze will be used to identify the side or loop trails.

At major road and trail crossings, we will use the design adopted by the Scenic Trail Advisory Council on November 3, 1969.

Entrance Signs

Entrance signs on the National Forest land will be used to identify major changes from the National Forest to National Park, Private land and other National Forests.

Topography signs, features and places

This signing must be placed with discretion to allow the hiker a chance to check his location against his map or Appalachian Trail Guide Book and to lead him to special features. Topographic signs may be used to identify significant topographic features.

Directional Signs

Directional signs will be placed only at intersections of roads and trails giving direction and distance to other intersection and destinations. Distances will be shown in miles and tenths. Warning signs should be placed at road intersections if the section of the trail ahead is extremely rough and hard to negotiate.

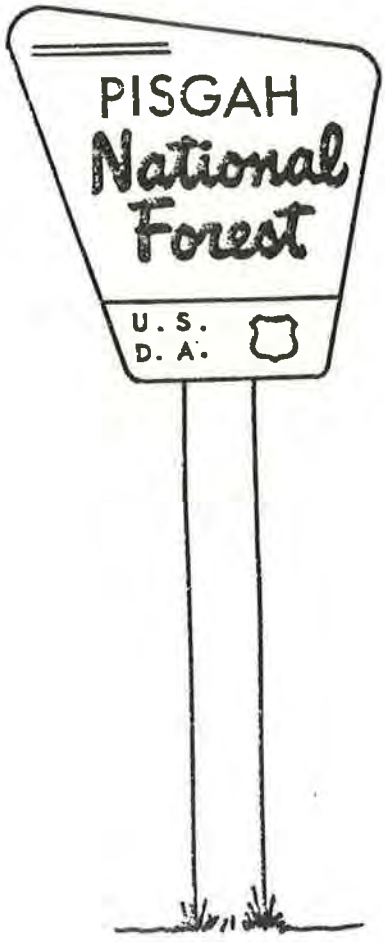
Distances to shelters should normally be omitted at highway crossing signs in order to minimize vandalism or foul play. This concept should be verified as part of a socio-economic study.

Shelter Signing

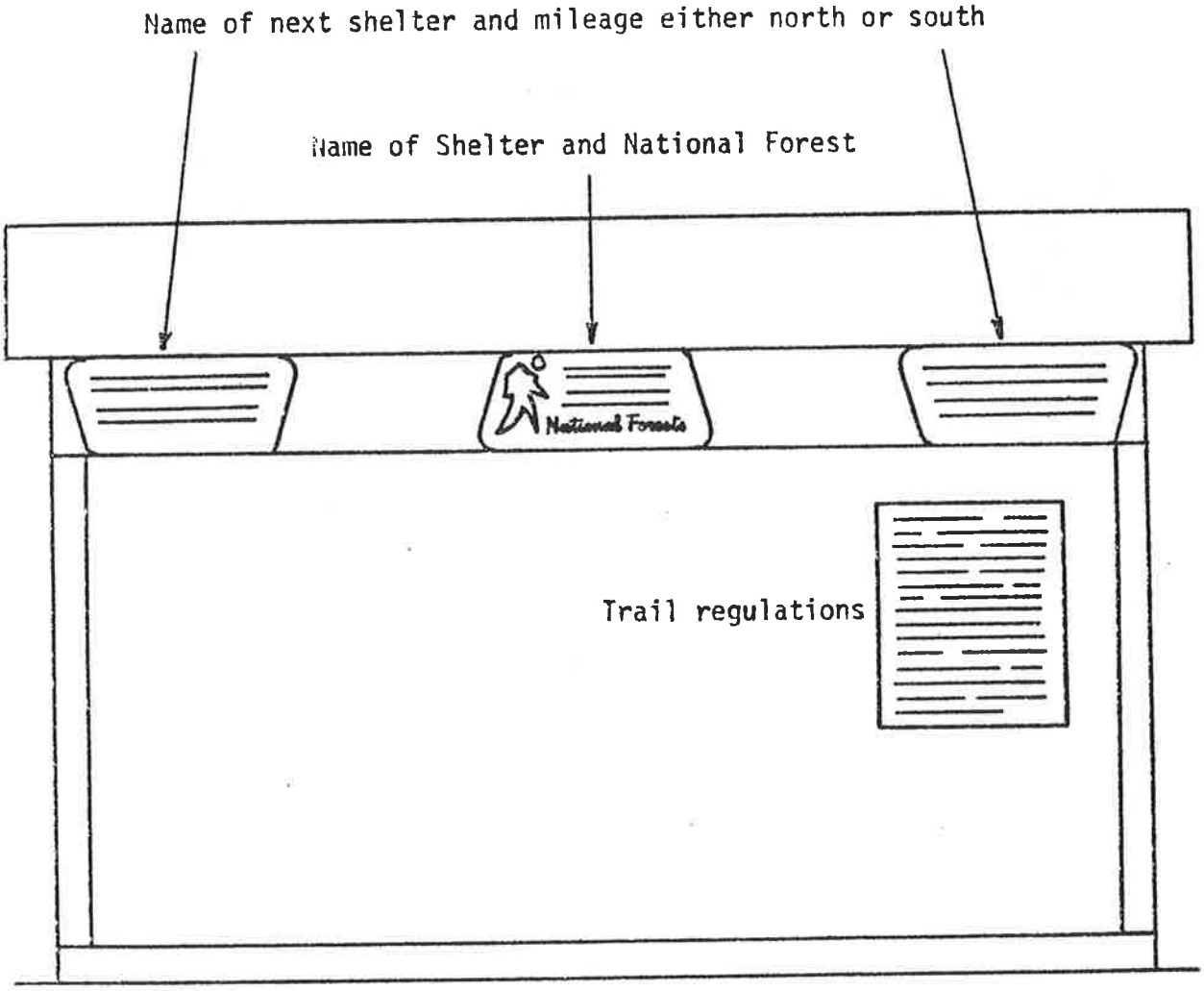
Signs will be placed in each shelter showing: The name of the shelter, trail regulations, shelter regulations, name of the next shelter in each direction and distance to the next shelter in each direction. Direction and distance to nearest location for emergency help. Need to carry out refuse and distance to garbage disposal facilities. See example.

Facility Signing

These will be the arrow-head shaped signs with symbols or writing.

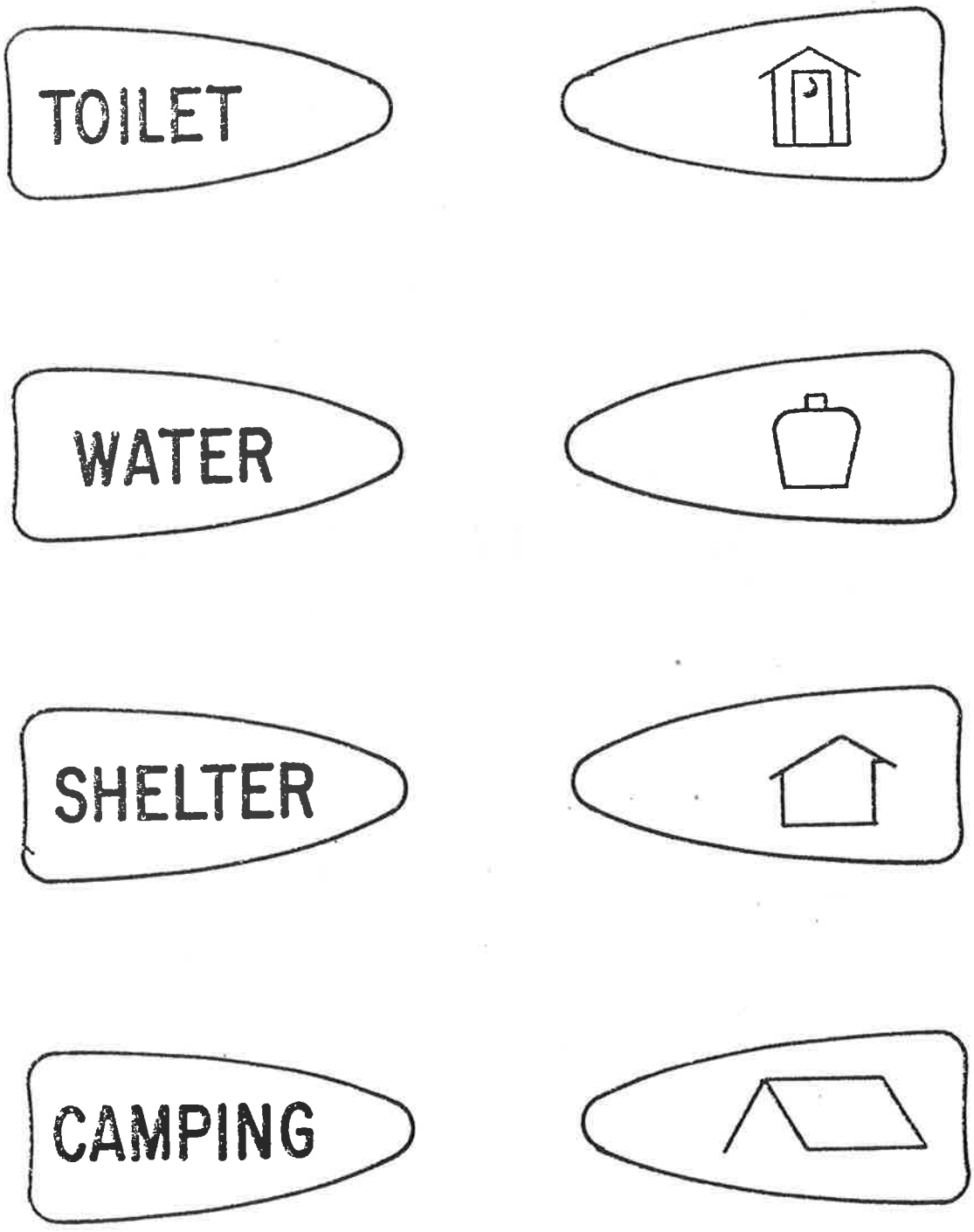

PISGAH
National
Forest
U. S.
D. A.

14"
PISGAH
National
Forest
U. S. DEPARTMENT
OF AGRICULTURE


Name of next shelter and mileage either north or south
Name of Shelter and National Forest
National Forests
Trail regulations

Topographic sign

Directional Sign



Facilities signing will use symbols or wording

Facilities

Shelters and other overnight accommodations on or close to the trail should ordinarily be limited to those for small parties, such as the customary open-front, lean-tos which accommodate 8 to 10 persons. Where feasible, a shelter should be located a short distance off the trail. Care should be taken so that such distances are not excessive and do not involve too much loss of elevation. The tired walker will not care to have to carry his heavy pack up or down steep grades for the night's shelter. Shelters should be located away from public access by motorized vehicles and be a minimum of one mile from any road.

Accommodations for camping of larger parties may be provided for a greater distance from the trail. For example, an abandoned field, or other cleared areas, near safe drinking water, at a distance of 1/4 to 1/2 miles from the trail, would be suitable for camping of larger groups. Such encampment areas should be connected to the A. T. by signed side trails.

Sanitation

Generally, sanitary facilities will be provided near shelters, roadcrossings and overnight camping sites only. These facilities will be the most primitive design that will meet applicable health codes.

Hikers will be encouraged to pack out their garbage to the nearest roadcrossing where solid waste collection facilities will be provided.

Shelters and camp sites will be located near springs or small streams where practicable. These facilities will be located in such a manner that the surface run-off from them will not contaminate the source of water.

*-Exhibit 1

RECREATION EXPERIENCE LEVELS

LEVEL	DESCRIPTION
PRIMITIVE	Recreation opportunities to satisfy basic-needs to the maximum degree. A maximum degree of outdoor skills required. Unmodified natural environment and an absence of man-made developments and comfort or convenience facilities dominates. Feelings of adventure, challenge, and physical achievement, in the absence of obvious controls, important to the user.
1	Recreation opportunities to satisfy basic-needs to a near maximum degree. High degree of outdoor skills involved. Little modified natural environment is dominant consideration. Modifications for comfort and convenience are minimal. Feeling of physical achievement at reaching opportunities without mechanized access is important to the user. Adventure and challenge afforded through minimum controls.
2	Recreation opportunities to satisfy basic-needs to near maximum degree except as tempered by motorized access. Little modified natural environment is dominate consideration. Modifications for comfort and convenience are few. Some feeling of achievement for reaching the opportunity through challenging motorized access is important. Minimum controls evident to the user.
3	Recreation opportunities to satisfy basic-needs to an intermediate degree. Moderate degrees of outdoor skills are involved. Natural environment dominates but some modifications for comfort and convenience are also important to the user. Controls and regimentation afford sense of security although some taste of adventure is still important to the user.
4	Recreation opportunities to satisfy basic-needs to only a moderate degree. Moderate degree of activity skills suffice. Natural environment important but modifications for comfort and convenience are more important. Sense of security afforded the user. Regimentation and fairly obvious controls important to the user.
5	Recreation opportunities to satisfy basic-needs to a modest degree. Skills required for outdoor activities are minimal. Natural environment is important but dominated by man-made modifications. Feeling of security is very important to the user. Learning or beginning skills suffice when supplemented by administrative controls.

1/ Degrees of outdoor recreation activities satisfying basic-needs of people including needs: to find isolation; to socialize; to achieve self-fulfillment; for identity; for compensating experiences; for agression outlets and others.

-*

ILLUSTRATIONS

Following is a series of illustrations, maps and drawings pertaining to the Trail route, camping areas, access points along the Trail, stream and river crossing structures, and informational sign designs.

Sheet 1 - Consists of an overall map of the geographical location of the Trail and surrounding area.

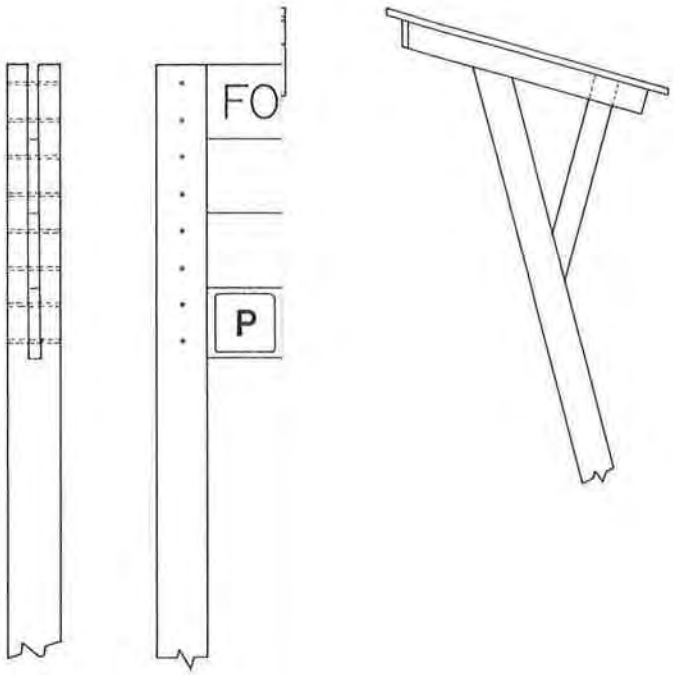
Sheets 2 and 3 - Consist of the same area with more additional supplemental information. Local mountain names, camping and access points are part of this information.

Sheet 4 - Duke's portion of the Trail will include 6 major access points. 4 by land and 2 by Lake Jocassee. Two additional accesses to the Trail are presently provided by the Table Rock State Park, and the U.S. Forest Service at Whitewater Falls.

Sheet 5 - Bodies of water ranging from several inches wide to over 100 feet wide will be experienced along the Trail route. The drawings on sheet 5 will be typical of the type crossings used at these bodies of water. The type (A through D) will depend on size of the crossing, and surrounding terrain.

Sheet 6 - Shown here are various informational type signs that will be supplied by Duke Power at each of the Access Points along the Trail. Also is a directional sign which will help the hiker determine the route at road intersections and other designated points.

"As constructed drawings" will be provided at the end of the construction period and will include any changes or revisions in route as shown on sheets 1-3.



AC)

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THE 1st DAY OF JULY , 1980.

DUKE POWER COMPANY
BY _____
SR. VICE PRESIDENT

KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL SIGNS
SHEET 6
DUKE POWER COMPANY
CHARLOTTE, N. C.

MAY , 1980 SCALES AS SHOWN

REFERENCES

"America's Trails." Outdoor Recreation Action, Winter, 1976.

Appalachian Trail, The, Publication No. 17. Washington, D.C.: The Appalachian Trail Conference, 1965.

Agrow, Keith A.. Trail Construction - How Much Will It Cost, Presentation to conference on "Private Involvement in Outdoor Recreation." Asheville, N.C.: 1974.

Ashbaugh, Byron L.. Trail Planning and Layout. Information and Education Bulletin 4. New York, N. Y.: National Audubon Society, 1967.

Barkauskas, Mary Ellen. Hiking and Hiking Trails - A Bibliography. Washington, D.C.: USDI, 1970

Bartram Trail Study - A Potential National Scenic Trail. Atlanta, GA: USDI National Park Service, 1979.

Busbee, Dr. Raymond L.. Trails - Multiple Use (A Position Statement). A Report to the N.C. Trails Committee, Raleigh, N.C.: 1977

Camp Lightly Please.... USDI National Park Service. Washington, D.C.: Government Printing Office, 1979.

Carstarpen, Carol. "Hiking the Bartram Trail from Rabun Bald to Warwoman Dell." Browns's Guide to Georgia, (Fall, 1973).

Chilman, Dr. Kenneth C.. "Profile: The Trail User." National Trails Symposium Proceedings, (1975)

Christiansen, Monty L.. Park Planning Handbook. University Park, PA.: John Wiley and Sons, 1977.

Clark, Roger N., John C. Hendee and Frederick L. Campbell. Deprecative Behavior in Forest Campgrounds: An Exploratory Study, USDA Forest Research Note PNW-161. Portland, OR.: USDA Forest Service Pacific Northwest Forest and Range Experiment Station, 1971.

Clark, Roger N., John C. Hendee and Randel F. Washburne. Litterbags: An Evaluation of Their Use , USDA Forest Service Research Note PNW-184. Portland OR.: USDA Forest Service Pacific Northwest Forest and Range Experiment Station, 1972.

Cole, Gerald L. and Wilbur F. LaPage. 1978 National Camping Market Survey, USDA Forest Service Research Paper NE-450. Upper Darby, PA.: USDA Forest Service NE Forest Experiment Station, 1978.

Colorado Mountain Trails Foundation, Inc.. Guide for Mountain Trail Development. Littleton, CO,: USDA Forest Service - Rocky Mountain Region, 1976.

Cooper, Arthur W.. "A Survey of the Vegetation of the Toxaway River Gorge with Some Remarks About Early Botanical Explorations and An Annotated List of the Vascular Plants of the Gorge Area." The Journal of the Elisha Mitchell Scientific Society, 79, No.1 (1963).

Crowders Mountain State Park Master Plan. Raleigh, N. C.: N.C. Department of Natural & Economic Resources, 1975.

Duncan, David and Ralph Maughn. "Feet vs ORVs: Are there Social Differences Between Backcountry Users?" Journal of Forestry, 76, No.8 (1978).

Echelberger, Herbert E. and George H. Moeller. Use and Users of the Cranberry Backcountry in West Virginia: Insights for Eastern Backcountry Management,. USDA Forest Service Research Paper NE-363. Upper Darby, PA.: USDA Forest Service NE Forest Experiment Station, 1977.

English, John W.. Laws Regulating Off-Highway Vehicles. Washington, D.C.: Government Printing Office, 1972.

Expanding America's Trail System. Chicago, Ill.: National Trails Council, 1977.

Folkman, William S. High-Fire-Risk Behavior in Critical Fire Areas. USDA Research Paper PSW-125. Berkeley, CA.: USDA Forest Service Pacific Southwest Forest and Range Experiment Station, 1977.

Frissell, Sidney S.. "Judging Recreation Impacts on Wilderness Campsites." Journal of Forestry, 76, No.8 (1978).

Georgia Power Company. Rocky Mountain Project: Application to the FPC for License - Exhibit R. Atlanta, GA.: Georgia Power Company, 1972.

Hendee, John C. and Robert C. Lucas. "Mandatory Wilderness Permits: A Necessary Management Tool." Journal of Forestry, 71, No.4 (1973).

Hiwassee Land Company. National Recreation Trail Designation Evaluation and Recommendation for Piney River Trail. Calhoun, TN.: Bowater Southern Paper Corporation, 1978.

Hiwassee Land Company. Recreation Opportunities on Industrial Forests. Calhoun, TN.: Bowater Southern Paper Corporation

Hofe, G. Douglas. "American Trails - Rediscovered." Parks and Recreation, 6, No.3 (1971).

Larsen, Dayton M. and William R. Miles. Nature Trails, Univ. of Minnesota Extension Bulletin 308. St. Paul, MN.: University of Minnesota.

Leonard, R. E. and A. M. Whitney. Trail Transect - A Method of Documenting Trail Changes, USDA Forest Service Research Paper No. NE-389. Upper Darby, PA.: USDA Forest Service NE Forest Experiment Station Station, 1977.

Lime, David W.. Large Groups in the Boundary Waters Canoe Area - Their Numbers, Characteristics and Impact, USDA Forest Service Research Note NC-142. St Paul, MN.: USDA Forest North Central Forest Experiment Station, 1972.

Location and Design Criteria for the Appalachian Trail. USDA Forest Service Division of Engineering, Southern Region for the Appalachian Trail Conference, Harpers Ferry, W.Va., 1970.

Lower Water Temperatures Within A Streamside Buffer Strip. USDA Forest Service Research Note SE-193. Asheville, N.C.: SE Forest Experiment Station, 1973.

Lucas, Robert C. and Robert P. Rinehart. The Neglected Hiker. Ogden, Utah: USDA Forest Service Intermountain Forest and Range Experiment Station, 197_.

Manning, Harvey, et al. 50 Hikes in Mount Rainier National Park. Seattle, WA.: The Mountaineers, 1978.

McCay, Roger E.. Hiker Preference for Trail Features and Maps, USDA Forest Service Research Note NE-262. Broomall,Pa.: USDA Forest Service NE Forest Experiment Station, 1978.

McCay, Roger E.. Ohio Trail Users. USDA Forest Research Note NE-228. Upper Darby, PA.: USDA Forest Service NE Forest Experiment Station, 1976.

Moeller, George H. and Terence L. Ross. Communicating Rules in Recreation Areas. USDA Forest Service Research Paper NE-297. Upper Darby, PA.: USDA Forest Service NE Forest Experiment Station, 1974.

Murray, Judith Buckley. "A Questionnaire Study of Appalachian Trail Conference Members, Their Characteristics, Trail Attitudes, and Management Preferences," Appalachian Trailway News, 34, No.1. Arlington, VA.: Appalachian Trail Conference, 1973.

Murray, Judith Buckley. "A Study of the Appalachian Trail User in the Southern National Forest - His Characteristics, Attitudes and Management Preferences," Appalachian Trailway News, 33, No.3. Arlington, VA.: Appalachian Trail Conference, 1972.

National Recreation Trails in the Southeast. USDI Bureau of Outdoor Recreation Current List. Atlanta, GA.: Government Printing Office, 1976.

National Trails System Act as Amended by Public Law 94-527. Washington, D.C.: Government Printing Office, 1976.

N. C. State Trails Committee. Annual Report. Raleigh, N.C.: N.C. Dept. of Natural and Economic Resources, 1974.

Ontario Trails Council. Final Report. Toronto, Ont.: Ontario Ministry of Natural Resources, 1977.

Overmountain Victory Trail - Draft and Addendum. Atlanta, GA.: USDI National Park Service, 1979.

Park Pactice Program. Design. continuous subscription. Washington, D.C.: National Recreation and Park Association, 1957-80.

Park Practice Program. Grist. continuous subscription. Washington, D.C.: National Recreation and Park Association, 1957-80.

Park Practice Program. Trends. continuous subscription. Washington, D.C.: National Recreation and Park Association, 1957-80.

Proceedings of the Third National Trails Symposium. Chicago, IL.: National Trails Council, 1975.

Rhyne, David F.. Trail Construction Manual. Calhoun, TN.: Bowater Southern Paper Corporation, 1979.

Ries, Michael L.. Design Standards to Accommodate People with Physical Disabilities in Park and Open Space Planning. Madison,WE.: University of Wisconsin-Extension, 1973.

S. C. Agricultural Experiment Station and USDA Soil Conservation Service. Soil Survey - Oconee County, South Carolina. SCS Series 1958, No.25. Walhalla, S.C.: Government Printing Office, 1963.

Soil Survey of Transylvania County, North Carolina. USDA Soil Conservation Service Series 1962-67. Washington, D.C.: Government Printing Office, 1974.

Status of State River and Trail Programs in the Southeast. USDI Bureau of Outdoor Recreation Report. Atlanta, GA.: Government Printing Office, 1975.

Suggestions for Appalachian Trail Users, Publication No.15. Washington, D.C.: The Appalachian Trail Conference, 1962.

Sutton, Anne and Myron. The Appalachian Trail. New York, N.Y.: J. B. Lippincott Co., 1967.

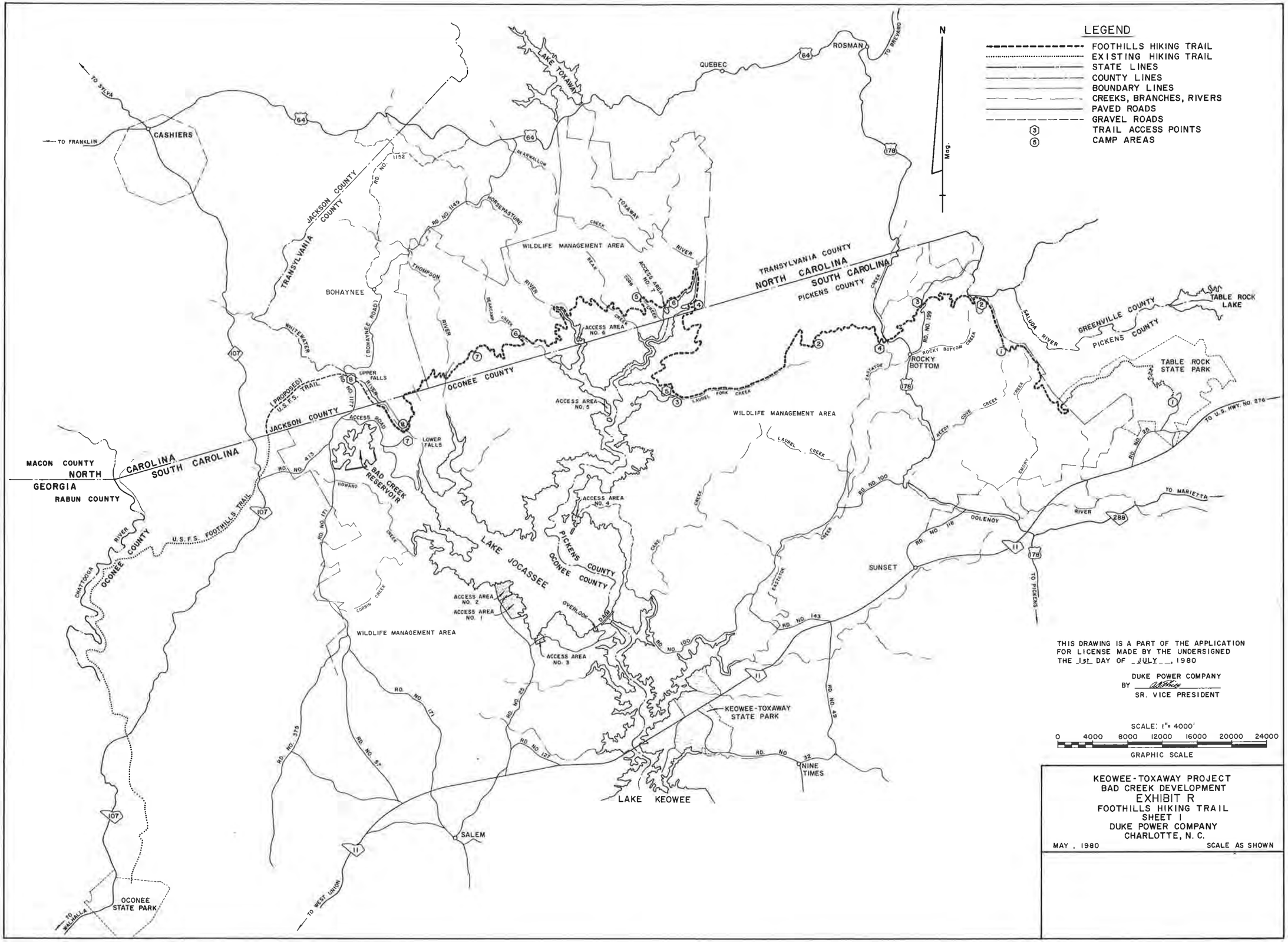
Trail Tracks. St. Charles, IL.: National Trails Council, continuous subscription.

Tribe, Charles A.. Recreation Carrying Capacity. NE Region: USDA Forest Service Division of Recreation and Lands, 1972.

Tucker, Margaret. "A Winter Hike on Blood Mountain." Brown's Guide to Georgia, winter (1974).

Wagar, J. Alan. The Carrying Capacity of Wild Lands for Recreation. Washington, D.C.: Society of American Foresters, 1964.

Your National Forests - Trails for Everyone. Washington, D.C.: USDA Forest Service, 1976.



THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THE 1st DAY OF JULY, 1980

DUKE POWER COMPANY
BY _____
SR. VICE PRESIDENT

SCALE: 1"= 4000'

0 4000 8000 12000 16000 20000 24000

GRAPHIC SCALE

KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL
SHEET 1
DUKE POWER COMPANY
CHARLOTTE, N. C.

MAY , 1980 SCALE AS SHOWN

LEGEND

- FOOTHILLS HIKING TRAIL
- EXISTING HIKING TRAILS
- STATE LINES
- COUNTY LINES
- BOUNDARY LINES
- CREEKS, BRANCHES, RIVERS
- PAVED ROADS
- GRAVEL ROADS
- (3) TRAIL ACCESS POINTS
- (2) CAMP AREAS

N

MAGNETIC

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THE 1st DAY OF JULY, 1980.

DUKE POWER COMPANY
BY _____
SR VICE PRESIDENT

SCALE: 1" = 2000'
0 2000 4000 6000 8000 10000 12000
GRAPHIC SCALE

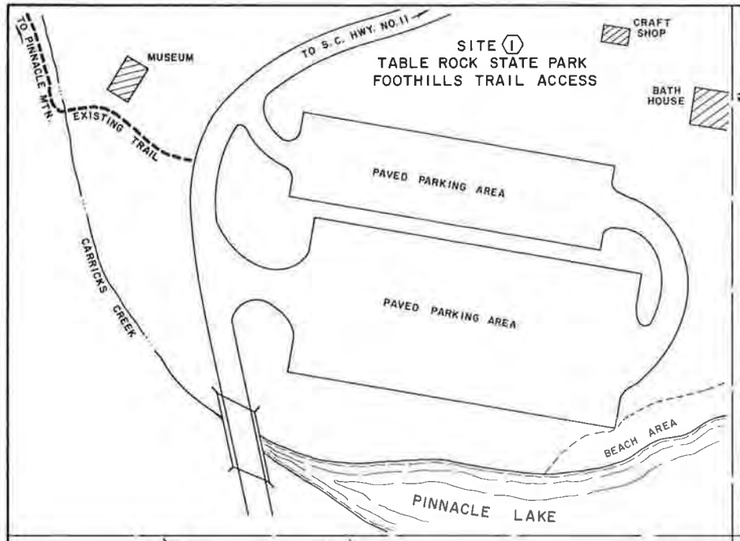
KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL
SHEET 2
DUKE POWER COMPANY
CHARLOTTE, N. C.
MAY, 1980 SCALE AS SHOWN

N

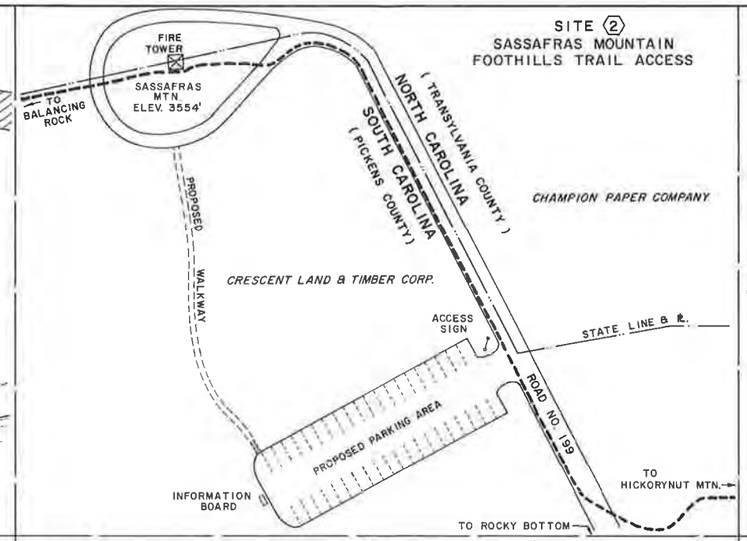
EG N

FC TH LS HI ING TR IL
EX ST IG IK IG R LS
ST TE LI ES
CO NT L E
BC ND RY LI S
CR EK B AN IE R EF
PA ED RO S
GR VE R AD
TR IL AC ES P NT
CA IP AR S

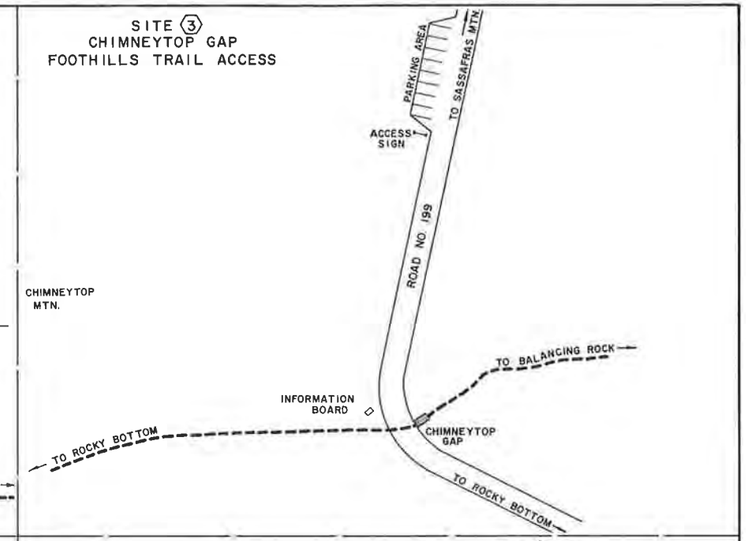
MATCH 2



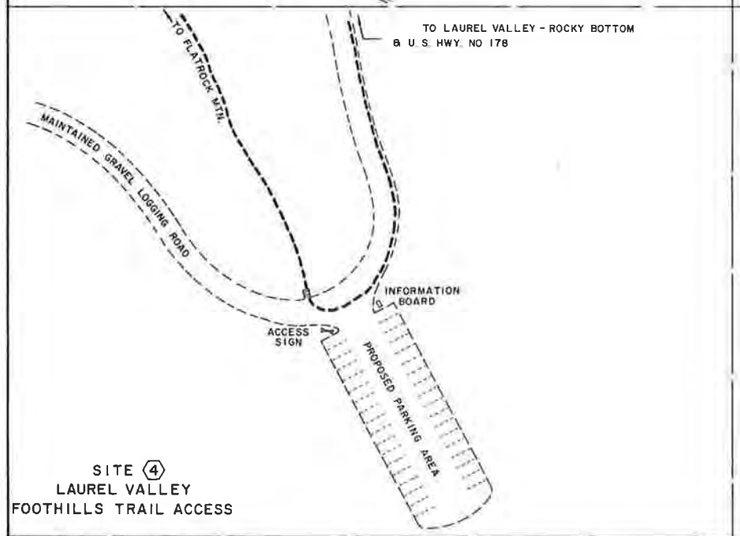
SITE (1)
TABLE ROCK STATE PARK
FOOTHILLS TRAIL ACCESS



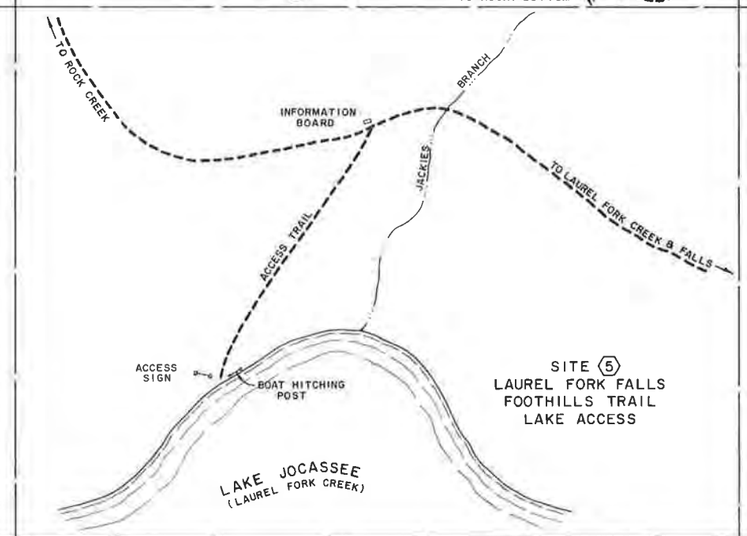
SITE (2)
SASSAFRAS MOUNTAIN
FOOTHILLS TRAIL ACCESS



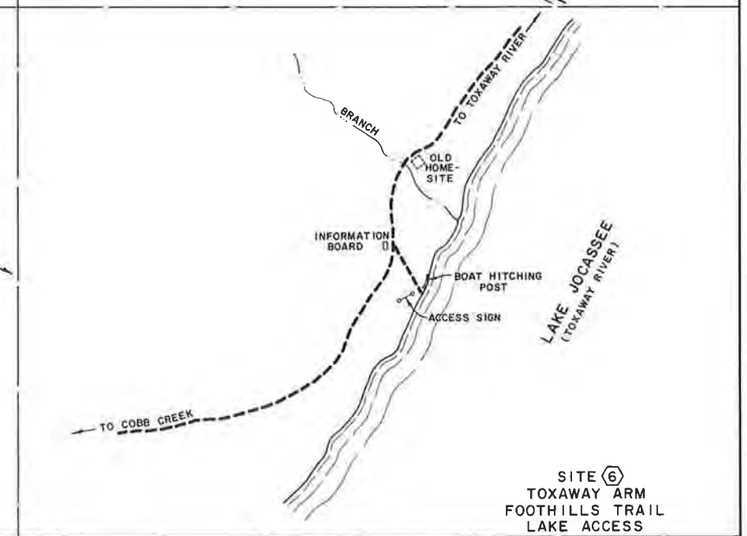
SITE (3)
CHIMNEYTOP GAP
FOOTHILLS TRAIL ACCESS



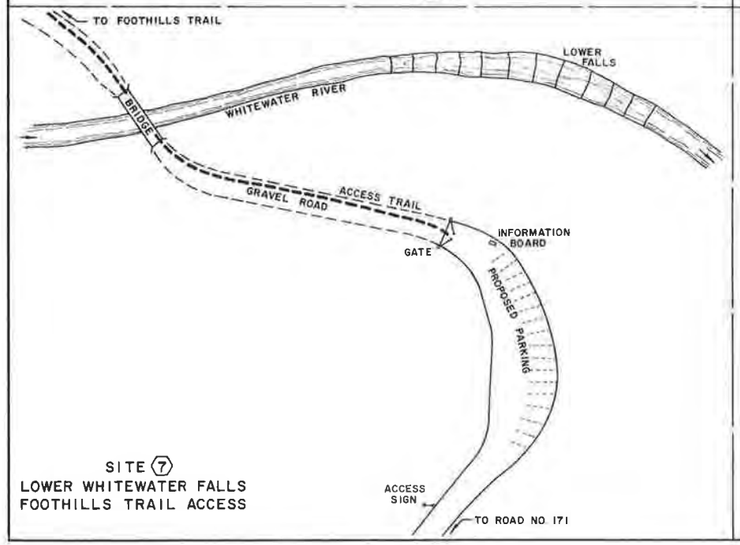
SITE (4)
LAUREL VALLEY
FOOTHILLS TRAIL ACCESS



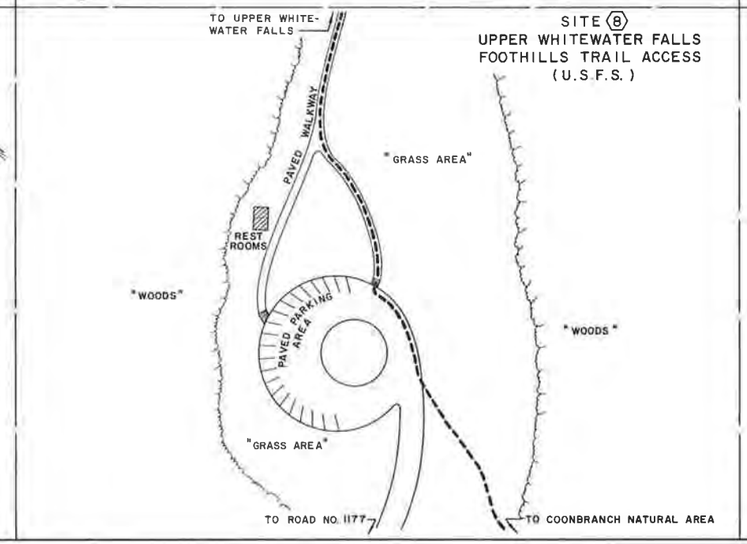
SITE (5)
LAUREL FORK FALLS
FOOTHILLS TRAIL
LAKE ACCESS



SITE (6)
TOXAWAY ARM
FOOTHILLS TRAIL
LAKE ACCESS



SITE (7)
LOWER WHITEWATER FALLS
FOOTHILLS TRAIL ACCESS



SITE (8)
UPPER WHITEWATER FALLS
FOOTHILLS TRAIL ACCESS
(U.S.F.S.)

LEGEND

- FOOTHILLS HIKING TRAIL
- CREEKS, BRANCHES
- STATE LINE

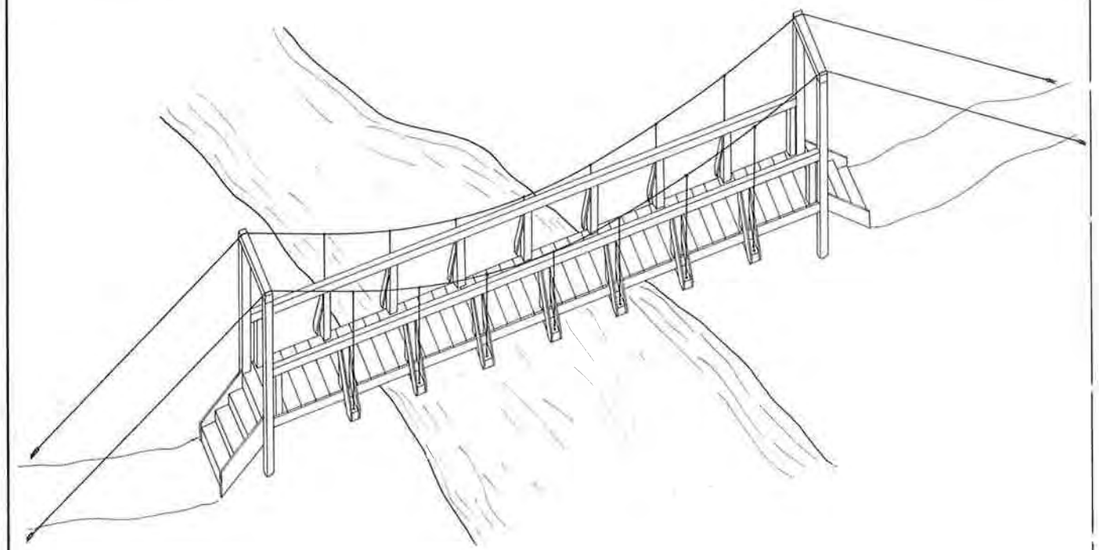
N
Mag.

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THE 1st DAY OF JULY, 1980.

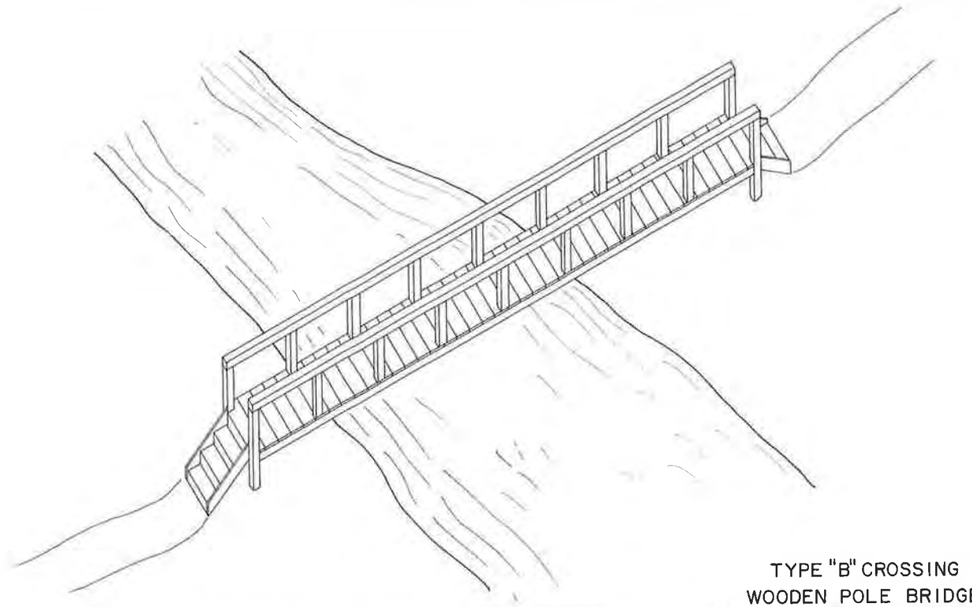
DUKE POWER COMPANY
BY _____
SR VICE PRESIDENT

SCALE: 1" = 50'
0 50 100 150 200 250 300
GRAPHIC SCALE

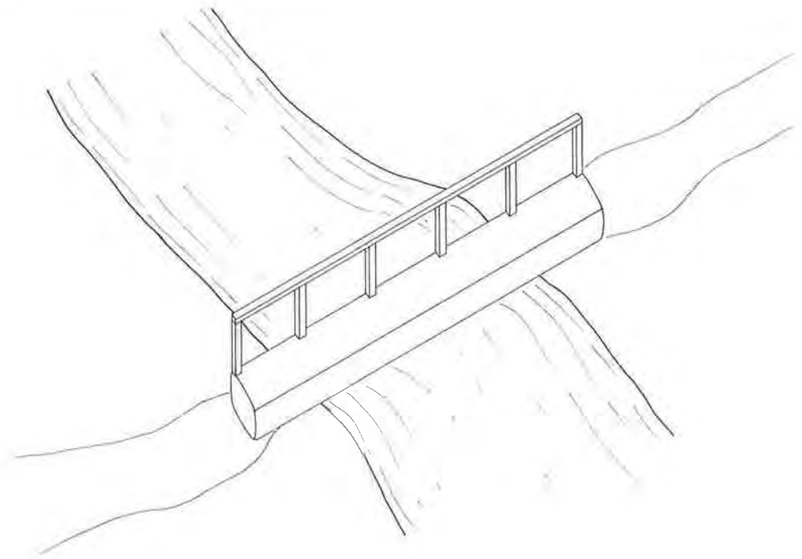
KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL ACCESS POINTS
SHEET 4
DUKE POWER COMPANY
CHARLOTTE, N. C.
MAY, 1980 SCALE AS SHOWN



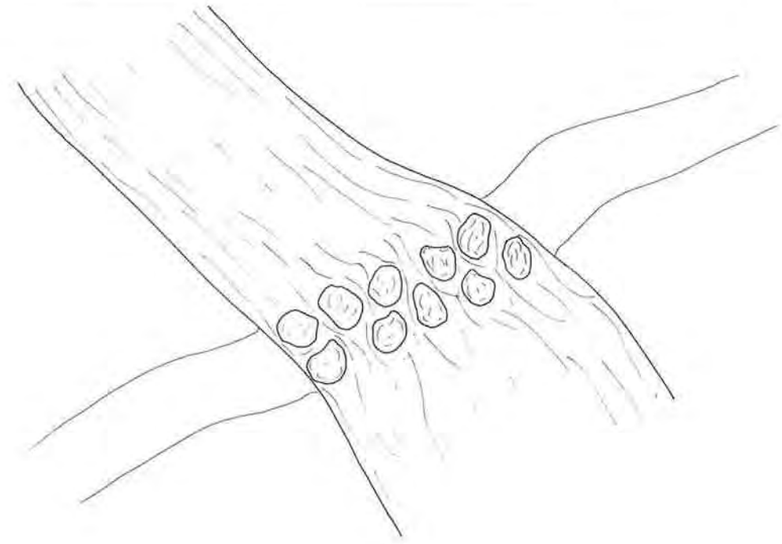
TYPE "A" CROSSING
SUSPENSION BRIDGE



TYPE "B" CROSSING
WOODEN POLE BRIDGE



TYPE "C" CROSSING
FOOTLOG



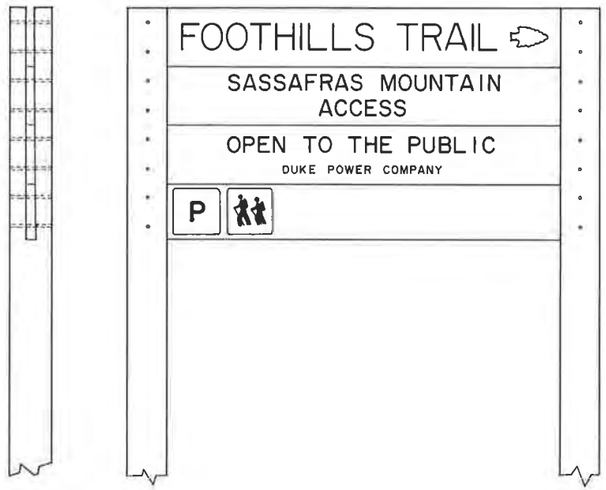
TYPE "D" CROSSING
STONES

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THE 1st DAY OF JULY, 1980.

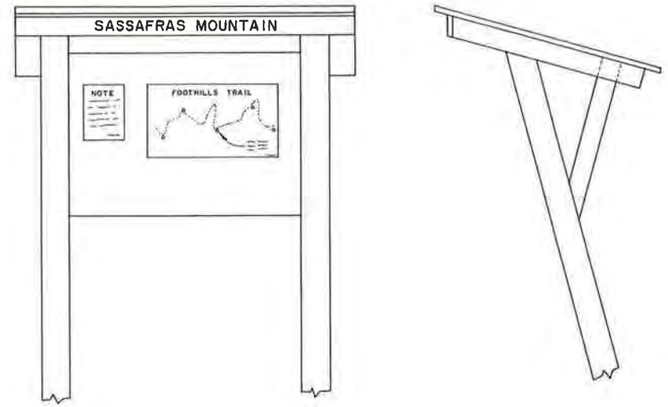
DUKE POWER COMPANY
BY A. Tollis
SR. VICE PRESIDENT

KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL BRIDGES
SHEET 5
DUKE POWER COMPANY
CHARLOTTE, N. C.

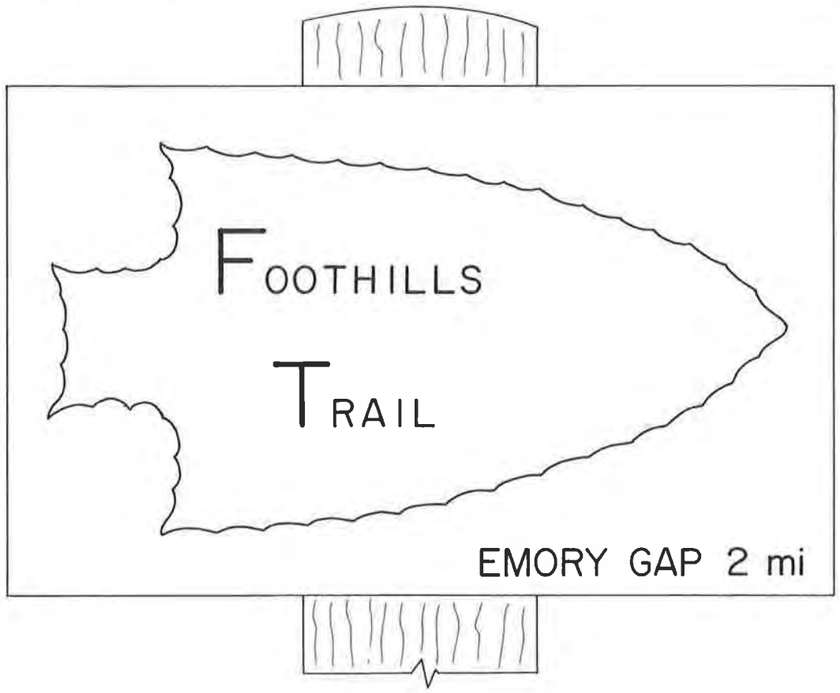
MAY . 1980 NO SCALE



ACCESS ENTRANCE SIGN
APPROXIMATE SCALE: 1"=1'



INFORMATION BOARD
APPROXIMATE SCALE: 1"=1'



DIRECTIONAL SIGN
APPROXIMATE SCALE: 1"=1'

THIS DRAWING IS A PART OF THE APPLICATION
FOR LICENSE MADE BY THE UNDERSIGNED
THE 1st DAY OF JULY , 1980.

DUKE POWER COMPANY
BY W. Rees
SR. VICE PRESIDENT

KEOWEE-TOXAWAY PROJECT
BAD CREEK DEVELOPMENT
EXHIBIT R
FOOTHILLS HIKING TRAIL SIGNS
SHEET 6
DUKE POWER COMPANY
CHARLOTTE, N. C.
MAY , 1980 SCALES AS SHOWN

Cheetah®

Wolters Kluwer

1 FERC - 75 FERC, 14 FERC ¶62,026, Duke Power Company, Project No. 2740, FERC (Federal Energy Regulatory Commission), (Jan. 14, 1981)

1 FERC - 75 FERC

Click to open document in a browser

Duke Power Company, Project No. 2740

[63,036]

[¶62,026]

Duke Power Company, Project No. 2740

Order Approving Amendment to Exhibit R

(Issued January 14, 1981)

William W. Lindsay, Director, Office of Electric Power Regulation.

Duke Power Company (Licensee) filed an application on July 23 and 24, 1980, for approval of an amendment to Exhibit R, pursuant to Article 31 of its license for the Bad Creek Pumped Storage Project, FERC No. 2740. [1] Article 31 required the Licensee to submit a detailed plan for development and management of the proposed hiking trail approved in Exhibit R.

The Licensee's proposed trail would be located in the northwestern corner of South Carolina and southwestern North Carolina. The area is primarily steeply-sloped forest land. It would comprise the central segment of the Foothills Trail, which will ultimately join the Table Rock and Oconee State Park areas. Licensee's trial segment would be over 30 miles in length, from Pinnacle Mountain (Table Rock State Park) west to the Whitewater River (Nantahala National Forest). The Licensee's trail segment would be located on non-project lands owned by its land management subsidiary, Crescent Land and Timber Corporation.

The route of the trail would follow part of the north shoreline of Lake Jocassee (FERC Project No. 2503). The trail footpath would be 2 feet wide and require a cleared passage 4 feet wide and 8 feet high; the footpath would consist of natural forest material. Eight cleared campsites would be developed initially along the trail route, and a toilet facility would be provided at each site. Adirondack shelters would not be provided, as originally planned in Exhibit R, based on recent recreational development preferences in the region. Four types of stream crossings would be provided, as well as appropriate signs and trash receptacles at access points. All facilities would be constructed in accordance with Appalachian Trail Conference design standards. Construction would be completed within two years.

Agency Comments

The Licensee has coordinated its plans with Federal, state and local agencies, and interested organizations and individuals, including the Foothills Trail Conference. No significant adverse comments were received.

Environmental Impacts

Staff's final Environmental Impact Statement (EIS) for the Bad Creek Pumped Storage Project, including the general plan for the proposed hiking trail, was issued on March 14, 1977. The EIS concluded that the proposed trail would have a minimal environmental impact on the area through which it passes.

Construction of the trail would result in some soil erosion and water turbidity in areas of steep topography and at stream crossings. However, these impacts would be of short-term duration and minor in nature. Use of the trail by 6,000 visitors annually would result in no significant adverse environmental impacts because of the control

© 2021 CCH Incorporated and its affiliates and licensors. All rights reserved.

measures planned by the Licensee. For the above reasons, and the conclusion in the EIS for Project No. 2740, it is concluded that approval of the proposed recreational development would not constitute a major Federal action significantly affecting the quality of the human environment.

It is ordered that:

(A) The amendment to Exhibit R for FERC Project No. 2740, consisting of:

(1) 61 pages of text filed on July 23, 1980, entitled "A Plan for Development and Management of the Foothills Trail"; and

(2) 6 drawings, FERC Nos. 2740-17 through 2740-22, filed on July 24, 1980, is approved.

(B) This order is final unless a petition appealing it to the Commission is filed within 30 days from the date of its issuance, as provided in Section 1.7(d) of the Commission's regulation, 18 C.F.R. 1.7 (d) (1979) as amended, 44 Fed. Reg. 46449 (1979).

-- Footnote --

[1] Authority to act on this matter is delegated to the Director, Office of Electric Power Regulation, under §375.308 of the Commission's regulations, 45 Fed. Reg. 21216 (1980), *amending* 44 Fed. Reg. 46449 (1979) and 18 C.F.R. 3.5 (g) (1979).

© 2021 CCH Incorporated and its affiliates and licensors. All rights reserved.

Mar 4, 2021 from Cheetah®

WATER STRATEGY AND
HYDRO LICENSING

Duke Energy
526 South Church
Street / EC12Q
Charlotte, NC 28202

August 5, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Filing of Proposed Study Plan for Relicensing Studies

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

On February 23, 2022, in accordance with 18 CFR §5.6, Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent (NOI) with FERC to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on April 22, 2022. SD1 is intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) or Environmental Impact Statement (EIS) for the Project and to seek additional information pertinent to the Commission's analysis. In SD1 and a Comments on the PAD and Study Request letter dated June 16, 2022, the Commission requested that Duke Energy complete an Environmental Justice Study as part of the relicensing.

On May 16 and 17, 2022, the Commission held virtual public scoping meetings. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition,

FERC staff solicited comments regarding the scope of issues and analyses for the EA. A virtual site visit was provided by Duke Energy prior to each public scoping meeting.

Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period (which concluded on June 23, 2022) to request studies and provide comments on the PAD and SD1. During the comment period, a total of eight stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or comments on studies of interest or proposed by Duke Energy in the PAD. Since the scoping meetings, Duke Energy has convened resource committee groups with interested stakeholders to provide an overview of methodology and goals for resources studies covered by the Proposed Study Plan (PSP).

In accordance with 18 CFR §5.11 of the Commission's regulations, Duke Energy is filing the PSP describing the studies that the Licensee is proposing to conduct in support of relicensing the Project.

Proposed Study Plan

Duke Energy has evaluated the study comments submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria for study requests as set forth at 18 CFR §5.9(b) of the Commission's ILP regulations. One study request met ILP criteria and was submitted by FERC for the preparation of an Environmental Justice Study.

The purpose of the PSP is to present the studies that are being proposed by Duke Energy and to address the comments and study requests submitted by resource agencies and other stakeholders. At this time, Duke Energy is proposing to conduct the following studies as described in detail in the PSP:

1. Water Resources Study;
2. Aquatic Resources Study;
3. Visual Resources Study;
4. Recreational Resources Study;
5. Cultural Resources Study; and
6. Environmental Justice Study.

Duke Energy is filing the PSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the PSP electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2] If any party would like to request a CD containing a copy of the PSP, please contact the undersigned at the address listed below. Note that Critical Unclassified Information [CUI] pertaining to locations of protected archeological sites is being filed separately.

Comments on the PSP, including any additional or revised study requests, must be filed within 90 days of the deadline for filing this PSP, which is no later than November 5, 2022. Comments must include an explanation of any study plan concerns, and any accommodations reached with Duke

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://badcreekpumpedstorage.com

Energy regarding those concerns (18 CFR §5.12). Any proposed modifications to this PSP must address the Commission's seven ILP study criteria as presented in 18 CFR §5.9(b).

Initial Proposed Study Plan Meeting

In accordance with 18 CFR §5.11(e) of the Commission's regulations, Duke Energy intends to hold an initial PSP Meeting to describe the background, concepts, and study methods described in the PSP. Details for the proposed meeting are provided below. A dial-in number will also be provided upon request.

Date:	Wednesday, September 7, 2022
Time:	9:00 a.m. (until 5:00 p.m., if necessary)
Location:	Duke Energy's Wenwood Operations Center 425 Fairforest Way Greenville, SC 29607

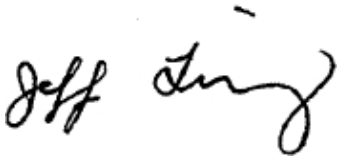
To assist with meeting planning and logistics, Duke Energy respectfully requests that individuals or organizations who plan to attend the meeting in-person please RSVP by sending an email to Alan.Stuart@duke-energy.com on or before August 22, 2022.

Response to Additional Information Requests

As noted above, on June 16, 2022, the Commission issued comments on the PAD, a study request, and requests for additional information. Duke Energy's responses to the additional information requested by FERC staff are provided within the PSP. Duke Energy has addressed (or deferred until a later phase of the relicensing process) all of the Commission's requests. In response to the Commission staff's request, Duke Energy is filing a copy of the Duke Energy (2020) Avian Protection Plan as an Appendix (Appendix J) to the PSP, and additional GIS data requested by Commission staff are being eFiled concurrent with the PSP.

Duke Energy looks forward to working with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are any questions regarding filing, please contact Alan Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Alan Stuart, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Federal Energy Regulatory Commission
Rachel McNamara
Recreation and Land Use Coordinator
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission,
Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission,
Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Agency
Federal Energy Regulatory Commission,
Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

National Park Service
Jeffrey Duncan
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

NOAA – National Marine Fisheries Service
Habitat Conservation Division
Fritz Rohde
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

NOAA – National Marine Fisheries Service
Southeast Region
David Berhnart
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
Herb Nadler
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

U.S Bureau of Indian Affairs, Eastern Regional Office
Keith Bluecloud
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

U.S. Army Corps of Engineers
Lisa Hreha
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

U.S. Army Corps of Engineers
Howard Mindel
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

U.S. Army Corps of Engineers, Greenville Office
Kristin Andrade
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

U.S. Army Corps of Engineers, Savannah District
Kimberly Garvey
Chief, Planning Division
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
kimberly.l.garvey@usace.army.mil

U.S. Army Corps of Engineers, Savannah District
Marvin Griffin
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

U.S. Bureau of Indian Affairs, Natural Resources
Bob Dach
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
625 E. Wisconsin Ave
Ste 200
Milwaukee, WI 53202-4618

U.S. Bureau of Land Management, Jackson District Office
411 Briarwood Dr
Ste 404
Jackson, MS 39206-3058

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Department of Transportation, United States Coast Guard
2100 2nd St S.W.
Washington, D.C. 20593-0001

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

U.S. Environmental Protection Agency, Region IV, Atlanta Federal Center
Jamie Higgins
NEPA Policy Office
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

U.S. Fish and Wildlife Service
Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

U.S. Forest Service – Sumter National Forest
Jen Barnhart
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

U.S. Forest Service – Sumter National Forest
Derrick Miller
Special Uses Program Manager
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

U.S. House of Representatives (CD4)
Office of William Timmons
1237 Longworth House Office Building
Washington, D.C. 20515

U.S. House of Representatives (CD6)
Office of James E. Clyburn
2135 Rayburn House Office Building
Washington, D.C. 20515

U.S. House of Representatives (CD7)
Office of Tom Rice
325 Cannon House Office Building
Washington, D.C. 20515

U.S. House of Representatives (CDS)
Office of Ralph Norman
1004 Longworth House Office Building
Washington, D.C. 20515

U.S. House of Representatives (CO2)
Office of Joe Wilson
2229 Rayburn House Office Building
Washington, D.C. 20515

U.S. House of Representatives (CO2)
Office of Jeff Duncan
116 Cannon House Office Building
Washington, D.C. 20515

U.S. Senate
Matt Rimkunas
Office of Senator Burr
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

U.S. Senate
Office of Senator Burr
217 Russell Senate Office Building
Washington, D.C. 20510

U.S. Senate
Office of Senator Scott
520 Hart Senate Office Building
Washington, D.C. 20510

U.S. Senate
Office of Senator Tillis
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senate, Upstate Regional Office
Van Cato
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

U.S. Senate, Upstate Regional Office
Office of Senator Graham
130 South Main St
Ste 700
Greenville, SC 29601

Local Governments

City of Brevard, NC
Joe Moore
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

City of Clemson, SC
J.C. Cook
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

City of Pickens, SC
David Owens
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

City of Seneca, SC
Gregory Dietterick
P.O. Box 4773
Seneca, SC 29679

City of Seneca, Seneca Light & Water
Bob Faires
P.O. Box 4773
Seneca, SC 29676

City of Walhalla, SC
Danny Edwards
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

Greenville Water
David Bereskin
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Oconee County
Amanda Brock
County Administrator
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Pickens County
Ken Roper
County Administrator
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

Pickens County Water Authority
David Gilstrap
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Pickens County Water Authority
Steve Jewsbury
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Town of Salem
Lynne Towe
Mayor
5A Park Ave
Salem, SC 29676

Transylvania County, NC
Jamie Laughter
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Non-Governmental

Advocates for Quality Development (AQD)
Terry Keene
jtk7140@me.com

Advocates for Quality Development (AQD)
Sue Williams
suewilliams130@gmail.com

Advocates for Quality Development (AQD)
Gerry Yantis
gcyantis2@yahoo.com

Advocates for Quality Development, Inc.
Gary Owens
President
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

American Rivers
Erin Singer McCombs
Conservation Director, Southeast
emccombs@americanrivers.org

American Whitewater
Kevin Colburn
National Stewardship Director
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Duke Energy
Garry Rice
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Fishers Knob Homeowners Group
Phil Mitchell
lputnammitchell@gmail.com

Foothills Trail Conservancy
Heyward Douglas
Executive Director
heyward69@gmail.com

Foothills Trail Conservancy
Andrew Gleason
andrewandwilla@hotmail.com

Foothills Trail Conservancy
Glenn Hilliard
glenn@hilliardgrp.com

Foothills Trail Conservancy
Bill Ranson
bill.ranson@retiree.furman.edu

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Friends of Lake Keowee Society
John Hains
jhains@g.clemson.edu

Friends of Lake Keowee Society
Dale Wilde
Executive Director
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

HDR
Sarah Kulpa
Senior Regulatory Specialist
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Jocassee Outdoor Center
Ray Hawkins
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

K&L Gates LLP
Elizabeth Thomas Esq.
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

National Wild Turkey Federation
Mike Hoffstatter
Regional Director
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Naturaland Trust
Wes Cooler
wes.cooler@mac.com

Nature Conservancy
Dale Threatt-Taylor
Chief of Staff
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

North Carolina Wildlife Federation
Tim Gestwicki
Executive Director
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Oconee Economic Alliance
Annie Caggiano
President
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Palmetto Trust for Historic Preservation
Michael Bedenburgh
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

South Carolina Wildlife Federation
Sara Green
Executive Director
sara@scwf.org

Trout Unlimited, Chattooga River Chapter
Bob King
Chapter President
40 Quartermaster Dr
Salem, SC 29676

Upstate Forever
Erika Hollis
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Upstate Forever
Chris Starker
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

North Carolina Department of Environmental Quality, Division of Water Resources
Fred Tarver
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

North Carolina Department of Justice
Elizabeth Weese
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

North Carolina Division of Parks and Recreation
Amin Davis
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

North Carolina House of Representatives
Chris Whitmire
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

North Carolina State Historic Preservation Office
Renee Gledhill-Earley
Environmental Review Coordinator
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

North Carolina State Parks
Christine Farrell
Environmental Review Coordinator
christine.farrell@ncparks.gov

North Carolina State Parks
Brian Strong
brian.strong@ncparks.gov

North Carolina Utilities Commission
P.O. Box 29520
Raleigh, NC 27626-0520

North Carolina Wildlife Resources Commission
Chris Goudreau
Hydropower Special Projects Coordinator
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
P.O. Box 11649
Columbia, SC 29211-1649

S.C. Wildlife Federation
Andy Douglas
adoug41@att.net

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

South Carolina Department of Archives and History
Elizabeth Johnson
Director
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

South Carolina Department of Health and Environmental Control
Morgan Amedee
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

South Carolina Department of Health and Environmental Control
Charles Hightower
Water Quality Standards & Wetlands Section, Manager
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

South Carolina Department of Health and Environmental Control
Jennifer Hughes
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

South Carolina Department of Natural Resources
Shannon Bobertz
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

South Carolina Department of Natural Resources
Elizabeth Miller
FERC Coordinator
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

South Carolina Department of Natural Resources
Lorrianne Riggin
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

South Carolina Department of Parks, Recreation & Tourism
Aiden Fell
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

South Carolina Department of Parks, Recreation & Tourism
Rowdy Harris
charris@scprt.com

South Carolina Department of Parks, Recreation & Tourism
Kelly Howell
Khowell@scprt.com

South Carolina Department of Parks, Recreation & Tourism
Paul McCormack
Director
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

South Carolina House of Representatives
Jerry Carter
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

South Carolina House of Representatives
Neal Collins
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

South Carolina House of Representatives
David Hiott
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

South Carolina House of Representatives
Bill Sandifer
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

South Carolina House of Representatives
Anne Thayer
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

South Carolina House of Representatives
Bill Whitmire
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

South Carolina State Senate
Thomas Alexander
Mayor
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

South Carolina State Senate
Rex Rice
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Tribes

Catawba Indian Nation
Wenonah Haire
Tribal Historic Preservation Officer
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

Catawba Indian Nation
William Harris
Chief
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Eastern Band of Cherokee Indians
Tyler Howe
Tribal Historic Preservation Officer
P.O. Box 455
Cherokee, NC 28719

Eastern Band of Cherokee Indians
Russell Townsend
Tribal Historic Preservation Officer
P.O. Box 455
Cherokee, NC 28719

United Keetoowah Band of Cherokee Indians
Lisa Baker
Tribal Historic Preservation Officer
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Friday, August 5, 2022 4:17 PM
To: Alexander, Thomas - SC Senate; amedeemd@dhec.sc.gov; Andrade, Kristin - USACE Greenville; Bailey, William - USACE Savannah; Baker, Lisa - United Keetoowah Band of Cherokee Indians; Barnhart, Jen - USFS Sumter NF; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; Bereskin, David - Greenville Water; Bernhart, David - NOAA; Bluecloud, Keith - USBIA ERO; Bobertz, Shannon - SCDNR; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance; Carter, Jerry - SC House of Representatives; Cato, Van - US Senate; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Mayor, Clemson - cityofclemson; Wes Cooler; Corney, Michael; Corney, Steve; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Edwards, Danny - City of Walhalla, SC; Farrell, Christine - NC State Parks; Fell, Aiden - SCDPRT; Gestwicki, Tim - NC Wildlife Federation; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gledhill-Earley, Renee - NCSHPO; Goudreau, Chris J.; Green, Sara - SC Wildlife Federation; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; wenonah.haire; Rowdy Harris; Hawkins, Ray - Jocassee Outdoor Center; Higgins, Jamie - USEPA; hightocw@dhec.sc.gov; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hreha, Lisa - USACE; Hughes, Jennifer - SCDHEC; Jewsbury, Steve - Pickens Cty Water Auth; Jobsis, Gerritt - American Rivers; Johnson, Elizabeth - SCDAH; Keene, Terry - AQD; Kulpa, Sarah; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; Mitchell, Phil - Fishers Knob Home Owners Group; Moore, Joe - City of Brevard NC; n, herb - sepa.doe; Olds, Melanie J; Owens, David - City of Pickens, SC; growens@gmail.com; Bill Ranson-Retired; Rice, Garry S; Rice, Rex - SC Senate; Lorianne Riggin; Rimkunas, Matt - US Senate; Rohde, Fritz; Roper, Ken - Pickens County; Sandifer, Bill - SC House of Representatives; cstarker@upstateforever.org; Strong, Brian - NC State Parks; Stuart, Alan Witten; Tarver, Fred - NCDEQ; Thayer, Anne - SC House of Representatives; Liz Thomas; Threatt-Taylor, Dale - Nature Conservancy; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Whitmire, Chris - NC House of Representatives; Dale Wilde; suewilliams130@gmail.com; Yantis, Gerry - AQD
Cc: Elizabeth Miller; jhains@g.clemson.edu; jtk7140@me.com; Rowdy Harris; cloningerp@dnr.sc.gov; Tom Daniel; mixong@dnr.sc.gov; Alex Pellett; RankinD@dnr.sc.gov; gcyantis2@yahoo.com; Erika Hollis; amedeemd@dhec.sc.gov; Olds, Melanie J; Amy Breedlove; Ross Self; quattrol@dnr.sc.gov; William T. Wood; kernm@dnr.sc.gov; Dale Wilde; Scott Harder; More, Priyanka; suewilliams130 @gmail.com; Bill Ranson-Retired; cstarker@upstateforever.org; Wes Cooler; Ken Forrester; Austen Attaway; bradleyk@dnr.sc.gov; grossea@dnr.sc.gov; Jennifer Kindel; simmonsw@dnr.sc.gov; Samantha Tessel; Andrew Gleason; Christopher Moore; taylors@dnr.sc.gov; caitlin.rogers; wenonah.haire; ejohnson@scdah.sc.gov
Subject: P-2740 Bad Creek Pumped Storage Project: Relicensing Filing (Proposed Study Plan)
Attachments: Bad Creek_FERC 2740_PSP Transmittal_Aug.5.2022.pdf

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the next major ILP submittal, the Proposed Study Plan (PSP), which was filed with FERC by Duke Energy on August 5, 2022. The PSP describes the studies that the Licensee is proposing to conduct in support of relicensing the Project. This document also provides response to comments and requests for additional information received from FERC and relicensing stakeholders.

In accordance with 18 CFR §5.11(e), Duke Energy intends to hold an initial PSP Meeting on **Wednesday, September 7, 2022**. Comments on the PSP, including any additional or revised study requests, must be filed within 90 days of the deadline for filing this PSP, which is no later than November 5, 2022. Details for the proposed meeting and requirements for comments and additional study requests are provided in the attached cover letter. Please note that, due to file size restrictions, the PSP is not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

FEDERAL ENERGY REGULATORY COMMISSION
Washington, DC 20426
August 5, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Subject: Scoping Document 2 for the Bad Creek Pumped Storage Project, P-2740-053

To the Parties Addressed:

The Federal Energy Regulatory Commission (Commission) is currently reviewing the Pre-Application Document (PAD), filed on February 23, 2022, by Duke Energy Carolinas, LLC (Duke Energy) for relicensing the Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project). The project is located in Oconee County, South Carolina. No federal lands have been identified within the project boundary.

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Commission staff will prepare an environmental document (NEPA document), which will be used by the Commission to determine whether, and under what conditions, to issue a new license for the project. The public scoping process will support and assist our environmental review, to ensure that all pertinent issues are identified and analyzed, and that the NEPA document is thorough and balanced.

Our preliminary review of the scope of environmental issues to be addressed in our NEPA document was contained in Scoping Document 1 (SD1), which was issued on April 22, 2022. We requested comments on SD1 to obtain the views off all interested entities on the scope of issues that should be addressed in the NEPA document. Due to restrictions on mass gatherings related to COVID-19, Commission staff were unable to conduct any on-site scoping meetings or an on-site environmental site review. Rather, two virtual scoping meetings were held by staff, and two virtual site visits were held by Duke Energy. Based on comments from the scoping meetings and written comments received during the scoping process, we have updated SD1 to reflect our current view of issues and alternatives to be considered in the NEPA document. ***Key changes from SD1 to Scoping Document 2 (SD2) are identified in bold, italicized type.***

SD2 is being distributed to both Duke Energy's distribution list and the Commission's official mailing list for the project (see section 9.0, *Mailing List* of the attached SD2). If you wish to be added to or removed from the Commission's official

mailing list, please send your request by email to efiling@ferc.gov or by mail via the U.S. Postal Service to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street NE, Room 1A, Washington, DC 20426. Submissions sent via any other carrier must be addressed to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. All written or emailed requests must specify your wish to be added to or removed from the mailing list, and must clearly identify the following on the first page: **Bad Creek Pumped Storage Project No. 2740-053**.

The enclosed SD2 supersedes SD1. SD2 is issued for information use by all interested parties; no response is required. If you have any questions about SD2, the scoping process, or how Commission staff will develop the NEPA document for this project, please contact Navreet Deo at (202) 502-6304 or navreet.deo@ferc.gov. Additional information about the Commission's licensing process and the project may be obtained from the Commission's website, www.ferc.gov.

Enclosure: Scoping Document 2

SCOPING DOCUMENT 2

BAD CREEK PUMPED STORAGE PROJECT
(PROJECT NO. 2740-053)

SOUTH CAROLINA

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

August 2022

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

2.0 SCOPING **3**

2.1 PURPOSES OF SCOPING **3**
2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEWS **3**
2.3 ISSUES RAISED DURING SCOPING 4

3.0 PROPOSED ACTION AND ALTERNATIVES **11**

3.1 NO-ACTION ALTERNATIVE 11
3.1.1 Existing Project Facilities **11**
3.1.2 Existing Project Operation **12**
3.2 LICENSEE'S PROPOSALS 13
3.2.1 Proposed Project Facilities and Operation **13**
3.2.2 Proposed Environmental Measures **13**
3.3 DAM SAFETY 17
3.4 ALTERNATIVES TO THE PROPOSED ACTION 17
3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY 17
3.5.1 Federal Government Takeover **17**
3.5.2 Non-power License **17**
3.5.3 Project Decommissioning **18**

4.0 SCOPE OF CUMULATIVE EFFECTS AND SITE-SPECIFIC RESOURCE ISSUES **19**

4.1 CUMULATIVE EFFECTS 19
4.1.1 Resources That Could be Cumulatively Affected **19**
4.1.2 Geographic Scope **19**
4.1.3 Temporal Scope **20**

5.0 SITE-SPECIFIC RESOURCE ISSUES **20**

5.1 RESOURCE ISSUES 20
5.1.1 Geology and Soils Resources **20**
5.1.2 Aquatic Resources **20**
5.1.3 Terrestrial Resources **21**
5.1.4 Threatened and Endangered Species **22**
5.1.5 Recreation, Land Use, and Aesthetics **22**
5.1.6 Cultural Resources **23**
5.1.7 Socioeconomics **23**
5.1.8 Noise, Air Quality, and Traffic **23**
5.1.9 Developmental Resources **23**

6.0..PROPOSED STUDIES 23
7.0 NEPA DOCUMENT PREPARATION SCHEDULE 25
8.0 COMPREHENSIVE PLANS 26
9.0 MAILING LIST 30
APPENDIX A 1

LIST OF FIGURES

Figure 1: Location and Existing Facilities of the Bad Creek Pumped Storage Project (source: Duke Energy, Bad Creek Project Pre-Application Document (PAD)). 2

SCOPING DOCUMENT *2*

Bad Creek Pumped Storage Project, No. 2740-053

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (Commission or FERC), under the authority of the Federal Power Act (FPA),[1] may issue new licenses for terms ranging from 30 to 50 years for the continued operation and maintenance of non-federal hydroelectric projects. On February 23, 2022, Duke Energy Carolinas, LLC (Duke Energy), licensee for the existing Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project or project), filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to file an application for new license with the Commission.

The Bad Creek Project is located in Oconee County, South Carolina, about 8 miles north of the Town of Salem (figure 1). ***The lower reservoir of the project, Lake Jocassee,[2] is located on a headwater tributary to the Savannah River.*** The project facilities consist of an upper reservoir, a main dam, a west dam, an east saddle dike, a water conveyance system, an underground powerhouse, access roads, and voltage transformation facilities. The project has a total installed capacity of 1,400 megawatts (MW). The total average annual generation of the project is about 1,884,685 megawatt-hours (MWh). A detailed description of the project is provided in section 3.0, *Proposed Action and Alternatives*. A map of the project site is shown on figure 1. The project does not occupy federal lands.

The National Environmental Policy Act (NEPA) of 1969,[3] the Commission's regulations, and other applicable laws require that we independently evaluate the environmental effects of relicensing the Bad Creek Project as proposed, and also consider reasonable alternatives to the licensee's proposed action. We will prepare an environmental document (NEPA document) for the Bad Creek Project that describes and evaluates the probable effects, if any, of the licensee's proposed action and alternatives. The Commission's scoping process will help determine the required level of analysis and satisfy the NEPA scoping requirements, irrespective of whether the Commission issues an environmental assessment (EA) or an environmental impact statement (EIS).

---

[1] 16 U.S.C. § 791(a)-825(r).

[2] *See* 156 FERC ¶ 62,122 issued August 16, 2016.

[3] 42 U.S.C. §§ 4321-4370(f).

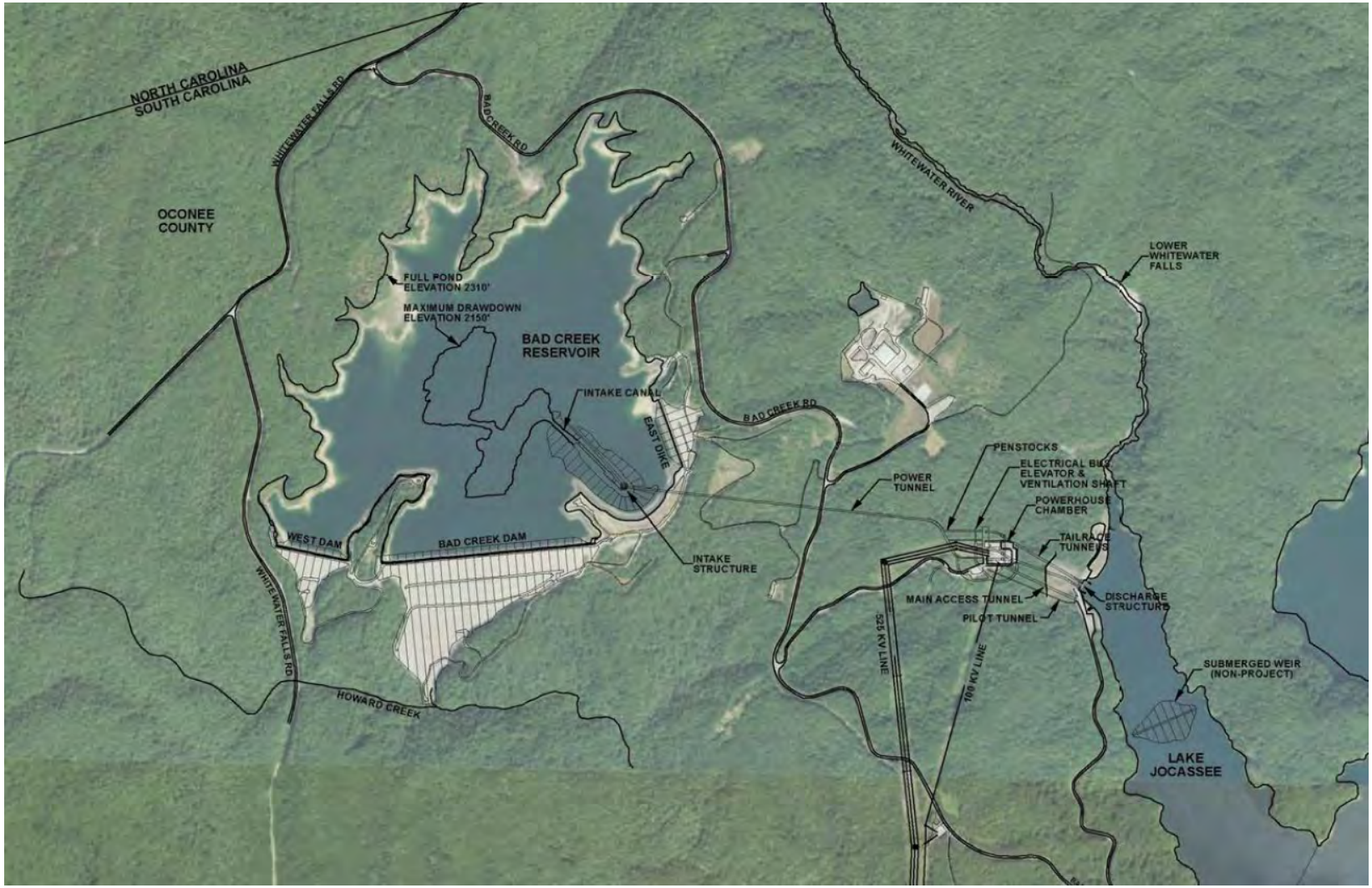


Figure 1: Location and Existing Facilities of the Bad Creek Pumped Storage Project (source: Duke Energy, Bad Creek Project Pre-Application Document (PAD)).

2.0 SCOPING

This Scoping Document 2 (SD2) is intended to advise all participants as to the proposed scope of the Commission's NEPA document and to seek additional information pertinent to this analysis. This document contains: (1) a description of the scoping process and schedule for the development of the NEPA document; (2) a description of the licensee's proposed action and alternatives; (3) a preliminary identification of environmental issues and proposed studies; (4) a proposed outline for the NEPA document; and (5) a preliminary list of comprehensive plans that are applicable for the project.

2.1 PURPOSES OF SCOPING

Scoping is the process used to identify issues, concerns, and opportunities for mitigation or enhancement associated with a proposed action. In general, scoping should be conducted early in the planning stage of a project. The purposes of the scoping process are as follows:

- invite the participation of federal, state, and local resource agencies, Native-American tribes, non-governmental organizations (NGOs), and the public to identify significant environmental and socioeconomic issues related to the proposed project;

- determine the resource issues, depth of analysis, and significance of issues to be addressed in the NEPA document;

- identify reasonable alternatives to the proposed action that should be evaluated in the NEPA document;

- solicit, from participants, available information on the resources at issue, including existing information and study needs; and

- determine the resource areas and potential issues that do not require detailed analysis during review of the project.

2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEWS

Commission staff issued Scoping Document 1 (SD1) on April 22, 2022, to enable resource agencies, Native-American Tribes, NGOs, and the public to participate more effectively, and contribute to, the scoping process. In SD1, we requested clarification of preliminary issues concerning the project and identification of any new issues that needed to be addressed in the NEPA document. Due to restrictions on mass gatherings related to

Novel Coronavirus Disease (COVID-19), Commission staff were unable to conduct any on-site scoping meetings or participate in any in-person environmental site review. Instead, on May 16, 2022 and May 17, 2022, we conducted virtual scoping meetings and Duke Energy provided virtual site tours. The scoping meetings were transcribed by a court reporter. We also solicited written comments, recommendations, and information on SD1.

We revised SD1 following the scoping meetings and after reviewing comments filed during the scoping comment period, which ended June 23, 2022. SD2 presents our current view of issues to be considered in the NEPA document. ***To facilitate review, key changes from SD1 to SD2 are identified in bold, italicized type.***

Commenter	***Filing Date***
Phil Mitchell	***May 17, 2022***
United States Fish and Wildlife Services (FWS)	***June 9, 2022***
Friends of Lake Keowee Society	***June 22, 2022***
Foothills Trail Conservancy	***June 23, 2022***
South Carolina Department of Natural Resources (South Carolina DNR)	***June 23, 2022***
Upstate Forever	***June 23, 2022***
United States Environmental Protection Agency (EPA)	***June 27, 2022***

Scoping meeting transcripts and all comments received are part of the Commission's official record for the project. Information in the official file is available for review on the Commission's website at https://www.ferc.gov, using the "eLibrary" link. At this time, the Commission has suspended access to the Commission's Public Reference Room due to the proclamation declaring a National Emergency concerning COVID-19 issued by the President on March 13, 2020. For assistance, please contact FERC at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY).

2.3 ISSUES RAISED DURING SCOPING

The issues raised by participants in the scoping process are summarized below. We revised SD1 to address only those comments relating directly to the scope of environmental issues. Further, we do not address recommendations for license conditions, such as protection, mitigation, and enhancement (PM&E) measures (e.g., specific whitewater flow releases, resource management plans), as these recommendations will be addressed in the NEPA document or any license order issued for the project. We also do not address requests for studies in the scoping document as these requests will be addressed through the ILP's study plan development process. After Commission staff accept the license application for filing and determine we have sufficient information to evaluate environmental resource and engineering issues, we

will request final terms, conditions, recommendations, and comments when we issue our Ready for Environmental Analysis Notice. Finally, we do not address comments or recommendations that are administrative in nature or outside of the Commission's authority for relicensing the project.

General Comments

Comment: South Carolina DNR requests the addition of Ms. Lorianne Riggin and Ms. Elizabeth Miller to the official mailing list for the project.

Response: We have updated the official mailing list for the project to include the individuals requested by South Carolina DNR, and noted this change in Section 9.0, Mailing Lists of this scoping document.

Project Facilities and Operations

Comment: Upstate Forever comments that in addition to the Bad Creek Project, the Keowee-Toxaway Hydroelectric Project (FERC No. 2503) (Keowee-Toxaway Project) and Duke Energy's Oconee Nuclear Plant also depend on water levels in Lake Jocassee to generate power, respectively. Upstate Forever requests that Section 3.1.2, Existing Project Operation, of the scoping document include a description of how water levels in Lake Jocassee may affect these projects, and provide an extreme low-inflow scenario where changes in operation of the Bad Creek Project may be needed to maintain normal operation of the other two projects.

Response: Lake Jocassee is licensed as part of the Keowee-Toxaway Project and serves as the lower reservoir for the Bad Creek Project. As listed in section 3.2.2, Proposed Environmental Measures, of the scoping document, Duke Energy proposes to continue to operate the Bad Creek Project in accordance with the Keowee-Toxaway Project Relicensing Agreement (Relicensing Agreement). The Relicensing Agreement includes operating provisions and protection, mitigation, and enhancement measures governing the use of Lake Jocassee by both projects. In addition, Section 5.1.2, Resource Issues - Aquatic Resources, of the scoping document identified the effects of project operation on water levels in Lake Jocassee as a preliminary issue to be addressed in the NEPA document.

Comment: Upstate Forever comments that the proposed pump-turbine upgrades and Bad Creek II Complex could result in larger, and more rapid, fluctuations in the upper reservoir and Lake Jocassee. As a result, the existing 160-foot upper reservoir fluctuation band could affect a variety of environmental parameters, including but not limited to water quality, shoreline habitat, and fish entrainment.

Response: As identified in Section 5.1.2, Resource Issues – Aquatic Resources, of the scoping document, the effects of project operation on water levels and water quality in Lake Jocassee, and the effects of reservoir fluctuations associated with project operation on aquatic resources in Lake Jocassee, will be analyzed in the NEPA document.

Comment: South Carolina DNR comments that the description of the project location in Section 1.0, Introduction, of SD1 fails to note that the lower reservoir (Lake Jocassee) is located on a headwater tributary to the Savannah River.

Response: We have revised Section 1.0, Introduction, of the scoping document to include information regarding the location of the project with respect to the Savannah River watershed.

Aquatic Resources

Comment: The Foothills Trail Conservancy recommends that Commission staff consider the potential threats to aquatic resources (i.e., sedimentation as a result of trail use, etc.,) throughout the Foothills Trail corridor.

Response: The effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in Lake Jocassee and streams in the project vicinity is addressed in Section 5.1.2 of the scoping document. We have modified Section 5.1.2 to include an evaluation of the effects of project recreation on aquatic resources.

Comment: Upstate Forever comments that the Fisheries Memorandum of Understanding (MOU) and 10-Year Work Plans for fishery resources that Duke Energy has completed in partnership with the South Carolina DNR should be included as proposed environmental measures.

Response: Duke Energy's proposal to consult with resource agencies and other stakeholders to update the MOU and 10-year Work Plans as part of the relicensing process are included in Section 3.2.2 of the scoping document.[4]

Comment: Upstate Forever expresses concerns regarding the effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in the Bad Creek reservoir, Lake Jocassee, and the surrounding tributaries.

[4] ***The MOU and most recent 10-year Work Plan (2017-2027) were filed with the Commission on December 6, 1996, and January 16, 2017, respectively.***

Response: The effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in Lake Jocassee and streams in the project vicinity is addressed in Section 5.1.2. We have modified Section 5.1.2 to include the effects construction-related erosion, sedimentation, and spoils disposal in the Bad Creek reservoir on Lake Jocassee.

<u>Terrestrial Resources and Threatened and Endangered (T&E) Species</u>

Comment: Regarding Sections 5.1.3 (Terrestrial Resources) and 5.1.4 (Threatened and Endangered Species) of the scoping document, Upstate Forever comments that in addition to assessing the effects of project construction, operation, and maintenance activities on ecological communities and protected terrestrial species, Commission staff should also assess the effects on potential[5] habitat, including the effects of non-native, invasive, and noxious species on ecological communities and potential habitat areas. Upstate Forever further states that Commission staff's assessment should explicitly examine past habitat availability, the current amount of available habitat, determine trends for habitat loss or creation through the term of a new license, and habitat needs for healthy, diverse, and viable populations of the target species.

Response: Section 5 describes staff's intent to analyze the existing available habitat for terrestrial flora and fauna and status of non-native invasive species. The environmental baseline for the Commission's NEPA assessment is the present time and, therefore, the focus of staff's analysis will be the current condition of natural resources at the project, and the effects of the applicant's proposal on those resources.

Comment: Upstate Forever states that Sections 5.1.3 (Terrestrial Resources) and 5.1.4 (Threatened and Endangered Species) of the scoping document should consider project impacts on species not included in these sections. Upstate Forever references the "List of Threatened, Endangered, Candidate, and Proposed Species Generated by ECOS-IPaC Website on April 11, 2022," which is available on the FERC's eLibrary for this docket. Specifically, Upstate Forever comments that this list includes 10 migratory bird species considered Birds of Conservation Concern, which warrant special attention in the project vicinity.

Response: Section 5.1.4 (Threatened and Endangered Species) of SD2 strictly includes federally listed species and species proposed for federal listing, as shown on the official species list generated by Commission staff on April 11, 2022, and filed to the record on April 12, 2022. Section 5.1.3 (Terrestrial Resources) of SD2 covers other special status terrestrial species (e.g., state listed species and federal candidate species). We have modified Section 5.1.3 to include the effects of project construction, operation,

[5] ***Upstate Forever emphasized the word "potential" in its comments on SD1.***

maintenance, and project-related recreation on Birds of Conservation Concern and their habitats.

Comment: FWS comments that on March 23, 2022, it published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the ESA of 1973, as amended. If finalized, the proposed reclassification of the NLEB would occur by November 2022 and would go into effect in December 2022, and it would remove the current 4(d) rule for this species. FWS states that it does not yet know what impact the proposed up-listing of NLEB will have on tree clearing and similar activities. In addition, FWS notes that there is potential for additional bat species to be listed during the relicensing process.

Response: Commission staff will monitor the status of the NLEB and will use FWS's Information and Planning and Consultation (IPaC) system to update the official species list for the project throughout the relicensing process and ensure that the Commission is prepared should the listing status for NLEB or other species change.

Comment: FWS comments that it does not have any records of the Indiana bat within Oconee County, South Carolina, and therefore FWS believes this species does not need to be included in the list of T&E species to be analyzed.

Response: Given FWS's comments and the fact that the Indiana bat does not appear on the IPaC official species list for the project, we have modified Section 5.1.4, Threatened and Endangered Species, to remove Indiana bat from the list of T&E species to be analyzed during the Bad Creek relicensing process.

Comment: South Carolina DNR comments that the gray bat may occur in the Bad Creek Project area because there are records of this species less than one mile north of the project in Transylvania County, North Carolina. In addition, South Carolina DNR-verified gray bat calls were detected at sites located about 9 miles and 15 miles from the project and this species' range can extend 16.8 miles from roosting and foraging sites. Therefore, South Carolina DNR recommends that the gray bat be included in the list of T&E species for the project.

Response: We have modified Section 5.1.4, Threatened and Endangered Species, to include project effects on the gray bat.

<u>Climate Change</u>

Comment: Upstate Forever and Foothills Trail Conservancy comment that the impacts of climate change on natural resources at the project and within the Foothills Trail corridor should be considered, evaluated, and discussed. These stakeholders state

that, in particular, wildlife habitat corridors may be necessary for species migration due to climate change and should be considered throughout the life of a new license for the project.

Response: We have added a bullet to Section 5.1.3, Terrestrial Resources, to describe our intent to consider climate change, along with other reasonably foreseeable effects on natural resources, including wildlife habitat corridors, in the project boundary to the extent possible.

Recreation, Land Use, and Aesthetics

Comment: The Foothills Trail Conservancy and Upstate Forever comment that requirements of the original license for the Bad Creek Project should be accurately and comprehensively discussed, including requirements related to the Foothills Trail.

Response: We have modified section 3.1.1, Existing Project Facilities, to more accurately reflect requirements of the original license for the Bad Creek Project in regard to the Foothills Trail. Further, we have modified section 5.1.5, Resource Issues—Recreation, Land Use, and Aesthetics, to clarify our intent to address issues relating to the Foothills Trail in our NEPA document.

Comment: Upstate Forever requests that Section 5.1.5, Resource Issues—Recreation, Land Use, and Aesthetics, be modified to discuss management of the project shoreline as riparian and littoral habitat.

Response: We have added a bullet to Section 5.1.5 to describe our intent to analyze the effects of land management within the project boundary on environmental resources, such as aquatic and terrestrial habitat.

Comment: Upstate Forever requests that the NEPA document consider traditional recreation activities, such as fly-fishing and birdwatching, which are not affected by the fluctuating water levels of a pumped storage development.

Response: We have added a bullet to Section 5.1.5 to describe our intent to evaluate the use of project lands for recreation activities that are not dependent on use of the Bad Creek Project's upper reservoir, including fly fishing and birdwatching.

Noise, Air Quality, and Traffic

Comment: EPA comments that Duke Energy should disclose construction and operational emissions related to the project and recommends the use of best management practices to minimize mobile sources of emissions during construction.

Response: To clarify, Section 5.1.8, Resource Issues—Noise, Air Quality, and Traffic, provides a preliminary list of potential issues to be analyzed in the NEPA document and includes the effects of project construction activities on air quality. Staff's analysis will use existing information in the project record and any additional information developed during the relicensing process to evaluate potential effects on air quality and the need for protection, mitigation, and enhancement measures.

Comment: Mr. Phil Mitchell notes that there is only one access road, Bad Creek Road, leading to the project site and 21 residential properties in the surrounding area. Mr. Mitchell raises concern that excavation work associated with the construction of the proposed Bad Creek Complex II may block or limit access to Bad Creek Road by homeowners and emergency services. Mr. Mitchell suggests the use of a temporary, rough-cut road to serve as a secondary access point, and potentially, a recreational access route in the future.

Response: Section 5.1.7, Resource Issues—Socioeconomics, and Section 5.1.8, Resource Issues—Noise, Air Quality, and Traffic, provide a preliminary list of potential issues to be analyzed in the NEPA document, including the effects of continued project operation and maintenance on the provision of government services and the effects of project-related construction on road networks in the project area. Staff's analysis will use existing information in the project record and any additional information developed during the relicensing process to evaluate potential effects of the project, including a discussion of how construction of the Bad Creek II Complex, if proposed, would affect access for emergency services. The need for protection, mitigation, and enhancement measures would be evaluated in the NEPA document.

Comprehensive Plans

Comment: The Foothills Trail Conservancy states that Section 8.0, Comprehensive Plans, should be revised to include the most recent version of documents available online.

Response: If more recent versions of documents listed in Section 8.0 are available, the preparing agency should file the revised documents with the Commission using the instructions available here: https://cms.ferc.gov/media/list-comprehensive-plans. We recommend that the State of South Carolina file its most recent State Comprehensive Outdoor Recreation Plan, as identified in the comments of the Foothills Trails Conservancy.

Comment: Upstate Forever requests that the Commission consider the most recent future land use maps and comprehensive plans available in both Transylvania and Jackson Counties, North Carolina and Oconee County, South Carolina.

Response: Local land use plans, and other municipally-prepared documents typically do not qualify as comprehensive plans under section 10(a)(2)(a) of the Federal Power Act because they are not prepared by a state or federal agency. If there are specific recommendations in municipally-prepared plans that are relevant to the project's relicensing, stakeholders may file such plans in the project docket with an explanation of how the document applies to the relicensing of the project. These comments would be considered, like other comments, as part of the Commission's 10(a) analysis.

3.0 PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA, the environmental analysis will consider the following alternatives, at a minimum: (1) a no-action alternative, (2) the licensee's proposed action, and (3) alternatives to the proposed action.

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Bad Creek Project would continue to operate as required by the current project license (i.e., there would be no change to the existing environment). No new environmental protection, mitigation, or enhancement measures would be implemented. This alternative is the baseline environmental condition for comparison with other alternatives.

3.1.1 Existing Project Facilities

The existing Bad Creek Project includes: (1) a 2,600-foot-long, 355-foot-high main dam composed of an impervious core and rockfill shell, and equipped with 5-foot-high flashboards; (2) a 900-foot-long, 170-foot-high west dam; (3) a 900-foot-long, 90-foot-high east saddle dike; (4) a 363-acre upper reservoir with a gross storage capacity of 35,513 acre-feet at a normal maximum elevation of 2,310 feet mean sea level (msl); (5) an upper reservoir intake channel consisting of a dewatering dam and bellmouth inlet; (6) a 5,026-foot-long water conveyance system consisting of: (a) a 856-foot-long, 29.5-foot-diameter vertical access shaft, (b) 1,186-foot-long, 29.5-foot-wide power tunnel, (c) a manifold tunnel, (d) four, 13.6-foot-diameter steel-lined penstocks, (e) four, 316-foot-long, 16.4-foot-diameter draft tube tunnels, and (f) two, 875-foot-long, 24.6-foot-diameter tailrace tunnels; (7) a 433-foot-long, 164-foot-tall underground powerhouse containing four, Francis reversible-pump turbine-generator units with a total installed capacity of 1,400 MW; (8) an 43.5-foot-high equipment building located about 469 feet above the underground powerhouse; (9) a 118-foot-long, 15-foot-wide reinforced concrete, lower reservoir (Lake Jocassee) [6] inlet/outlet structure, including four, 30-foot-high, 18-foot-wide steel lift gates; (9) generator leads; (10) a transformer

[6] *See* 156 FERC ¶ 62,122 issued August 16, 2016.

yard; (11) a switchyard consisting of: (a) four step-up transformers, (b) one 9.25-mile-long, 100-kilovolt (kV) transmission line, and (c) one 9.25-mile-long, 525-kV line; (12) a 9.25-mile-long, 254-foot-wide transmission line corridor; and (13) appurtenant facilities. The project also includes an existing 4.8-mile road that leads from the project entrance to the powerhouse area near Lake Jocassee.

There is no public access to Bad Creek Reservoir due to potential large daily fluctuations in water and public safety considerations. As a requirement of the project's existing license, Duke Energy constructed a ***43-mile*** portion of the 77-mile Foothills Trail, which is ***largely*** located outside of the project boundary***, although public access to the trail is currently provided within and adjoining the project boundary***. ***Management of the Foothills Trail is guided by the document "A Plan for Development and Management of the Foothills Trail" (1980), which is part of the approved Exhibit R for the project. The trail*** is maintained ***by Duke Energy in partnership with*** the Foothills Trail Conservancy. Duke Energy does not propose to include the Foothills Trail as a project recreation facility under the new license.

3.1.2 Existing Project Operation

The Bad Creek Project is an automated pumped storage plant where water is regularly moved from the upper reservoir to the lower reservoir during generation, and from the lower reservoir back to the upper reservoir during pumping. All water utilized for generation originates from the 7,980-acre lower reservoir, Lake Jocassee. The lower reservoir has a gross storage capacity of 1,206,798 acre-feet at a normal maximum elevation of 1,110 feet msl. The project is currently licensed to operate on a weekly pump-storage cycle by generating approximately six hours per weekday, and partially pumping flow back to the upper reservoir each weeknight and on weekends. The upper reservoir is licensed to fluctuate between 2,310 feet msl (normal maximum elevation) and 2,150 feet msl (normal minimum elevation), resulting in a maximum drawdown of 160 feet and a useable storage capacity of 31,808 acre-feet.

However, in practice, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 feet msl for approximately 97 percent of the time to maximize head and unit efficiency. Generation usually occurs during the day, while water is pumped from the lower reservoir to partially replenish the upper reservoir at night.

The average annual generation of the project is about 1,884,685 MWh based on the period of record from 2015 to 2020. The average annual energy required for pumping during the same period is about 2,398,114 MWh. Therefore, the net energy consumption of the project is 513,429 MWh. The average cycle efficiency is about 78.6 percent.

3.2 LICENSEE'S PROPOSALS

3.2.1 Proposed Project Facilities and Operation

Duke Energy proposes to use the ILP pre-filing period to analyze the potential to develop a Bad Creek II Complex (Complex). The Complex would consist of a new: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line.

The Complex powerhouse would include four new, reversible pump-turbine units with an installed generating capacity between 106 MW and 425 MW, and a starting capacity between 308 MW and 372 MW for pumping. Average annual generation for the project would increase by up to 25,856 MWh. With the new pump-turbine units, generating and pumping capacity would increase due to a combination of an increase in flow and improvement in the hydraulic design of the generation runners. The overall cycle capacity would increase by an estimated 80 percent, when all four units are in operation.

No modifications are proposed to the existing upper and lower reservoirs. However, construction of the Complex would require modifications to the existing project boundary to enclose the new facilities. While Duke Energy owns all property required for the existing project in fee simple, a portion of the potential Complex transmission line corridor is currently maintained under a property easement. Duke Energy intends to identify a new project boundary in the final license application that would include all lands necessary for access to, or control of, the expanded project facilities.

If, during prefiling, Duke Energy determines that it will not include the Complex in its final licensing proposal, the licensee proposes instead to continue to operate the project as required by the existing license.

3.2.2 Proposed Environmental Measures

Duke Energy identifies several preliminary studies and environmental protection, mitigation, and enhancement (PM&E) measures in its PAD. The PM&E measures described below address both the potential effects of the new Complex, and the effects of continued project operation, on resources in the project area, as appropriate. The potential need for additional PM&E measures will be evaluated during the relicensing process.

General

- Continue to operate the project in a pumped-storage mode in accordance with the Keowee-Toxaway Project Relicensing Agreement.[7]

- Consult with resource agencies and other stakeholders through the relicensing process to update the Memorandum of Understanding and 10-Year Work Plans between Duke Energy and the South Carolina Department of Natural Resources to maintain high quality fisheries in Lakes Jocassee and Keowee.

Geology and Soil Resources

- Identify feasible upland areas within the project boundary and/or property owned by Duke Energy to deposit spoils from construction of the proposed Complex.

- Complete a geotechnical investigation and geologic assessment to identify the potential effects of construction and operation of the proposed Complex and inform mitigation measures to maintain geological stability.

Aquatic Resources

- Continue to implement the following operational protocols to reduce entrainment at the Bad Creek Project: (1) minimize, to the extent practicable, the length of time during which the Lake Jocassee surface elevation is below 1,099 feet msl; (2) if Lake Jocassee surface elevation falls below 1,099 feet msl, implement operational changes on turbine unit availability and other operational considerations to minimize fish entrainment, such as turning lights off near inlet/outlet structures and implementing a unit startup and shutdown sequence;[8] and (3) if Lake Jocassee is projected to remain below elevation 1,099 feet msl for 30 or 60

[7] The Keowee-Toxaway Relicensing Agreement includes operating provisions and protection, mitigation, and enhancement measures associated with the Keowee-Toxaway Hydroelectric Project No. 2503 (Keowee-Toxaway Project). Lake Jocassee, the Bad Creek Project's lower reservoir, is part of the Keowee-Toxaway Project.

[8] The pumping protocol includes starting up unit 4 first, followed by units 2, 3, and 1 sequentially. Unit order is reversed during the shutdown sequence.

days, notify and/or consult with the resource agencies to determine if additional measures are needed to minimize entrainment.

- Develop a water quality monitoring plan in consultation with the resource agencies that describes methods and reporting criteria for monitoring water quality (i.e., DO, temperature, pH, specific conductance, and turbidity) before construction, during construction, and during project operation.

- Develop an erosion and sedimentation control plan to minimize the effects of construction related erosion and sedimentation on water quality and aquatic habitat.

- Develop spill prevention, control, and safety management plans to prevent vehicle spilled fluids from entering the watersheds and harming water quality during construction and operation.

- Consult with the resource agencies and stakeholders through the relicensing process to determine: (1) appropriate measures to protect trout in Lake Jocassee; (2) the need for additional fisheries research and enhancements; and (3) measures for the protection of water quality, fish, and other aquatic resources during construction and operation of the Complex.

Terrestrial Resources and Threatened and Endangered Species

- Consult with resource agencies through the relicensing process to determine: (1) appropriate seasonal restrictions for vegetation clearing and measures for revegetation plans that are protective of plant and wildlife resources; and (2) measures to reduce the potential spread of invasive species during project construction and operation.

- Consult with resource agencies through the relicensing process to determine the need for pre-construction surveys for, and/or conservation measures to protect: (1) special status species such as Chamberlain's dwarf salamander, golden-winged warbler, Edmund's snaketail, Carolina hemlock, Georgia aster, and sun-facing coneflower; and (2) federally listed species including the persistent trillium, smooth coneflower, and small whorled pogonia.

- Consult with resource agencies prior to conducting tree clearing activities to protect special status bats, including the little brown bat, tricolored bat,

eastern small-footed bat, and the federally listed northern long-eared bat and Indiana bat.

Recreation, Land Use, and Aesthetics

- Prepare an updated recreation plan for the project.

- Consult with agencies and relicensing participants to identify and propose measures to address short-term construction-related impacts on boating or land-based recreation amenities.

- Employ common mitigation techniques to reduce impacts to visual resources during and after construction, including minimizing disturbance (e.g., limiting tree clearing and vegetation removal to the extent possible), lighting control, strategic placement of facility appurtenances, and reduction of visual contrast caused by new rights-of-way, access roads laydown areas, and staging areas.

Cultural Resources

- Identify National Register of Historic Places-eligible cultural resources and appropriate resource protection, avoidance, or mitigation measures for historic archaeological, and traditional cultural resources including, but not limited to, development of a Historic Properties Management Plan, installment of temporary fencing to protect cultural resources during construction (if present), avoidance of sensitive areas not directly within the footprint of the Complex facilities (as feasible), and monitoring during construction by a qualified archaeologist for construction in areas where cultural resources are likely to be present.

Developmental Resources

- Complete the ongoing Bad Creek II Complex Feasibility Design Study to analyze potential effects that may result from construction of the Complex, including construction of a new upper reservoir inlet/outlet structure, water conveyance system, underground powerhouse with four pump-turbine units, lower reservoir inlet/outlet structure, transformer yard, and transmission line.

- Conduct a comprehensive transmission line siting study for the proposed Complex to determine environmental effects and identify the preferred route for the new line.

3.3 DAM SAFETY

It is important to note that dam safety constraints may exist and should be taken into consideration in the development of proposals and alternatives considered in the pending proceeding. For example, proposed modifications to the dam structure, such as the addition of flashboards or fish passage facilities, could impact the integrity of the dam structure. As the proposal and alternatives are developed, the applicant must evaluate the effects and ensure that the project would meet the Commission's dam safety criteria found in Part 12 of the Commission's regulations and the Engineering Guidelines (http://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp).

3.4 ALTERNATIVES TO THE PROPOSED ACTION

Commission staff will consider and assess all alternative recommendations for operational or facility modifications, as well as PM&E measures identified by Commission staff, federal and state agencies, Native-American tribes, NGOs, and the public.

3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

At present, we propose to eliminate the following alternatives from detailed study in the NEPA document.

3.5.1 Federal Government Takeover

In accordance with section 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the FPA.[9] We do not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

3.5.2 Non-power License

A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the

[9] 16 U.S.C. §§ 791(a)-825(r).

non-power license. At this time, no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Bad Creek Project should no longer be used to produce power. Thus, we do not consider a non-power license a reasonable alternative to relicensing the project.

3.5.3 Project Decommissioning

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing in most cases.[10] Decommissioning can be accomplished in different ways depending on the project, its environment, and the particular resource needs.[11] For these reasons, the Commission does not speculate about decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or a participant in a relicensing proceeding demonstrates that there are serious resource concerns that cannot be addressed with appropriate license measures and that make decommissioning a reasonable alternative.[12] Duke Energy does not propose decommissioning, nor does the record to date demonstrate there are serious resource concerns that cannot be mitigated if the project is relicensed; as such, there is no reason, at this time, to include decommissioning as a reasonable alternative to be evaluated and studied as part of staff's NEPA analysis.

[10] *See*, e.g., *Eagle Crest Energy Co*., 153 FERC ¶ 61,058, at P 67 (2015); *Public Utility District No. 1 of Pend Oreille County*, 112 FERC ¶ 61,055, at P 82 (2005); *Midwest Hydro, Inc*., 111 FERC ¶ 61,327, at PP 35-38 (2005).

[11] In the unlikely event that the Commission denies relicensing a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2020). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

[12] *See* generally *Project Decommissioning at Relicensing*; Policy Statement, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); *see also City of Tacoma, Washington*, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

4.0 SCOPE OF CUMULATIVE EFFECTS AND SITE-SPECIFIC RESOURCE ISSUES

4.1 CUMULATIVE EFFECTS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 C.F.R. 1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

4.1.1 Resources That Could be Cumulatively Affected

Based on information in the PAD for the Bad Creek Project, and preliminary staff analysis, we have identified geology and soil resources, water quality, water quantity, and fishery resources as resources that could be cumulatively affected by the proposed continued operation and maintenance of the Bad Creek Project, in combination with other hydroelectric projects and other activities in the Savannah River Basin.

4.1.2 Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources; and (2) contributing effects from other hydropower and non-hydropower activities within the Savannah River Basin. Because the proposed actions would affect the resources differently, the geographic scope for each resource may vary.

We have tentatively identified the geographic scope for geology and soil resources, water quality, water quantity, and fishery resources to include the Lake Jocassee watershed, including the tributaries to Lake Jocassee, as our upstream geographic scope of analysis. In addition, we identify the downstream geographic scope of analysis as extending to the mouth of the Savannah River. We chose this geographic scope because the collective operation and maintenance of the project, in combination with other developmental and non-developmental uses, may cumulatively affect geology and soil resources, water quality, water quantity, and fishery resources in the Savannah River.

4.1.3 Temporal Scope

The temporal scope of our cumulative effects analysis in the NEPA document will include a discussion of past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a new license, the temporal scope will look 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

5.0 SITE-SPECIFIC RESOURCE ISSUES

5.1 RESOURCE ISSUES

In this section, we present a preliminary list of environmental issues to be addressed in the NEPA document. We identified these issues, which are listed by resource area, by reviewing the PAD and the Commission's record for the Bad Creek Project. This list is not intended to be exhaustive or final, but contains those issues raised to date that could have substantial effects. The resource issue listed below would address the potential effects of the new Complex, as well as the effects of continued project operations under the existing license, as appropriate. After the scoping process is complete, we will review the list and determine the appropriate level of analysis needed to address each issue. ***Those issues identified by an asterisk (*) will be analyzed for both cumulative and site-specific effects.***

5.1.1 Geology and Soils Resources

- Effects of project construction and spoil disposal on soil erosion and sedimentation.
- Effects of project operation on shoreline erosion along the lower reservoir.*****
- Effects of project construction on slope instability in the project area.
- Effects of seismic activity in the project area on construction of the Complex, and vice versa.

5.1.2 Aquatic Resources

- Effects of construction-related erosion, sedimentation, and spoils disposal on water quality, aquatic habitat, and aquatic biota in Lake Jocassee and streams in the project vicinity.

- Effects of project operation on water levels in Lake Jocassee.*****

- Effects of project operation on water quality in Lake Jocassee, including water temperature, dissolved oxygen (DO) concentrations, and vertical mixing of DO.*****

- Effects of reservoir fluctuations associated with project operation on aquatic habitat and biota in Lake Jocassee.*****

- Effects of vertical mixing of DO associated with project operation on fish populations in Lake Jocassee.

- Effects of project operation on aquatic habitat and biota in Howard Creek.[13]

- Effects of project induced impingement, entrainment, and turbine mortality on fish populations in Lake Jocassee.*****

- ***Effects of project recreation on aquatic resources.***

- ***The effects construction-related erosion, sedimentation, and spoils disposal in the Bad Creek reservoir on Lake Jocassee.***

5.1.3 Terrestrial Resources

- Effects of project construction, operation, and maintenance activities, including maintenance for roads and transmission line rights-of-way, and project-related recreation on native plant communities, wetlands, and the spread and control of non-native, invasive plants.

- Effects of the existing and proposed project transmission lines on raptors and other birds, including electrocution and collision hazards.

- Effects of permanent and temporary wildlife habitat loss due to construction of proposed project features and disposal of spoils, including potential loss of habitat that supports foraging and/or nesting raptors and other birds.

- Effects of noise, lighting, vehicular traffic, and human presence during project construction, operation, and maintenance activities on wildlife,

[13] Howard Creek is a tributary of Lake Jocassee and receives seepage flows from the two earthen dams of the Bad Creek upper reservoir.

including special-status wildlife species, especially during sensitive periods (e.g., migrating or breeding).

- Effects of project construction, operation, maintenance, and project-related recreation on special status species, including the monarch butterfly, a federal candidate species, ***Birds of Conservation Concern,*** and ~~its~~ ***their*** habitat***s***.

- ***Effects of climate change and other reasonably foreseeable effects on natural resources, including wildlife habitat corridors, in the project boundary, to the extent possible.***

5.1.4 Threatened and Endangered Species

- Effects of project construction, operation, maintenance, and project-related recreation on the endangered persistent trillium (*Trillium persistens*), smooth coneflower (*Echinacea laevigata*), and ***gray bat (Myotis grisescens)*** ~~***Indiana bat (Myotis sodalis)***~~,[14] and the threatened northern long-eared bat (*Myotis septentrionalis*) and small whorled pogonia (*Isotria medeoloides*).

5.1.5 Recreation, Land Use, and Aesthetics

- Effects of proposed project construction, operation, and maintenance on recreational use in the project ***boundary, including access to the existing Foothills Trail.***

- ***Use of project lands for recreation activities, including fly fishing and birdwatching.***

- Effects of project construction, operation, and maintenance existing land uses in the project-affected area.

- ***Effects of land management activities within the project boundary on environmental resources.***

[14] On April 11, 2022, Commission staff accessed the U.S. Fish and Wildlife Service's IPaC database, and filed the IPaC official species list for the Bad Creek Project on April 12, 2022. The Indiana bat is discussed in Duke's PAD, but it does not appear on the official species list for the project ***and this species is removed herein based on FWS's comments on SD1 filed on June 9, 2022***.

- Effects of project construction, operation (including the presence of project facilities), and maintenance activities on visual resources.

5.1.6 Cultural Resources

- Effects of project construction, operation, and maintenance activities on historic and archaeological resources, traditional cultural properties, and access to exercise traditional practices and treaty rights.

5.1.7 Socioeconomics

- Effects of project construction and operation activities on local roads (including traffic), housing, businesses, employment opportunities, and government services.

- Effects of project construction and operation activities on human health or the environment in identified environmental justice communities.

5.1.8 Noise, Air Quality, and Traffic

- Effects of project construction on noise levels in the project area.

- Effects of project construction activities on air quality.

- Effects of project construction on traffic and road networks in the project area.

5.1.9 Developmental Resources

- Effects of proposed or recommended environmental measures on project generation and economics.

6.0 PROPOSED STUDIES

Initial study proposals from Duke Energy are identified by resource area, below in Table 1, and in the PAD. Further studies may need to be added to this list based on comments provided to the Commission and Duke Energy from agencies, Native-American tribes, and interested parties during the study planning process.

Table 1. Duke Energy's initial study proposals for the Bad Creek Project (source: Duke Energy, Bad Creek Project PAD).

Resource Area and Issue	Duke Energy's Proposed Study
1. General	Use a three-dimensional computational flow dynamics model (CFD)[15] to evaluate the effects of water discharge from the Complex on shoreline erosion, vertical mixing of DO, and water-based recreation in Lake Jocassee.
2. Geology and Soil Resources	Identify feasible upland areas within the project boundary and/or property owned by Duke Energy to deposit spoils from construction of the Complex.
3. Geology and Soil Resources	Complete a geotechnical investigation and geological assessment to identify potential effects of the Complex, and inform mitigation measures to maintain geological stability.
4. Fish and Aquatic Resources	Conduct a water quality study that includes~~: (1)~~ a literature review of available water quality data~~, (2)~~ water quality standards, ~~(3) and~~ current designated uses in the project boundary and Lake Jocassee. ***If construction of the Complex is pursued, the study will also include: (1) an evaluation of the potential impacts of excavated material in upland disposal areas and at the submerged weir on water quality; and (2) development of a water quality monitoring plan in consultation with the resource agencies to monitor water quality prior to construction, during construction, and after construction.***
5. Fish and Aquatic Resources	Implement updates to the desktop entrainment study[16] based on consultation with stakeholders during the relicensing process.
6. Fish and Aquatic Resources	Conduct presence/absence surveys for mussels and other protected aquatic species in streams potentially impacted

[15] In the PAD, Duke Energy indicates that a preliminary CFD model has been developed and will be updated to reflect the working design of the Complex.

[16] Appendix F of Duke Energy's PAD includes a desktop entrainment analysis that evaluated the addition of a second powerhouse identical in size and capacity to the existing powerhouse.

Resource Area and Issue	Duke Energy's Proposed Study
	by potential project construction.
7. Recreation	Develop an understanding of existing recreation use and needs for future recreation development at the project through a mixed-method approach including background research, stakeholder consultation, and data collection to include spot and/or continuous visitor counts, aerial photography, and visitor use surveys.
8. Recreation and Public Safety	Evaluate safety risks to the public generally, and boaters specifically during both construction and operation of the Complex.
9. Aesthetic Resources	Assess aesthetic resources near the project and evaluate impacts of construction and operation of the Complex on these resources.
10. Cultural Resources	Conduct archaeological surveys for all non-steep landforms as well as architectural surveys of any structures at or near the project that are 40 or more years old.
11. Developmental Resources	Complete the Bad Creek II Feasibility Design Study to analyze potential effects that may result from construction of the Complex.
12. Developmental Resources	Conduct a transmission line siting study for the potential Complex.

7.0 NEPA DOCUMENT PREPARATION SCHEDULE

The NEPA document will be distributed to all persons and entities on the Commission's service and mailing lists for the Bad Creek Project. The document will include our recommendations for operating procedures, as well as environmental protection and enhancement measures that should be part of any new license issued by the Commission. All recipients will then have 30 days to review the NEPA document

and file written comments with the Commission. All comments on the NEPA document filed with the Commission will be considered in preparation of the license order.

The major milestones, including those for preparing the NEPA Document,[17] are as follows:

Major Milestone	Target Date
Scoping Meeting	May 2022
License Application Filed	July 2025
Ready for Environmental Analysis Notice Issued	September 2025
Deadline for Filing Comments, Recommendations, and Agency Terms and Conditions/Prescriptions	November 2025
NEPA Document Issued	July 2026
Comments on NEPA Document Due	August 2026
Deadline for Filing Modified Agency Recommendations	October 2026

A copy of the process plan, which has a complete list of the relicensing milestones for the Bad Creek Project, including those for developing the license application, is attached as Appendix A to this SD2.

8.0 COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. section 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. The staff has preliminarily identified and reviewed the plans listed below that may be relevant to the Bad Creek Project. Agencies are requested to review this list and inform the Commission staff of any changes. If there are other comprehensive plans that should be considered for this list that are not on file with the Commission, or if there are more recent versions of the plans already listed, they can be filed for consideration with the Commission according to 18 C.F.R. § 2.19 of the Commission's regulations. Please follow the instructions for filing a plan at http://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf.

The following is a list of comprehensive plans currently on file with the Commission that may be relevant to the Bad Creek Project:

Atlantic States Marine Fisheries Commission. 1996. Interstate fishery management plan for weakfish. (Report No. 27). May 1996.

[17] This schedule assumes that a single EA would be prepared. If a draft and final EA, or EIS is prepared, the target dates for comments on the draft EA or EIS and deadline for filing modified agency recommendations may need to be revised.

Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (*Acipenser oxyrhynchus*). (Report No. 31). July 1998.

Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.

Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.

Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). (Report No. 36). April 2000.

Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.

Atlantic States Marine Fisheries Commission. 2008. Amendment 2 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2008.

Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.

Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. February 2010.

Atlantic States Marine Fisheries Commission. 2013. Amendment 3 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. August 2013.

Atlantic States Marine Fisheries Commission. 2014. Amendment 4 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2014.

Forest Service. 2004. Sumter National Forest revised land and resource management plan. Department of Agriculture, Columbia, South Carolina. January 2004.

National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.

National Marine Fisheries Service, North Carolina Wildlife Resources Commission, South Carolina Department of Natural Resources, and U.S. Fish and Wildlife Service. 2017. Santee Basin Diadromous Fish Passage Restoration Plan. 2017.

National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

South Carolina Department of Health and Environmental Control. 1989. Assessment of non-point source pollution for the State of South Carolina. Columbia, South Carolina. April 1989.

South Carolina Department of Health and Environmental Control. 1989. Non-point source management program for the State of South Carolina. Columbia, South Carolina. April 1989.

South Carolina Department of Parks, Recreation, & Tourism. 2008. South Carolina State Comprehensive Outdoor Recreation Plan (SCORP). Columbia, South Carolina. April 2008.

South Carolina Department of Parks, Recreation, & Tourism. 2002. The South Carolina State Trails Plan. Columbia, South Carolina. 2002.

South Carolina Department of Natural Resources. 2014. South Carolina's State Wildlife Action Plan 2015. Columbia, South Carolina. October 2014.

South Carolina Department of Natural Resources. 2004. South Carolina Water Plan-Second Edition. Columbia, South Carolina. January 2004.

South Carolina Water Resources Commission. 1985. Instream flow study - Phase I: identification and priority listing of streams in South Carolina for which minimum flow levels need to be established. Report No. 149.
Columbia, South Carolina. June 1985.

South Carolina Water Resources Commission. 1988. Instream flow study - Phase II: determination of minimum flow standards to protect instream uses in priority stream segments. Report No. 163. Columbia, South Carolina. May 1988.

South Carolina Water Resources Commission. National Park Service. 1988. South Carolina rivers assessment. Columbia, South Carolina. September 1988.

South Carolina Wildlife and Marine Resources Department. 1989. South Carolina instream flow studies: a status report. Columbia, South Carolina. June 1, 1989.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

9.0 MAILING LIST

The list below is the Commission's official mailing list for the Bad Creek Project. If you want to receive future mailings for this proceeding and are not included in the list below, please send your request by email to efiling@ferc.gov or by mail to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 12225 Wilkins Avenue, Rockville, Maryland 20852. All written or emailed requests to be added to the mailing lists must clearly identify the following on the first page: **Bad Creek Pumped Storage Project (P-2740-053).** You may use the same method if requesting removal from the mailing list below.

Register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this project or other pending projects. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov,mailto: or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

Official Mailing List for the Bad Creek Pumped Storage Project

Paul Nolan Energy Consultant 5515 17th Street North Arlington, Virginia 22205-2722	David Bernhart Assistant Regional Administrator NOAA National Marine Fisheries Service-SERO 263 13th Avenue South St. Petersburg, Florida 33701-5505
Patrick T McHenry Honorable U.S. House of Representatives 224 Cannon Washington, District of Columbia 20515	***Lorianne Riggin*** ***South Carolina Department of Natural Resources*** ***P.O. Box 167*** ***1000 Assembly Street*** ***Columbia, South Carolina 29202***
Elizabeth Miller ***South Carolina Department of Natural Resources*** ***P.O. Box 12559*** ***217 Fort Johnson Road*** ***Charleston, South Carolina 29422-2559***	

APPENDIX A

BAD CREEK PUMPED STORAGE PROJECT
PROCESS PLAN AND SCHEDULE

Shaded milestones are unnecessary if there are no study disputes. If the due date falls on a weekend or holiday, the due date is the following business day. Early filings or issuances will not result in changes to these deadlines. As appropriate, the process plan and schedule may be revised in the future.

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§ 5.5(a)	Duke Energy	Filing of NOI and PAD	Actual filing date	2/23/2022
§ 5.7	FERC	Initial Tribal Consultation Meeting	Within 30 days of NOI and PAD notice (Waived)	3/25/2022
§5.8	FERC	FERC Issues Notice of Commencement of Proceeding and SD1	Within 60 days of NOI and PAD notice	4/22/2022
§5.8 (b)(3)(viii)	FERC/ Stakeholders	Public Scoping Meetings and Environmental Site Review	Within 30 days of NOI and PAD notice and issuance of SD1	5/16/2022 & 5/17/2022
§ 5.9	Stakeholders/ FERC	File Comments on PAD, SD1, and Study Requests	Within 60 days of NOI and PAD notice and issuance of SD1	6/23/2022
§5.10	FERC	FERC Issues SD2, if necessary	Within 45 days of deadline for filing comments on SD1	8/5/2022
§5.11(a)	Duke Energy	File PSP	Within 45 days of deadline for filing comments on SD1	8/8/2022
§5.11(e)	Duke Energy/ Stakeholders	Study Plan Meetings	Within 30 days of deadline for filing proposed Study Plans	9/6/2022
§5.12	Stakeholders	File Comments on PSP	Within 90 days after proposed study plan is filed	11/7/2022

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.13(a)	Duke Energy	File RSP	Within 30 days following the deadline for filing comments on proposed Study Plan	12/5/2022
§5.13(b)	Stakeholders	File Comments on RSP	Within 15 days following Revised Study Plan	12/20/2022
§5.13(c)	FERC	FERC Issues SPD	Within 30 days following Revised Study Plan	1/4/2023
§5.14(a)	Mandatory Conditioning Agencies	Notice of Formal Study Dispute	Within 20 days of Study Plan determination	1/24/2023
§5.14(l)	FERC	Study Dispute Determination	Within 70 days of notice of formal study dispute	4/4/2023
§5.15(a)	Duke Energy	Conduct First Season Field Studies	May 2023 – April 2024	
§5.15(c)(1)	Duke Energy	File ISR	No later than one year from Study Plan approval	1/4/2024
§5.15(c)(2)	Duke Energy	ISR Meeting	Within 15 days of Initial Study Report	1/19/2024
§5.15(c)(3)	Duke Energy	File ISR Meeting Summary	Within 15 days of Study Results Meeting	2/5/2024
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/Modifications to Study/Requests for New Studies	Within 30 days of filing Meeting Summary	3/4/2024
§5.15(c)(5)	Duke Energy	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	4/3/2024
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination	Within 30 days of filing responses to disputes	5/3/2024

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.15	Duke Energy	Conduct Second Season Field Studies	May 2024 – April 2025	
§5.15 (f)	Duke Energy	File USR	No later than two years from Study Plan approval	1/3/2025
§5.15(c)(2)	Duke Energy	USR Meeting	Within 15 days of Updated Study Report	1/18/2025
§5.15(c)(3)	Duke Energy	File USR Meeting Summary	With 15 days of Study Results Meeting	2/3/2025
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/ Modifications to Study Requests/Requests for New Studies	Within 30 days of filing Meeting Summary	3/4/2025
§5.15(c)(5)	Duke Energy/ Stakeholders	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	4/3/2025
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination	Within 30 days of filing responses to disagreements	5/1/2025
§5.16(a)	Duke Energy	File PLP (or DLA) with FERC and distribute to Stakeholders	Not later than 150 days before final application is filed	3/3/2025
§5.16 (e)	FERC / Stakeholders	Comments on PLP, Additional Information Request	Within 90 days of filing Preliminary Licensing Proposal (or Draft License Application)	6/2/2025
§5.17 (a)	Duke Energy	License Application Filed	Within 2 years of license expiration	7/31/2025

Subject: FW: [EXTERNAL] RE: Question on Cultural Resources related to listing of lakes
Attachments: Keowee-Toxaway NRHP Evaluation of Structures.pdf

From: Johnson, Elizabeth <EJohnson@scdah.sc.gov>
Sent: Wednesday, August 10, 2022 1:28 PM
To: Churchill, Christy <Christy.Churchill@duke-energy.com>
Subject: RE: [EXTERNAL] RE: Question on Cultural Resources related to listing of lakes

Christy:

Thanks for following up, I have spent some time going back through our records here and having staff check the GIS.

The *NRHP Evaluation of the Keowee-Toxaway Hydroelectric Development* (2012) by Brockington resulted in recording the Keowee Hydro Development with SHPO Site No 0155 (373-0155) and Jocassee Development as SHPO Site No. 0156 (446-0156). The report specifically stated on page 116 that the structures would be assessed once reach 50 years of age. As noted in the attached letter from 11/16/12 (copies also in the HPMP for the Keowee-Toxaway project, and the NRHP evaluation appendix) our office was of the opinion that the Keowee Hydro Development and Jocassee Development were not eligible for the NRHP (due to age), and we understood a re-evaluation would occur once 50 years old. We appreciate that Duke Energy undertook this evaluation in a timely manner.

That letter also included the statement that "we encourage Duke Energy to consider the impoundments created by the developments as potential historic properties." Our office had provided previous comments (see 9/12/12 email from R. Dobrasko in appendix of the NRHP evaluation) asking about consideration of the lakes in the evaluation for the NRHP. Also in the appendix of the NRHP evaluation Duke Energy provided a response to this comment stating that the FERC-approved study plan specifically referenced "evaluation of Project structures and not associated landscape features" and that "the reservoirs are typically not included as part of the evaluation process."

When Terracon completed the recent *Architectural Survey and National Register Evaluation of the Keowee Hydroelectric Station*, the stated intent of the work (p.ii) was "to document and assess structures that could be eligible for inclusion in the National Register of Historic Places (NRHP)". That resulted in the Keowee Hydro Station, SHPO Site No. 0150 (with subnumbers for the powerhouse, intake structure, and spillway) being evaluated and recommended as eligible. As best as I can tell, the lake was not included in the evaluation, and the resulting recommendation was only for the structures. Our office concurred with the recommendation of eligibility (5/18/22).

When Terracon completed the recent *Architectural Survey and National Register Evaluation of the Jocassee Pumped Storage Hydro Station*, the stated intent of the work (p.ii) was "to document and assess structures that could be eligible for inclusion in the National Register of Historic Places (NRHP)". That resulted in the Jocassee Hydro Station, SHPO Site No. 0198 (with subnumbers for nine structures) being evaluated and recommended as eligible. The lake does not appear to have been included in this evaluation, and the resulting recommendation was only for the structures. Our office concurred with the recommendation of eligibility (5/18/22).

In hindsight it would probably have been better to have re-used the previous SHPO Site Nos, and thus just changed those boundaries to reflect the updated eligibility determinations but we didn't catch that duplication when Terracon requested the more recent numbers. And it would have been helpful for the reports to have referenced that the lakes were not considered in the evaluation, given the recommendation from 2012.

Here's a potential path forward. Our office will change 0155 and 0156 to points (would show as not eligible), and plot on their respective Hydro areas. We would also update the Notes fields as follows:

0155 Notes : “re-evaluated for NRHP eligibility 2021-22, see Site No. 0150.01, 0150.02 and 0150.03 for eligible structures (also Oconee Nuclear Station HD)

0156 Notes : “re-evaluated for NRHP eligibility 2021-22, see Site No. 0198 for eligible boundary and structures

This allows us to capture both the initial recording of the developments in 2012, as well as the re-evaluation in 2021-22.

I note that ArchSite has not yet been updated with the most recent shapefiles for 0198, but that will happen in the near future.

Thanks, let me know of any thoughts/concerns re this approach.

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office
SC Department of Archives & History
8301 Parklane Road
Columbia, SC 29223
Ph: 803.896.6168 Fax: 803.896.6167 https://scdah.sc.gov/historic-preservation

I as detailed here (www.terracon.com/disclaimer). If you cannot access the hyperlink, please e-mail sender.

WATER STRATEGY AND HYDRO LICENSING

Duke Energy
526 South Church Street/EC12Q
Charlotte, NC 28202

August 18, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Supporting GIS Data for Proposed Study Plan for Relicensing Studies

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

On February 23, 2022, in accordance with 18 CFR §5.6, Duke Energy filed the Pre-Application Document (PAD) and Notice of Intent (NOI) with FERC to initiate the ILP. The Commission provided comments on the PAD in a letter dated June 16, 2022 and requested additional geographic information system (GIS) data layers shown in the PAD. On August 5, 2022, Duke Energy filed the Proposed Study Plan for the Project.

The enclosed GIS files were intended to be filed concurrently with the PAD but were not accepted by FERC's eLibrary system due to file extension compatibility issues. Duke Energy is now filing the compatible files as subsequently directed by FERC staff.

If there are any questions regarding filing, please contact Alan Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy Carolinas, LLC

Enclosure

cc: w/o enclosure Alan Stuart, Duke Energy
Garry Rice, Duke Energy

Subject: FW: Bad Creek Relicensing Resource Committees Meeting - SAVE THE DATES

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Tuesday, October 18, 2022 3:14 PM
To: Alex Pellett <PellettC@dnr.sc.gov>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dan Rankin <RankinD@dnr.sc.gov>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Elizabeth Miller <MillerE@dnr.sc.gov>; mixong@dnr.sc.gov; jhains@g.clemson.edu; amedeemd@dhec.sc.gov; cloningerp@dnr.sc.gov; Rowdy Harris <charris@scprt.com>; Terry Keene <jtk7140@me.com>; Tom Daniel <danielt@dnr.sc.gov>; Abney, Michael A <Michael.Abney@duke-energy.com>; Amy Breedlove <BreedloveA@dnr.sc.gov>; Erika Hollis <ehollis@upstateforever.org>; Settevendemio, Erin <Erin.Settevendemio@hdrinc.com>; Gerry Yantis <gcyantis2@yahoo.com>; Lynn Quattro <quattrol@dnr.sc.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Morgan Kern <kernm@dnr.sc.gov>; Ross Self <SelfR@dnr.sc.gov>; Wahl, Nick <Nick.Wahl@duke-energy.com>; William T. Wood <woodw@dnr.sc.gov>; Dale Wilde <dwilde@keoweefolks.org>; David Bereskin <bereskind@greenvillewater.com>; Jeffrey Phillips <jphillips@greenvillewater.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; More, Priyanka <morep@dnr.sc.gov>; Raber, Maverick James <Maverick.Raber@duke-energy.com>; Scott Harder <harders@dnr.sc.gov>; Andrew Gleason <andrewandwilla@hotmail.com>; Andy Douglas <adoug41@att.net>; Bennett, Jennifer Wright <Jennifer.Bennett@duke-energy.com>; Chris Starker <cstarker@upstateforever.org>; Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>; Ken Forrester <forresterk@dnr.sc.gov>; suewilliams130@gmail.com; Willie Simmons <simmonsw@dnr.sc.gov>; Andrew Grosse <grossea@dnr.sc.gov>; Austen Attaway <attawaya@dnr.sc.gov>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Mularski, Eric <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Jennifer Kindel <kindelj@dnr.sc.gov>; bradleyk@dnr.sc.gov; Samantha Tessel <Tessels@dnr.sc.gov>; Wes Cooler <wes.cooler@mac.com>; Green, William G <bill.green@terracon.com>; caitlin.rogers <caitlin.rogers@catawba.com>; Christopher Moore <moorec@dnr.sc.gov>; Churchill, Christy <Christy.Churchill@duke-energy.com>; ejohnson@scdah.sc.gov; taylors@dnr.sc.gov; Wenonah Haire <wenonah.haire@catawba.com>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Salazar, Maggie <maggie.salazar@hdrinc.com>
Subject: Bad Creek Relicensing Resource Committees Meeting - SAVE THE DATES

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Bad Creek Relicensing Resource Committee Members:

Duke Energy would like to convene a catch-up meeting with all Resource Committees on either **Wednesday, November 16th or Thursday, November 17th, 9 am-12 pm**. Please block out your calendars for both of these date and time slots. We will provide further details on the meeting date/time slot and meeting agenda in the next two weeks. The meeting will be virtual and recorded so if you cannot make the meeting for some reason, we will send a link of the recorded meeting for your viewing.

I apologize in advance if you received multiple emails about this save the date announcement. I built my Resource Committee email contact lists based on those individuals who signed up for each committee; hence, some people serve on several committees and received the multiple emails.

Regards,

John Crutchfield
Project Manager II, Water Strategy & Hydro Licensing

Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: FW: Bad Creek Relicensing: Proposed Study Plan Meeting Summary-September 7, 2022
Attachments: Bad Creek PSP Meeting Summary.pdf

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, October 19, 2022 6:45 AM
To: Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; amedeemd@dhec.sc.gov; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Baker, Lisa - United Keetoowah Band of Cherokee Indians <ukbthpo-larue@yahoo.com>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bereskin, David - Greenville Water <bereskind@greenvillewater.com>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bluecloud, Keith - USBIA ERO <keith.bluecloud@bia.gov>; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; rhalfacre@cityofclemson.org; nhinkle@cityofclemson.org; Dustin Wilson <Dustin.Wilson@ferc.gov>; Gerry Yantis <gcyantis2@gmail.com>; Jake Dalton <jake.dalton@transylvaniacounty.org>; Ken Gish <Ken.Gish@klgates.com>; Scott Willett <swillett@arjwater.com>; Sarah Salazar <Sarah.Salazar@ferc.gov>; Shepherd, Forest T <Forest.Shepherd@ncdenr.gov>; Smith, Heather Shirley <Heather.Smith@duke-energy.com>; Hipp, Dawn <dhipp@ors.sc.gov>; Sandonato, Anthony <asandonato@ors.sc.gov>; Gordon, Jeffrey <JGordon@ors.sc.gov>; Salter, Findlay <FSalter@ors.sc.gov>; Seaman-Huynh, Michael <mseamanhuynh@ors.sc.gov>; Murphy, Melissa Chandler <Melissa.Murphy@duke-energy.com>; Smith, Ben <Ben.Smith@duke-energy.com>; Peoples, Danielle <Danielle.Peoples@duke-energy.com>; Jeff Caldwell <jcaldwell@arjwater.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Higgins, Jamie - USEPA <higgins.jamie@epa.gov>; hightocw@dhec.sc.gov; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; emccombs@americanrivers.org; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Moore, Joe - City of Brevard NC <joe.moore@cityofbrevard.com>; n, herb - sepa.doe <herbn@sepa.doe.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Owens, David - City of Pickens, SC <dowens@pickenscity.com>; growens@gmail.com; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Chris

Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Whitmire, Chris - NC House of Representatives <Chris.Whitmire@ncleg.net>; Dale Wilde <dwilde@keoweefolks.org>; suewilliams130@gmail.com; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; cloningerp@dnr.sc.gov; Tom Daniel <danielt@dnr.sc.gov>; mixong@dnr.sc.gov; Alex Pellett <PellettC@dnr.sc.gov>; RankinD@dnr.sc.gov; Amy Breedlove <BreedloveA@dnr.sc.gov>; Ross Self <SelfR@dnr.sc.gov>; quattrol@dnr.sc.gov; William T. Wood <woodw@dnr.sc.gov>; kernm@dnr.sc.gov; Scott Harder <harders@dnr.sc.gov>; More, Priyanka <morep@dnr.sc.gov>; Ken Forrester <forresterk@dnr.sc.gov>; Austen Attaway <attawaya@dnr.sc.gov>; bradleyk@dnr.sc.gov; Andrew Grosse <grossea@dnr.sc.gov>; Jennifer Kindel <kindelj@dnr.sc.gov>; simmonsw@dnr.sc.gov; Samantha Tessel <Tessels@dnr.sc.gov>; Christopher Moore <moorec@dnr.sc.gov>; taylors@dnr.sc.gov; caitlin.rogers <caitlin.rogers@catawba.com>; ejohnson@scdah.sc.gov; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Abney, Michael A <Michael.Abney@duke-energy.com>; Bennett, Jennifer Wright <Jennifer.Bennett@duke-energy.com>; Raber, Maverick James <Maverick.Raber@duke-energy.com>; Wahl, Nick <Nick.Wahl@duke-energy.com>; Churchill, Christy <Christy.Churchill@duke-energy.com>; Keener, Paul <Paul.Keener@duke-energy.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Settevendemio, Erin <Erin.Settevendemio@hdrinc.com>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>; Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>; Green, William G <Bill.Green@terracon.com>; Benjamin.Williamson <Benjamin.Williamson@duke-energy.com>; Navreet Deo <Navreet.Deo@ferc.gov>; Stephen Bowler (stephen.bowler@ferc.gov) <stephen.bowler@ferc.gov>; Santos, Sarah Anna <Sarah.Santos@duke-energy.com>
Subject: Bad Creek Relicensing: Proposed Study Plan Meeting Summary-September 7, 2022

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning,

Please find for your use the attached Bad Creek Proposed Study Plan (PSP) Meeting Summary prepared for the PSP meeting convened on September 7, 2022. The meeting summary was filed earlier this morning with the Federal Energy Regulatory Commission as part of relicensing consultation and supports Duke Energy's continuing efforts to secure a new operating license for the Bad Creek Project .

We greatly appreciate everyone's participation, support and commitment in relicensing the Bad Creek Project.

If you have any questions, please feel free to reach out to us.

Respectfully,
Alan

DUKE ENERGY.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

WATER STRATEGY AND HYDRO LICENSING

Duke Energy Corporation
Regulated and Renewable Energy
526 South Church Street / EC12Q
Charlotte, NC 28202

October 19, 2022 ***Electronically Filed***

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740)**
Proposed Study Plan Meeting Summary

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC No. 2740) (Project), located in Oconee County, South Carolina. The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission), and the current operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

On August 5, 2022, Duke Energy filed the Proposed Study Plan (PSP) with FERC. In accordance with 18 CFR §5.11(e), on September 7, 2022, Duke Energy held a PSP meeting at the Duke Energy Operations Center in Greenville, SC to present the studies proposed by Duke Energy and to address stakeholder comments on the Pre-Application Document. Duke Energy is hereby submitting a courtesy copy of the meeting summary and presentation to the Commission. This transmittal will also be posted on the Project's public relicensing website.[1] The parties listed on the attached distribution list are being directly notified of this filing.

If there are any questions regarding this filing, please contact Alan Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy Carolinas, LLC

Enclosure
CC: Distribution List
Alan Stuart, Duke Energy
Garry Rice, Duke Energy

[1] www.badcreekpumpedstorage.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Rachel McNamara
Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Herb Nadler
Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

Keith Bluecloud
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
625 E. Wisconsin Ave
Ste 200
Milwaukee, WI 53202-4618

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency
Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Jamie Higgins
NEPA Policy Office
U.S. Environmental Protection Agency
Region IV, Atlanta Federal Center
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

Melanie Olds
SC Ecological Services Field Office
FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Tom Rice
U.S. House of Representatives (CD7)
325 Cannon House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Burr
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

Office of Senator Graham
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Joe Moore
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

David Owens
City of Pickens, SC
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

David Bereskin
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Gerritt Jobsis
Associate Director of Conservation
American Rivers
gjobsis@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Chris Whitmire
North Carolina House of Representatives
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Goudreau
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
P.O. Box 11649
Columbia, SC 29211-1649

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
Mayor
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Tyler Howe
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

Meeting Summary

Project:	Bad Creek Pumped Storage Project Relicensing
Subject:	Proposed Study Plan Meeting
Date:	Wednesday, September 07, 2022
Location:	Duke Energy Wenwood Operations Center in Greenville, SC

In-Person Attendees:

Alan Stuart (Duke Energy)
Christy Churchill (Duke Energy)
Ed Bruce (Duke Energy)
Garry Rice (Duke Energy)
Jeff Lineberger (Duke Energy)
John Crutchfield (Duke Energy)
Lynne Dunn (Duke Energy)
Maverick Raber (Duke Energy)
Nick Wahl (Duke Energy)
Paul Keener (Duke Energy)
Jennifer Bennett (Duke Energy)
Mike Abney (Duke Energy)
Erin Settevendemio (HDR)
Maggie Salazar (HDR)
Sarah Kulpa (HDR)
Alison Jakupca (KA)
Kelly Kirven (KA)
Bill Green (Terracon)
Stephen Bowler (FERC)
Amy Chastain (SCDNR)
Dan Rankin (SCDNR)
Elizabeth Miller (SCDNR)
Hailey Goyette (SCDNR)
Lynn Quattro (SCDNR)
William Wood (SCDNR)
Andrew Gleason (Foothills Trail Conservancy)
Glenn Hilliard (Foothills Trail Conservancy)
Chris Starker (Upstate Forever)
Erika Hollis (Upstate Forever)
Andy Douglas (SCWF)
Dale Wilde (Friends of Lake Keowee Society)
David Bereskin (Greenville Water)
Phillip Mitchell (Fisher Knob HOA)
Rowdy Harris (SCPRT)
Sue Williams (AQD)

Online Attendees:

Sarah Santos (Duke Energy)
Scott Fletcher (Duke Energy)
Melissa Murphy (Duke Energy)
Danielle Peoples (Duke Energy)
Ben Williamson (Duke Energy)
Kerry McCarney-Castle (HDR)
Dustin Wilson (FERC)
Joshua Dub (FERC)
Navreet Deo (FERC)
Sarah Salazar (FERC)
Christopher Moore (SCDNR)
Tom Daniel (SCNDR)
Findlay Salter (SC Office of Regulatory Staff)
Jeffrey Gordon (SC Office of Regulatory Staff)
Charles Hightower (SCDHEC)
Derrick Miller (USFS)
Forest Shepherd (NCDEQ)
Kenneth Gish (K&L Gates)
Melanie Olds (USFWS)
Scott Willett (Anderson Regional Joint Water System)
Wes Cooler (Naturaland Trust)

Introductions

Alan Stuart opened the Proposed Study Plan (PSP) meeting and welcomed participants. He reviewed the agenda, objectives, and logistics for the meeting, provided a safety moment (basic disaster supply kit/hurricane season preparedness), and introduced Duke Energy and Federal Energy Regulatory Commission (FERC) meeting attendees (in person attendees and attendees via Microsoft Teams).

A. Stuart provided an overview of the existing Bad Creek Pumped Storage Project (Project) and the FERC project boundary and also introduced the proposed Bad Creek II Power Complex (Bad Creek II Complex) and the conceptual layout for the new facilities. The Bad Creek II Complex is a potential relicensing alternative for the new license application; it may or may not be included in the final license application. A. Stuart explained that the upper reservoir operating band will not change (160 vertical feet of fluctuation) with the construction of the Bad Creek II Complex. The new powerhouse complex would add an additional 1,400 megawatts (MW) of capacity to the existing Project.

Dale Wilde asked about the tunnel diameter of the proposed Bad Creek II Complex. A. Stuart noted that the diameter of the two-tunnels would be close in size to the existing Project's single tunnel but is dependent on the design of the pump-turbine units selected, which is still under study. The proposed tunnels are also slightly longer due to the distance between the existing upper reservoir and Lake Jocassee.

Andy Douglas asked about the schematic shown (Whitewater River cove) regarding boating / velocity impacts. Duke Energy acknowledged these components will be addressed in the Recreation Study and Computational Fluid Dynamics (CFD) modelling.

John Crutchfield provided an overview of the development of the PSP and the contents of the document that were filed with FERC on August 5, 2022. The PSP included six formal study plans. J. Crutchfield explained that the PSP did not include a Wildlife and Botanical Resources study plan, nor was one requested from FERC or stakeholders, because preliminary field assessments were performed and reported in the Pre-Application Document (PAD). Duke Energy expects that targeted field surveys may be required prior to construction, if the Bad Creek II Complex is included in the final license application.

J. Crutchfield reviewed the milestones completed to date and future scheduling. He reminded stakeholders that comments on the PSP are due by November 5, 2022 and that Duke Energy will file the Revised Study Plan (RSP) by December 5, 2022. The first field season for data collection will commence in the spring of 2023.

Sarah Salazar asked whether the stakeholders had a chance to visit the Project and J. Crutchfield confirmed that Duke Energy held a site visit on August 16, 2022, which was open to the relicensing stakeholder group. A. Stuart added that another site visit opportunity would be provided to coincide with the Initial Study Report meeting or second study season.

The PowerPoint presentation shown during this meeting is included in Attachment 1.

Water Resources Proposed Study Plan Meeting Presentation

Maverick Raber provided an overview of the Water Resources Study Plan and the general study area boundary. As part of relevant background and existing information, M. Raber described the monitoring data that had been collected prior to and following construction of the existing Project. Since impacts of existing Project operations are well documented, the focus of this study is on incremental impacts of construction and operation of the Bad Creek II Complex. M. Raber described each task proposed for this study and highlighted key components for the Water Quality Monitoring Plan that would be developed if the Bad Creek II Complex is proposed

in the final license. M. Raber also presented the proposed schedule for the study activities. Water quality monitoring is presently proposed for both the 2023 and 2024 field seasons (June – September).

Questions and Comments:

- David Bereskin (Greenville Water) asked how the proposed Bad Creek II Complex would impact Keowee lake levels. M. Raber does not anticipate impacts to Lake Keowee levels, but the CHEOPS model study will help to inform any downstream impacts. D. Bereskin requested that Lake Keowee impacts are studied and quantified or specified under a specific task in the Water Resources Study. D. Bereskin would like the study to look at potential effects on Lake Keowee from the operation of the Bad Creek II Complex. Jeff Lineberger noted that this requested assessment could fit under Task 4 since that is the task that includes efforts for modeling using the CHEOPS model. Chris Starker asked whether this question would be addressed in the Operations resource committee as well and Sarah Kulpa confirmed it would but noted it would also be captured as a task under the Water Resources study. A. Stuart clarified that water levels on Lake Keowee are maintained under the Keowee-Toxaway (KT) license. Action item: Duke Energy to evaluate if potential effects and discharges into Lake Keowee from the operation of the Bad Creek II Complex should be a new task or a subtask for Task 4.
- Erika Hollis asked about shoreline erosion (Lake Jocassee) and whether it would be assessed for the entire lake or just in certain areas. M. Raber noted that the focus for erosion is on the Whitewater River Cove since that will be the area affected by increased discharge from the addition of a new inlet/outlet structure but noted that the CFD model will determine the spatial extent of Bad Creek II Complex operation impacts relative to surface velocities and will determine whether there is a need for shoreline erosion studies outside of (downstream of) the Whitewater River Cove.
- C. Starker asked about Clean Water Act (CWA) 404/401 permitting and the potential placement of fill (i.e., spoil from excavation) at the existing weir. M. Raber confirmed that the 404/401 process would be applicable also for any impacts to streams or wetlands on land. A. Stuart noted that intent is to place rock spoils at the downstream end of the underwater weir; loose fill (fines) would be placed in upland areas. A sediment and erosion plan would also be required in addition to 404/401 permitting efforts. A. Stuart has confirmed with the U.S. Army Corps of Engineers (USACE) that a 404 permit would be required. C. Starker noted that Upstate Forever would be willing to help Duke Energy identify mitigation areas or opportunities in Region IV, if needed.
- Dan Rankin noted that the original weir was constructed to push water up hydraulically and inquired if the expansion of the weir would be similar and how the model would analyze this. M. Raber noted that the elevation of the weir and the upstream side (closest to the Whitewater River) are not expected to change, however the downstream side would be expanded. M. Raber noted the weir should function the same as under current conditions; with additional discharge from a second powerhouse, the weir should dissipate warm water and inhibit vertical mixing as much as possible (i.e., keep warmer water in the upper water column to prevent vertical mixing). A. Stuart noted the goal is to not raise the elevation of the weir, but Duke Energy could run scenarios to evaluate height increase during CFD model runs. M. Raber confirmed historical monitoring under

the KT license will continue and not be impacted. D. Rankin asked if Duke Energy would be interested in partnering with S.C. Department of Natural Resources (SCDNR) to place rock to create habitat for fish, which may also alleviate some permitting. A. Stuart noted that while that is not presently proposed, Duke Energy intends to continue to consult with SCDNR about recommended protection, mitigation, and enhancement (PM&E) measures.

- Elizabeth Miller asked about streams impacted by potential spoil placement and what sort of monitoring or modeling would support decision-making for spoil placement. M. Raber indicated that this would primarily be addressed through the 404/401 permitting process.
- Stephen Bowler noted that FERC must consider wetland impacts as part of FERC's National Environmental Policy Act (NEPA) analysis and that wetland impacts studied through the licensing could be used to support the 404 permit. A. Stuart noted that there are eight potential sites identified for spoils, but not all will be utilized. Avoidance of impacts would be a key criterion for final site selection.
- E. Hollis asked whether the stakeholder group will be involved in the Water Quality Monitoring Plan. M. Raber confirmed. A. Stuart clarified that the future Water Quality Monitoring Plan will be developed in 2024 so that a settlement agreement can be filed with the Draft License Application (DLA), if possible.
- S. Bowler reminded the group that the Integrated Licensing Process (ILP) does not preclude incorporation of consultation or data collection outside of the formal study plan process. J. Crutchfield noted that Duke Energy has created Resource Committees to support communication between Duke Energy and the stakeholders throughout the process. FERC offered to participate in these meetings as needed.
- S. Salazar asked about a potential excavation materials study report referenced in the PSP and whether a study of off-site material disposal would be done by Duke Energy. S. Kulpa noted while there is no official report, preliminary information regarding spoil sites was included as Appendix E of the PAD and that study of off-site disposal is not proposed due to the large volume of anticipated materials and the lack of cost-effective or practical options to move that much material offsite. Kerry McCarney-Castle sent a chat message to S. Salazar pointing to the table of estimated spoil amounts and spoil type provided in Section 5 of the PSP.

Aquatic Resources Proposed Study Plan Meeting Presentation

Mike Abney introduced the Aquatic Resources Study Plan and noted that he was also engaged in aquatic studies for the Keowee-Toxaway relicensing. M. Abney presented relevant background and existing information, including an overview of the Memorandum of Understanding (MOU) executed by Duke Energy and SCDNR, and the 10-Year Work Plans that have resulted from the MOU. M. Abney described the general study area which includes the Whitewater River Cove. M. Abney noted that because impacts of the existing Project are well documented, the focus of the study is on incremental impacts of construction and operation of the Bad Creek II Complex. M. Abney reminded the group that a desktop entrainment study for the proposed powerhouse had already been conducted and was reported in the PAD. M. Abney reviewed the major objectives, tasks, and schedule for the proposed study.

Questions and Comments:

- A. Douglas asked M. Abney to define entrainment. M. Abney explained impingement (stuck upon the trash rack or intake screen) and entrainment (going through the system). In the existing license model, the assumption was to assume 100% mortality to assume a worst-case scenario in the model. Duke Energy will consider mortality rates through this study. A. Douglas asked what sizes of fish are excluded from entrainment by protective measures such as trashracks at the intake (which are primarily designed to keep debris out of the intake). M. Abney explained there are standards for screens, primarily used to inhibit large fish, and entrainment is more a concern for smaller (forage) fish. A. Stuart noted that the trash racks for the proposed Bad Creek II Complex are proposed as 6-inch (spacing) vertical racks. D. Rankin noted that in past models, Duke Energy could identify the best way to operate units for reducing potential entrainment. D. Rankin asked whether a desktop study will be able to predict the best operational methods. D. Rankin noted that entrainment was higher in the winter because fish don't swim as fast in colder temperatures.
- E. Miller asked if and when the entrainment desktop study would be updated for variable speed pump/turbine technology. A. Stuart noted that the speed of the unit does not vary for purposes of entrainment (assume full load), so there is presently no plan to re-run the entrainment study.
- D. Wilde asked about the potential for construction of a second underwater weir. Duke Energy clarified there will be no second weir, just expansion of the downstream footprint of the existing weir.
- William Wood asked about the entrainment model and noted that the model assumed a 1.0-foot-long Threadfin Shad and requested Duke Energy re-run the model for a reduced/more representative size of forage fish. W. Wood suggested modeling a 3-inch fish instead of 12-inch fish. Action Item: Duke Energy acknowledges that reduction of Threadfin Shad size to 3 inches would theoretically make these fish more vulnerable to entrainment. While the entrainment model did assume a 1-foot-long Threadfin Shad, report results were based on hydroacoustic returns, therefore reducing the fish size would not impact results. An update to the entrainment report results will be provided with the RSP to address this comment.
- D. Rankin mentioned lighting effects and their ability in attracting fish and recommended avoiding or minimizing lighting around the intake structure.
- S. Salazar noted that FERC had commented on the PAD regarding the use of herbicide use around the Project. Duke Energy had replied that it does not apply any herbicides near or adjacent to streams or wetland areas. S. Salazar asked if the rate of reservoir fluctuation would change and would Duke Energy evaluate the herbicide application to account for altered drainage patterns, from reservoir operations or grading or placement of fill at spoil areas. Scott Fletcher noted that Duke Energy's vegetation management teams consider site specific conditions including terrain, slope, drainage, and in general, near aquatic habitat there is a buffer when applying herbicides. S. Salazar noted FERC may need additional information or these guidelines to support FERC's future NEPA evaluation.

- D. Rankin asked if Duke Energy is going to assess streams (Howard Creek) that were impacted by the existing Project and M. Abney clarified that the only streams Duke Energy is proposing to study are the ones that may be impacted by spoil placement and will not be considering any historic impacts. D. Rankin noted that the SCDNR has abundant historical data for Howard Creek that may be relevant to this study. Note: Dan later acknowledged during the meeting that Howard Creek was not an area potentially impacted by spoil placement. Action Item: Duke Energy and SCDNR coordinate to share this referenced information.

Recreation & Visual Resources Proposed Study Plan Meeting Presentation

Jennifer Bennett introduced the Recreation and Visual Resources study plans. For the Visual Resources Study, J. Bennett described which existing and proposed Project structures are/will be visible from access areas around the Project. J. Bennett described the study area, nexus between expanded Project operation and construction and resource impacts, and objectives for the Visual Resources Study. J. Bennett provided an overview of the tasks proposed in the PSP. J. Bennett noted that applicable land use plans and regulations include those of U.S. Forest Service (USFS) and Oconee County.

J. Bennett provided an overview of the Recreation Study Plan. She reviewed the proposed tasks, and described the proposed study area, which is different from the other studies due to the location of the (linear) Foothills Trail Corridor outside of the FERC Project Boundary.

J. Bennett provided an overview of the access areas that will be assessed as part of the Foothills Trail Corridor Recreational Use and Needs (RUN study) and noted that data collection methods for different access areas vary based on expected uses (vehicle vs. foot traffic) and site constraints. J. Bennett noted that Musterground Road was added following consultation with SCDNR because that road is used to access the Wildlife Management Area (WMA) for hunting. Musterground Road is only open to the public during specific hunting seasons, including September 15-January 15, and again from March 20-May 10. To capture data for the full bear and deer hunting season, a traffic counter was recently installed at Musterground Road. Data collection at other sites will commence in March 2023. J. Bennett also described how a UAS (drone) will be used to collect data for 10 days of the boating season (Memorial Day through Labor Day) in the Whitewater River Cove area. This data will inform temporary construction impacts (i.e., closure of this area for periods of construction).

Questions and Comments:

- A. Douglas asked about the Visual Resources study, and whether the interested stakeholders would be involved in evaluation of the study. J. Bennett noted that there will be stakeholders involved through the resource committees and their input will be taken into consideration, for example, when identifying key viewpoints. S. Kulpa added that the resource committee will be involved in choosing areas of interest.
- A. Douglas requested that the field visit portion of the study occur during leaf-off conditions so viewpoints will be visible. Action Item: Duke Energy to revise the Visual Resources Study to consider leaf-off conditions during the field visit.

- A. Douglas asked about light pollution. C. Starker asked about light pollution in terms of dark sky perspective. Action Item: Duke Energy will review PSP and consider revisions to the RSP to discuss light pollution in the appropriate study plan.
- E. Miller asked that since Labor Day just occurred, if Musterground Road would be surveyed next year over the Labor Day holiday. Kelly Kirven responded that the survey at Musterground Road will occur when the gate is open to the public, which is during bear and turkey season, or September 15-January 15 and March 20-May 10.
- E. Miller also asked how the 10 drone survey days would be selected. J. Bennett noted the methodology would be similar to that used to select survey days for the RUN study, including a mix of weekdays, weekends, and holiday use.
- D. Wilde asked if weather events would impact the days the drone would take photos and K. Kirven confirmed. D. Wilde noted that ten days of survey was not very many. D. Wilde asked about the methodology of the surveys. K. Kirven noted they typically use a combination of QR codes and staff in person for the recreation survey. Recreation surveys (part of the RUN study) will be collected over 30 days.
- C. Starker noted that spring break is a popular time to visit the Foothills Trail and wondered if there was intent to capture these dates specifically. K. Kirven noted that in the PSP there is a general schedule and presently some survey days are planned for March and April, but more surveying is planned for the summer and early fall seasons. Allocation of survey dates can be adjusted in consultation with the recreation resource committee.
- C. Starker asked about including rock climbing into the survey. K. Kirven noted that there is an “other” option to capture additional recreational uses on the survey form.
- Action Items: C. Starker noted that the uses identified in the survey could be revised to remove boating and add kayaking/canoeing. He also suggested adding fishing.
- A. Gleason asked about the condition assessment of the entire trail and noted that Duke Energy excluded engineered bridges as they are inspected every five years. A. Gleason wondered when the last bridge inspection was performed, and J. Bennett confirmed the last inspection was completed in 2021 by a contractor to Duke Energy. A. Gleason requested the inspection reports and J. Bennett confirmed these could be included in the study report. Action Item: Add additional details or listing of engineered bridges in the RSP. A. Gleason asked how Duke Energy defines engineered bridges and J. Bennett noted that the bridges have design plans and an inspection report with specific items evaluated. A. Gleason noted that since original construction of the trail, smaller bridges have been built, which he feels may be overlooked during the study. J. Bennett noted the inspector has a list of bridges, and in addition there is a trail inspector that is on-site often.
- Glenn Hilliard asked about the visual study and if there was consideration of impacts at the end of the next license term, and what would be the impacts if Duke Energy no longer maintained the license. Jeff Lineberger noted that the at the end of the next license term, there would be a similar relicensing process or if for some reason Duke Energy decided to no longer operate the Bad Creek Project, there is a decommission/surrender process that is very similar to relicensing. G. Hilliard noted that in the original license Duke Energy is allowed to close or re-route the trail and agreed to the corridor width. G. Hilliard agreed evaluating usage is important, but he

recommended Duke Energy evaluate/consider current usage vs. original usage, parking and appurtenant facilities, sanitation, and capacity. J. Bennett responded that the goal of the study is to document use of the trail and where and how often capacity is reached.

- A. Stuart noted that Duke Energy is evaluating recreation use today and projecting it out to account for population growth for Oconee County. K. Kirven confirmed that the escalation rate of population is applied to the data gathered through this study to account for population growth.
- In response to E. Miller asking about users traveling from other areas, K. Kirven noted that the survey requests information about where the individual lives (city, state, zip code) and population growth from other areas will be considered.
- A. Gleason noted that the recreation access points can be lake level dependent (specifically Toxaway River) and suggested flexibility in the field.
- G. Hillard proposed trail expansion up to Toxaway River access so one would have a way to get to the trail in low water and access and connect to other trails.
- Action Items: S. Salazar requested that the Wildlife Management Area near Musterground Road be identified on future maps. E. Miller noted that it would be helpful to also depict USFS lands in this figure as well.
- S. Salazar referred to the Task 2 Visual Study which she noted omits the existing Project transmission line corridor. Duke Energy confirmed that the existing transmission line would not be included in the analysis, however the proposed transmission line could be. A. Stuart confirmed that the future transmission line route has not been determined at this point. S. Kulpa clarified that if a new transmission corridor is determined, the study plans may be modified or supplemented to address the change. E. Miller asked about the timeline for the transmission routing study. A. Stuart said not until the end of 2023 at the earliest. S. Bowler confirmed Duke Energy would want to process and submit that information as soon as possible and that it is not uncommon for studies to drag into the post-application process when there is reason.
- S. Salazar noted that while the transmission line will be subject to S.C. Utility Commission environmental review, the lines are presently considered primary transmission lines and will have to be authorized by the FERC license and addressed in FERC's NEPA review. If the transmission line siting study timeframe extends through or past 2024, this may delay the new license issuance.
- S. Salazar requested that the Visual Resources Study occur during leaf-off conditions to capture visual effects. S. Kulpa asked the group if the primary concern from a visual resource perspective is the final proposed project or the construction impacts. Action Item: Duke Energy will add clarification in the study report that the field visit will occur during leaf-off conditions and discuss further with the resource committee.
- S. Salazar requested that GIS data and georeferenced photos from the field be included with the study report.
- S. Salazar stated FERC preference is that PM&E measures including but not limited to the Recreation Management Plan be presented in the Preliminary Licensing Proposal to allow for stakeholder feedback.
- S. Salazar asked for additional information about the spur trails. J. Bennett noted that the spur trails serve a variety of purposes. The term spur refers to a portion of trail that is not the mainstem of the Foothills Trail but connects to the mainstem of the Foothills

Trail. The spur trails identified in the PSP are maintained by Duke Energy. Action Item: Update Figure 3-3 in the Recreation Study to make sure it incorporates Project Boundary.

- S. Salazar requested a copy of relevant off-license memoranda of agreement between SCDNR and Duke Energy pertaining to management of recreation facilities or access areas. Action Item: Duke Energy and SCDNR to locate and review agreement(s) and determine if can be filed publicly with FERC and if so, append to the RSP or ISR.
- S. Salazar requested that additional details about the methods for the trail assessment be included in the RSP (Action Item). S. Salazar requested that the trail assessment also include existing or needed erosion and sediment controls. S. Salazar requested that additional information about vegetation maintenance and waste management (including who is responsible) at each site be captured in the Recreation Site Inventory forms (Action Item).
- A. Gleason noted that the only allowed use on the Foothills Trail is hiking. A. Stuart noted that documentation of "other" uses through the Recreation Use and Needs study task does not imply permission by Duke Energy for the use. J. Bennett noted the trail does run through other publicly managed lands where other uses are permitted off the trail.
- Dustin Wilson asked that a map showing what other uses are permitted at other sites in the vicinity of the Project be included in the RSP. D. Wilson asked if Duke Energy had considered adding the Lower Whitewater Falls Overlook to the survey sites. K. Kirven noted that the parking area for the overlook (located at the Bad Creek Hydro Access Area) would be evaluated with a traffic counter and in-person surveys and the trail to the overlook would be evaluated with a trail counter, capturing visitors to the overlook (unless visitors are through-hikers). K. Kirven suggested a QR code sign at the overlook may be appropriate to capture additional user surveys (Action Item).
- D. Wilson suggested Duke Energy include boater input (i.e., from Lake Jocassee) into the Visual Resources study. S. Bowler suggested using boaters to survey or create an event to take boaters out to survey them.
- D. Wilson asked the goal for number of surveys. K. Kirven noted that there are a lot of factors that influence the number surveys that will be completed, so it is common not to propose a set target for a study like this. Efforts will be made to collect as many surveys as possible.
- A. Gleason confirmed that the Foothills Trail Conservancy currently has survey QR codes available for to collect recreation data. E. Miller noted that the study's QR codes (for the relicensing) should not be confused with Foothills Trail Conservancy QR codes. A. Gleason indicated that he could remove Foothills Trail Conservancy QR code signs prior to the start of the RUN study at any sites where Duke Energy QR code signs will be installed.
- In response to D. Wilde asking about the Foothills Trail inclusion as a Recreation facility in the new license, Duke Energy intends for the trail to be maintained through the new license term, but it may or may not be a requirement of the license (i.e., could instead be covered by an off-license agreement). S. Bowler noted that FERC will evaluate independently whether the facility is needed for the Project.

- C. Starker commented on the Recreation Survey, noting that it would be helpful to include a “no comment” response option. He noted that first-time visitors tend to provide favorable responses. K. Kirven responded that based on her experience, respondents do provide input, both positive and negative, in response to open-ended questions. Surveys are written and administered so as not to lead the respondent toward a specific answer.

Cultural Resources Proposed Study Plan Meeting Presentation

Christy Churchill provided an overview of the Cultural Resources Study Plan and relevant background and existing information. The study area is the Area of Potential Effect (APE), and this will be defined in consultation with State / Tribal Historic Preservation Officer (SHPO and THPO). C. Churchill reviewed the major tasks of and schedule for the proposed study plan.

Questions and Comments:

- D. Wilson asked whether Duke Energy will include additional surveying work if artifacts are found. C. Churchill confirmed additional surveys would be performed as required.
- D. Wilde asked if the Cultural Resources surveys are completed only above the water line. C. Churchill confirmed the proposed surveys are above the water line. Underwater areas for the upper reservoir and Lake Jocassee would have been surveyed in association with original project construction. If historic resources or artifacts are located underwater, they are generally accepted as preserved. The only time Duke Energy would survey underwater is during a large, extended reservoir drawdown that may impact sensitive areas.
- E. Miller asked about whether there are any sensitive sites near the spoil areas. A. Stuart noted there is one known site close to the proposed new tunnels, so that area will be surveyed. The other two are not in proximity sites and Duke Energy presently does not believe there would be any spoil impacts.
- C. Churchill noted that the findings of the surveys will be treated as non-public (Privileged) by FERC and only provided to the SHPO and Tribes and will not be publicly mapped. Authorized cultural resources professionals have access to location information through subscription to a database maintained by the SC Department of Archives and History.

Environmental Justice Proposed Study Planning Meeting Presentation

Alison Jakupca provided an overview of the Environmental Justice (EJ) study, noting that this is a relatively newer study requirement for FERC relicensings. A. Jakupca provided definitions for terms used in these analyses (e.g., environmental justice, fair treatment, disproportionate effects, and sensitive receptor locations). She also described how the PAD provided a preliminary assessment and identification of EJ communities. FERC’s study request encompassed a broader geographic range. A. Jakupca reviewed the study goals and objectives as well as the proposed study area. The study area includes a 1-mile buffer around the Project Boundary (effects of continued operation of Bad Creek Project) and a 5-mile buffer around the center of the proposed Bad Creek II Complex (analysis of effects on EJ communities from the proposed project expansion).

A. Jakupca described the reporting and map that would be developed from the data collected and analyzed during this study. If EJ communities are determined to be present, public outreach is a necessary task for study completion. Stakeholder outreach would inform the selection of PM&E measures for the Project if project expansion is proposed in the Final License Application.

EJ study updates will be provided to the Operations Resource Committee on a quarterly basis leading up the final study report, presently planned as part of the Initial Study Report.

Questions and Comments:

- S. Salazar asked about the EJ boundary and stated a 5-mile radius from the transmission line may be appropriate. Action Item: Duke Energy to review PSP and propose expanded buffer to encompass transmission line corridor in the RSP.
- E. Miller asked if there is a non-English option on the recreational use survey. Action Item: Duke Energy will consider non-English option.
- D. Wilson asked about public outreach methods other than public meetings. A. Jakupca noted that it depends on the communities present, and that Duke Energy will formulate an approach based on the best way to reach them. Operations Resource Committee will discuss proposed methods. Duke Energy is also internally creating an initiative to develop EJ principles to conducting outreach, which are coming out this year and will be applied to this relicensing.
- D. Wilson suggested evaluating the total minority population percentage, not just the individual race categories.
- Joshua Dub noted that during the initial construction of the existing weir there was some turbidity observed. If spoils are to be added to existing weir, this may impact water quality (downstream effects) regarding the geographic scope of impacts.
- Latest census data will be used and is presently from 2019.

Additional Questions:

- S. Salazar had questions about the Wildlife and Botanical Resource Committee. Duke Energy clarified that the resource committee will continue to meet and if there are any botanical/terrestrial issues or concerns, these will be documented in meeting summaries and incorporated into the appropriate study or section of the license application. S. Salazar confirmed she would appreciate seeing a copy of the Resource Committee meeting summaries and requested a consultation section to the initial study reports to capture this additional resource-related consultation.
- S. Salazar asked whether the U.S. Fish and Wildlife Service (USFWS) is interested in participating in the resource committees. A. Stuart confirmed Melanie Olds is involved in a few of the resource committees.
- C. Starker asked for clarification and how sensitive botanical and wildlife issues like the fern species and migratory birds would be included in the studies. S. Fletcher noted that Duke Energy has standard environmental procedures, and when there is impact to a specific resource, Duke Energy would carry out an assessment for that species and account for mitigation (relevant to migratory birds, breeding birds, and listed species). S.

Fletcher noted that a study of loons on Lake Jocassee was conducted for the KT relicensing, and this information may inform the Bad Creek license application. Reptiles/herpetofauna are also included in the standard Duke Energy protection measures. The Wildlife and Botanical Resource Committee can review through these procedures to make sure they appropriately identify and mitigate impacts.

- S. Bowler described the triggers and study criteria for determining if a resource study should be conducted to inform a licensing. He noted that FERC staff are available to answer procedural questions from all participants.

Attachment 1

Attachment 1 – Meeting Presentation

This page intentionally left blank.

Bad Creek Pumped Storage Project No. 2740

Proposed Study Plan Meeting

DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE®

SEPTEMBER 7, 2022

Proposed Study Plan Meeting Agenda

- Welcome - Meeting Purpose & Expectations
- Safety Moment
- Introductions
- Bad Creek Project Site Orientation
- Proposed Study Plan Review Schedule and Overview
  - Water Resources
  - Aquatic Resources
  - Recreation & Visual Resources
  - Cultural Resources
  - Environmental Justice
- Meeting Wrap-Up and Questions
- Action Items
- Adjourn

Safety Moment

Basic Disaster Supply Kit

- Water – One gallon per person per day for several days (for drinking and sanitation)
- Food – At least a several-day supply of non-perishable food (and can opener)
- Battery-powered or hand crank radio for NOAA weather reports
- Flashlight(s) and batteries
- First aid kit/ medications
- Whistle (to signal for help)
- Dust mask (to help filter contaminated air)
- Plastic sheeting and duct tape (to shelter in place)
- Garbage bags, plastic ties, baby wipes
- Wrench/pliers (to turn off utilities)
- Local maps
- Cell phone, chargers, and back up battery

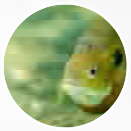
Resource Committees

Lead Technical Manager

- John Crutchfield

Project Manager

- Alan Stuart

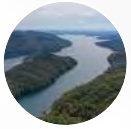


Aquatic Resources

- Mike Abney
- Nick Wahl

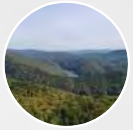
Cultural Resources

- Christy Churchill



Water Resources

- Maverick Raber

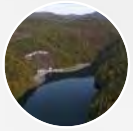


Recreation & Aesthetics

- Jennifer Bennett

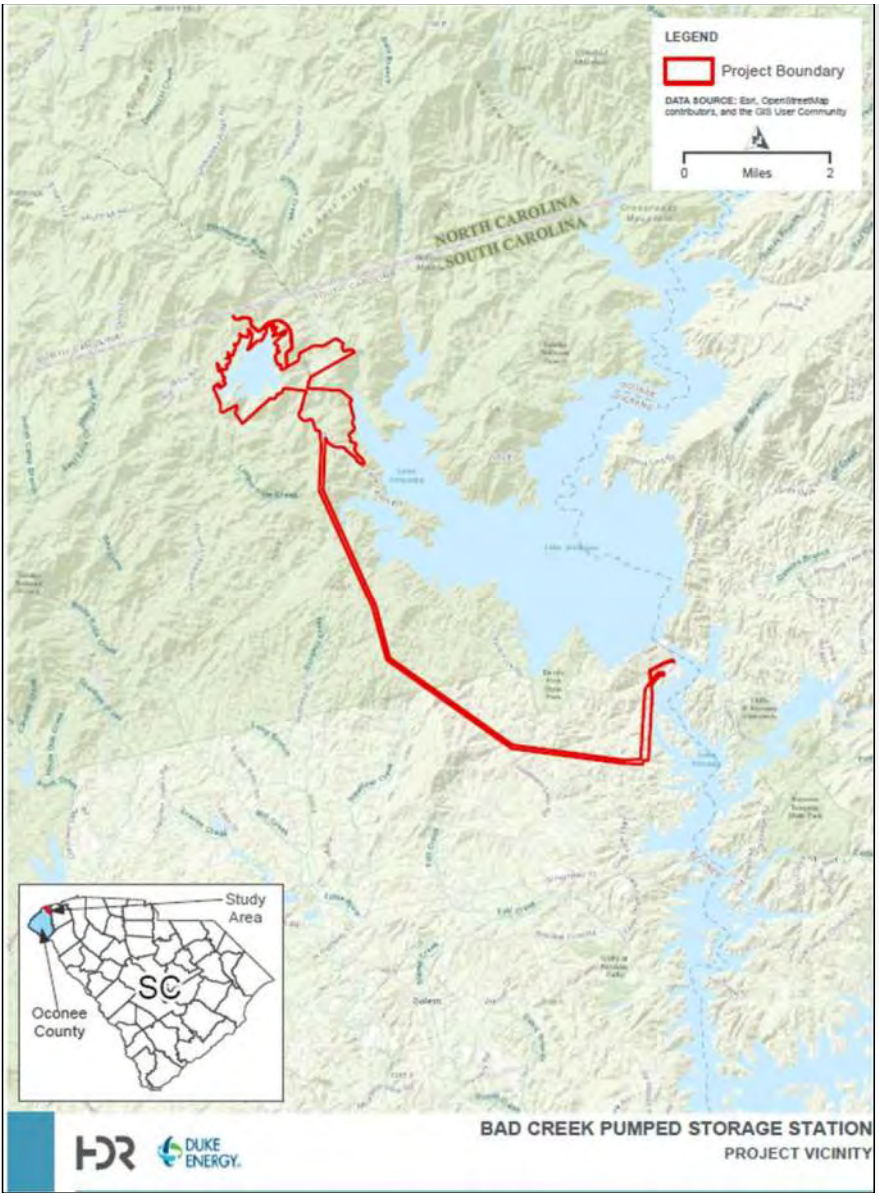
Wildlife & Botanical Resources

- Mike Abney
- Scott Fletcher



Operations

- Lynne Dunn
- Ed Bruce



Bad Creek Pumped Storage Project Location and FERC Project Boundary

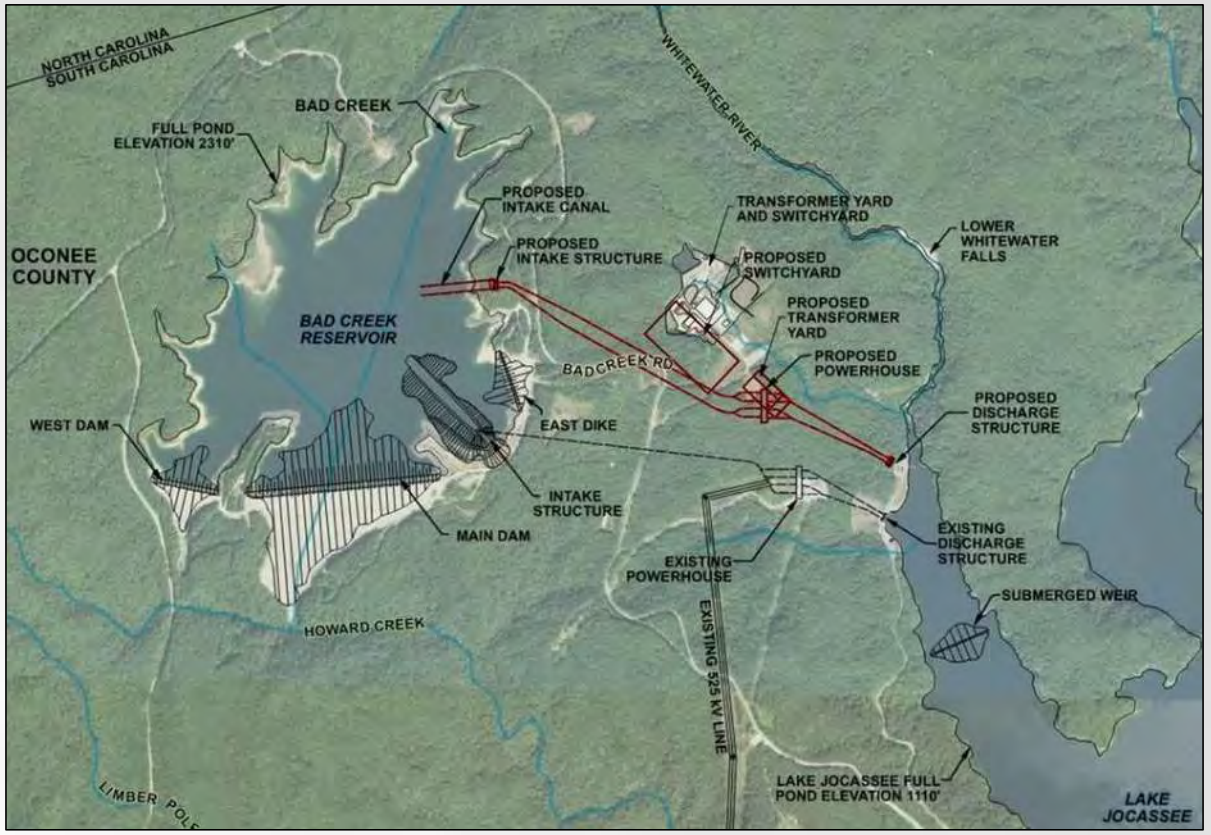
Bad Creek II Project Overview

Existing Bad Creek Powerhouse

- Four units used for peak load generation
- 1,400 MW capacity; 23 hours of storage
- Generates using water from Bad Creek Reservoir
- Pumps back water from Lake Jocassee using excess night/weekend energy

Proposed Bad Creek Powerhouse Addition

- Would essentially double existing Bad Creek capacity
- Utilize existing Bad Creek Reservoir
- Two new underground tunnels and powerhouse (4 Units)
- Additional 1,400 MW capacity; Total site ~3,360 MWs with 11 hours of storage



Privileged & Confidential/Attorney-Client Communication; Attorney Work Product

Study Plan Development

- **February 2022**: Five proposed studies were included in the Pre-Application Document (PAD) [Submitted to FERC February 23]
- **July 2022**: Six draft study plans were presented to Resource Committees during informal resource meetings (July 18-22)
- **August 2022**: Proposed Study Plan (PSP) was submitted to FERC August 5th, which also addressed stakeholder comments on PAD
- Scoping & Study Requests
  - Study requests – not PM&E measures
  - Existing data
  - FERC Study Criteria
  - FERC practice & precedence

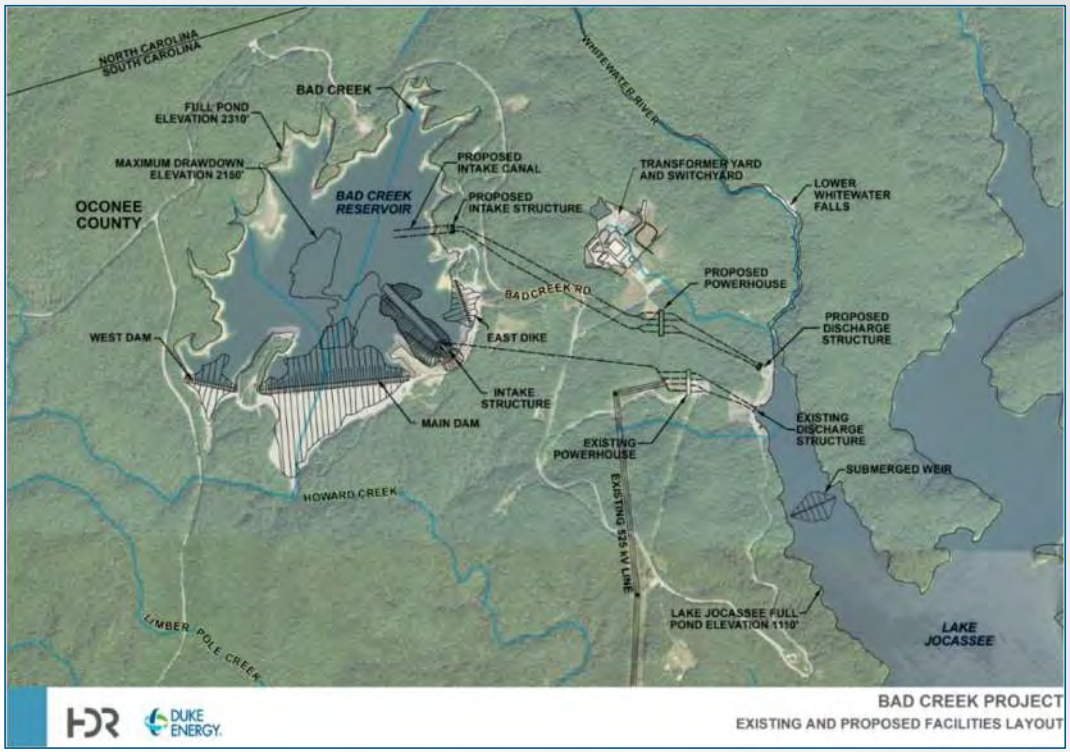
FERC ILP Schedule

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) and Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 24, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024

Water Resources Study

Water Resources Proposed Study Plan (PSP)

- No formal study requests related to water resources were submitted during the scoping process
- Several comments from agencies and stakeholder groups were received and considered in the development of the PSP

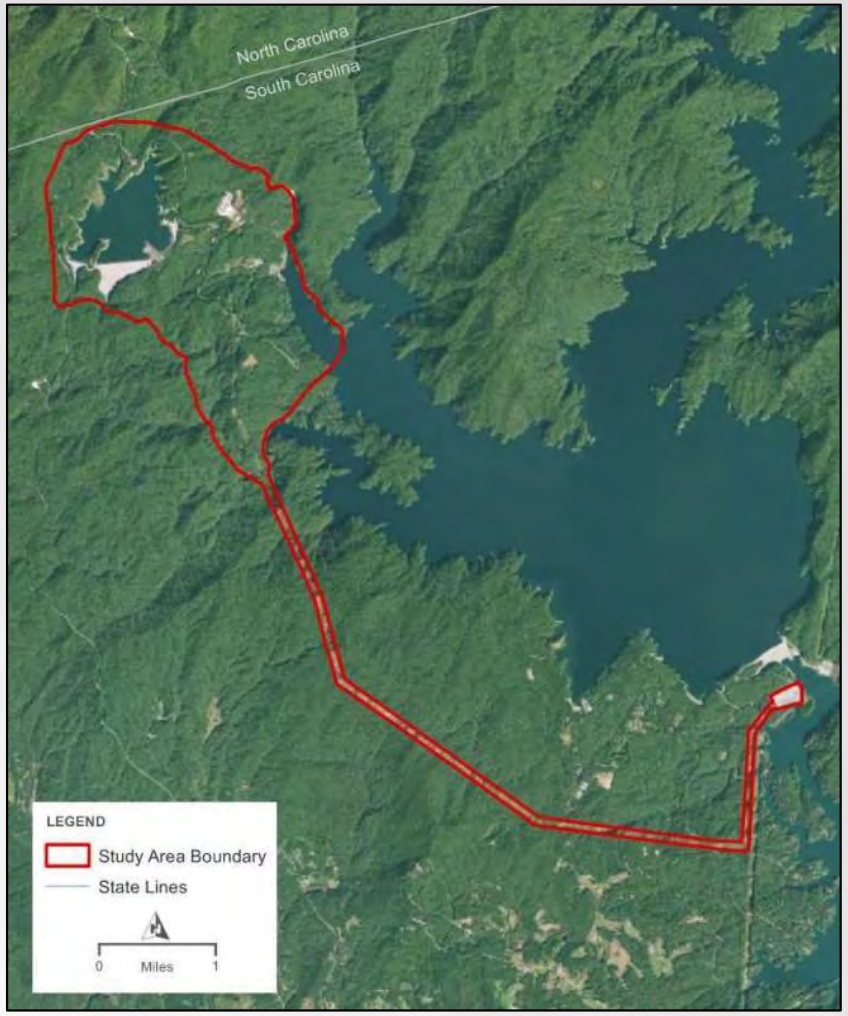


Background and Existing Information

- Bad Creek Reservoir is used only for Project operations and is inaccessible to the public; it is not designated for any other uses and has no known state or federal water quality standards.
- Lake Jocassee and tributaries in the study area are subject to state and federal water quality standards.
- Monitoring data (e.g. hydrology, water quality) collected as early as 1973.
  - Impacts on Bad Creek I construction and operation.
  - Comparison to applicable water quality standards.
  - Pelagic trout habitat (Aquatic Resources).

General Study Area

- The general study area includes several distinct areas at or in the vicinity of the Project
  - Main/primary Project site
  - Proposed Bad Creek II Complex
  - Upper reservoir
  - Lower reservoir (specifically, Whitewater River Cove)
  - Transmission line corridor



Project Nexus

- No anticipated additional potential adverse effects to existing water resources from the continued operation of Bad Creek I.
- The construction and operations of Bad Creek II Complex has the potential to impact water resources in Lake Jocassee.
- The construction of Bad Creek II Complex and spoil disposal in upland areas could result in impacts to upland water resources (tributary streams).

Goals and Objectives

The goal of the Water Resources Study is to evaluate potential impacts of Bad Creek I and II on water resources in the Study Area

Objective 1: Evaluate the impact of current (baseline) operations of Bad Creek I

Objective 2: Evaluate potential impacts on water resources from the construction and operation of the proposed Bad Creek II Complex

Objective 3: Address stakeholder concerns

Goals and Objectives

The goal of the Water Resources Study is to evaluate potential impacts of Bad Creek I and II on water resources in the Study Area

Objective 1: Evaluate the impact of current (baseline) operations of Bad Creek I

Task 1: Summary of Existing Water Quality Data and Standards

- Current and historical data
- Compare to applicable water quality standards
- Establish baseline conditions

Goals and Objectives

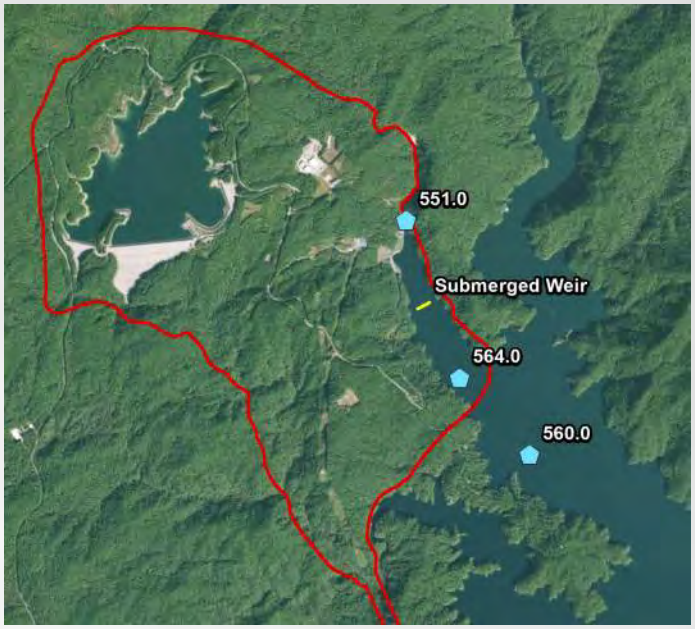
The goal of the Water Resources Study is to evaluate potential impacts of Bad Creek I and II on water resources in the Study Area

Objective 2: Evaluate potential impacts on water resources from the construction and operation of the proposed Bad Creek II Complex

Task 2 – Water Quality Monitoring in the Whitewater River Arm
- Temperature and Dissolved Oxygen (DO) monitoring
- June – September, 2023 and 2024
- Continuous temperature and bi-weekly DO vertical profiles

Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee
- Hydraulic modeling to determine Computational Flow Dynamics (CFD) model boundary
- 3-D CFD modeling to determine flow patterns and velocities in Whitewater River arm associated with Bad Creek I and Bad Creek II operations under various Jocassee reservoir elevations and submerged weir configurations
- Determine potential for shoreline erosion in Whitewater River arm

Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels
- Computer Hydro-Electric Operations and Planning Software (CHEOPS) Model – water exchange rates, magnitude, duration
- Reservoir elevation effects



Goals and Objectives

The goal of the Water Resources Study is to evaluate potential impacts of Bad Creek I and II on water resources in the Study Area

Objective 2: Evaluate potential impacts on water resources from the construction and operation of the proposed Bad Creek II Complex

Task 5 – Future Water Quality Monitoring Plan Development (WQMP) associated with the following Bad Creek II activities:

- Construction of inlet/outlet structure and submerged weir expansion
- Construction in upland areas
- Potential upland soil disposal

Key components:

- Consultation with Agencies on monitoring locations and parameters (in consideration of existing data and anticipated impacts)
- The WQMP will include pre-construction, construction, post-construction time periods
- Comparison of data to applicable water quality standards
- Water Resource Impacts in support of permitting activities including Clean Water Act 401/404

Goals and Objectives

The goal of the Water Resources Study is to evaluate potential impacts of Bad Creek I and II on water resources in the Study Area

Objective 3: Address stakeholder concerns

Next Step: Stakeholder comments on PSP (due first week of November)

Study Schedule

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	August – December 2022
Task 1 – Summary of Existing Water Quality Data and Standards	January 2023 – April 2023
Task 2 – Water Quality Monitoring in Whitewater River Arm	June 2023 – September 2023 June 2024 – September 2024
Task 3 – Velocity Effects and Vertical Mixing in lake Jocassee Due to a Second Powerhouse	April 2023 – October 2023
Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels	April 2023 – October 2023
Task 5 – Future Water Quality Monitoring Plan Development	January 2024 – December 2024
Distribute Draft Study Report with the Initial Study Report	January 2024
Distribute Revised Study Report with the Updated Study Report	January 2025

Aquatic Resources Study

Aquatic Resources Study Plan

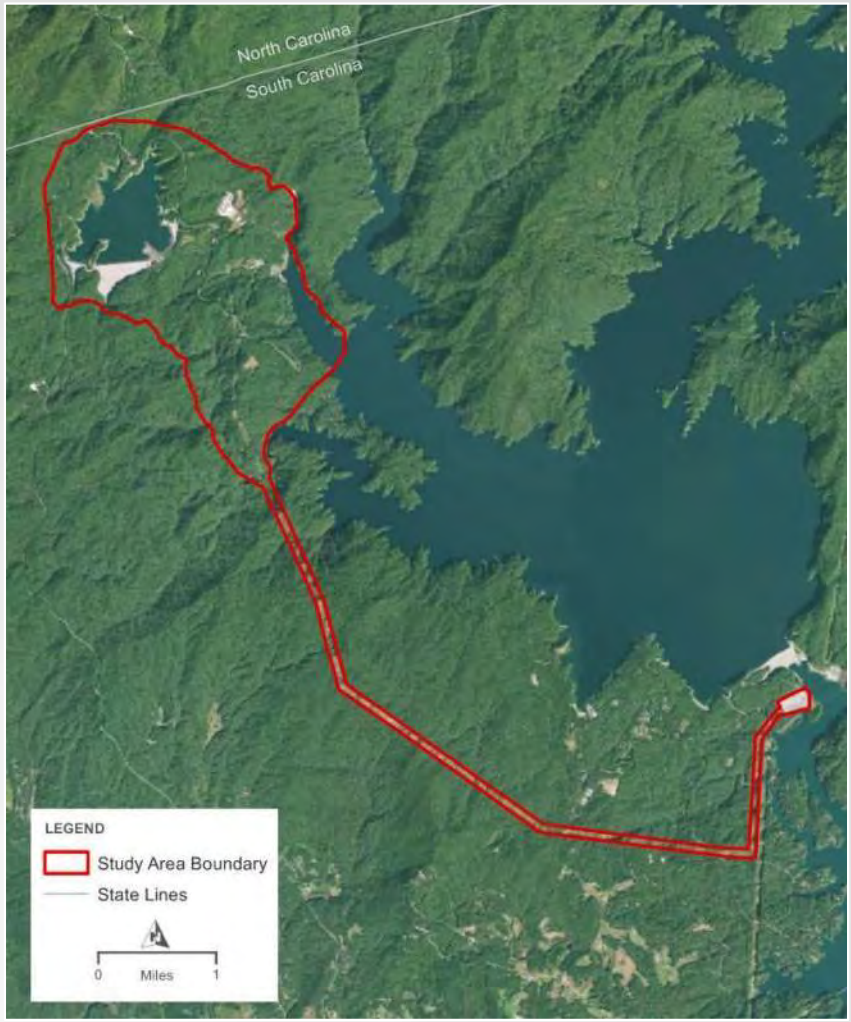
- No formal study requests related to aquatic resources were submitted during the scoping process
- Comments received from agencies and stakeholder groups considered in the development of the preliminary proposed study plan
- Responses to comments on the PAD were provided in Appendix A of the PSP filing

Background and Existing Information

- Bad Creek Reservoir is used only for Project operations; it is not designated for any other uses and therefore has no applicable state or federal water quality standards.
- In 1996, Duke Energy and SCDNR developed a Memorandum of Understanding to help maintain the high-quality fisheries of lakes Jocassee and Keowee. Implemented through 10-Year Work Plans (1996-2005, 2006-2016, 2017-2027).
  - Agreement on minimizing fish entrainment
  - Electrofishing of littoral fish populations
  - Hydroacoustic monitoring of pelagic forage fish populations
  - Cost sharing for trout stocking
  - Cost sharing for fisheries research and enhancements
  - Water quality monitoring for pelagic trout habitat (K-T license)

General Study Area

- The general study area includes several distinct areas at or in the vicinity of the Project
  - Main/primary Project site
  - Upper reservoir
  - Lower reservoir (specifically, Whitewater River Cove)
  - Preliminary transmission line alignment



Project Nexus

- The construction and operations of Bad Creek II Complex has the potential to impact aquatic habitat and fish populations in Lake Jocassee.
- The construction of Bad Creek II Complex and expansion of the underwater weir may cause direct, permanent and temporary impacts to aquatic resources.

Goals and Objectives

The goal of the Aquatic Resources Study is to evaluate potential impacts to fish and aquatic life populations, communities, and habitats due to the construction and operation of the proposed Bad Creek II Complex.

Objective 1: Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II Complex and consult with agencies and other Project stakeholders regarding results of the updated desktop Entrainment Study (Kleinschmidt 2021).

Objective 2: Assess changes to pelagic and littoral aquatic habitat in Lake Jocassee resulting from the additional discharge and expanded underwater weir using models developed for the Water Resources Study or related relicensings.

Objective 3: Evaluate potential direct impacts to aquatic habitats (including wetlands) related to Bad Creek II Complex construction activities by characterizing surface waters, including resource quality and presence of aquatic biota (e.g., mussels).

Methodology

Objective 1 – Consultation on Entrainment

- Meet with agencies and stakeholders to discuss the results of the updated Entrainment Study and minimization measures.

Objective 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

- Evaluation of potential effects to Lake Jocassee trout habitat
  - Expanded CFD model
- Evaluation of potential effects to littoral zone habitat
  - CHEOPS™ model

Objective 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- Characterization of affected waters and estimation of potential impacts
  - All affected waters (upland spoil locations, construction of Bad Creek II Complex powerhouse, and expansion of underwater weir)
    - Quantitative estimate of impacts
  - Upland spoil locations
    - Stream habit quality surveys
    - Presence/absence mussel surveys

Study Schedule

Task	Proposed Timeframe for Completion
Study Planning	August – December 2022
Consultation on Entrainment	January – June 2023
Desktop Studies on Pelagic and Littoral Habitat Effects	Spring – Fall 2023
Mussel Surveys and Stream Habitat Quality Surveys	Summer 2023
Initial Study Report	January 2024

Recreation and Visual Resources Study

Visual Resources Study Plan

- The Commission's April 22, 2022, Scoping Document 1 identified the following as a potential visual resource issue:
  - Effects of project construction, operation (including the presence of project facilities), and maintenance activities on visual resources.

- In the PAD, Duke Energy proposed to conduct a Visual Resources Study in support of the proposed Bad Creek II Complex.

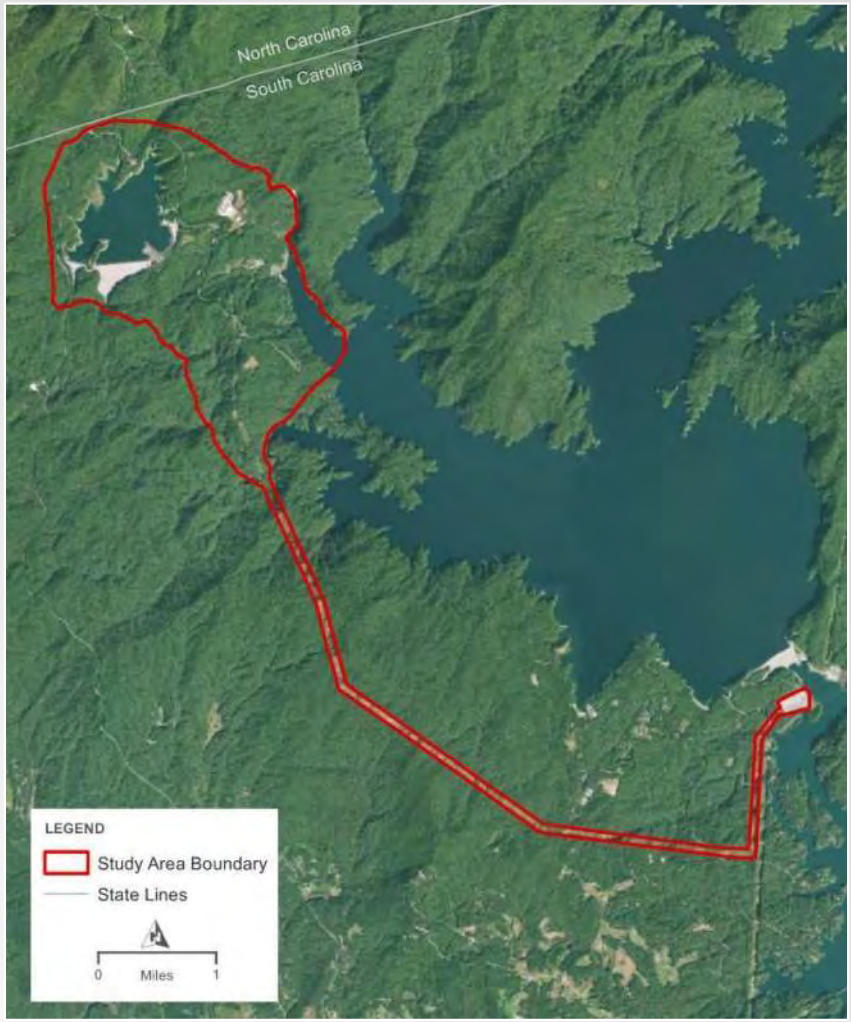
- No formal study requests or stakeholder comments related to aesthetic or visual resources were received; comments from the FERC in SD1 will be addressed in the Proposed Study Plan.

Background and Existing Information

- Upper reservoir Project structures as well as the inlet/outlet structure and powerhouse portal are visible from specific vantage points on Lake Jocassee and the surrounding area.
- During a 2013 RUN Study at the KT Project, one third of the people surveyed stated nothing detracts from the scenic quality of the Lake Jocassee.

General Study Area

- The general study area includes several distinct areas at or in the vicinity of the Project
  - Main/primary Project site
  - Proposed Bad Creek II Complex
  - Upper reservoir
  - Lower reservoir (specifically, Whitewater River Cove)
  - Transmission line corridor



Project Nexus

- A new inlet/outlet structure for a second powerhouse would be viewable from the same viewshed as the existing structures.
- With the construction of the proposed Project expansion, the visual landscape will be altered both during and after construction.

Goals and Objectives

The objective of the Visual Resources Study is to establish the baseline condition of scenery and visual resources near the existing Project and to provide additional information (e.g., including simulations of the expanded Project) to evaluate expected impacts of construction and operation of the Bad Creek II Complex on these resources and any PM&E measures.

Focus on impacts of the construction and operation of the Bad Creek II Complex.

No adverse additional effects to scenery and visual resources are expected to result from the continued operation of the existing Project over the new license term.

No practical or necessary PM&E measures have been identified or proposed for the existing Project structures.

Methodology

Task 1 – Existing Landscape Description

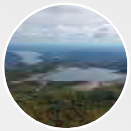
- Review existing information to characterize the scenic quality of the existing landscape and proposed expanded Project area.

Task 2 – Seen Area Analysis

- Identify areas within the existing landscape from which any part of the proposed Bad Creek II facilities would potentially be visible.

Task 3 – Field Investigation

- Field investigation of "visible" areas identified through Task 2.
- Will include photography and documentation of existing site attributes, and viewing/landscape conditions at potential Key View locations.



Task 4 – Key Views Selection

- Selection of representative photo points investigated during Task 3 and in consultation with stakeholder to identify Key Views that adequately cover potential scenic and visual impacts for the Project

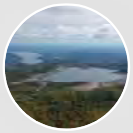
Methodology continued

Task 5 – Existing Visual Quality Assessment

- Assess existing scenic and visual quality at each Key View identified in Task 4.

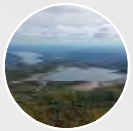
Task 6 – Visual Analysis

- Specific assessment and visual simulation of the expected visual impact at each Key View.



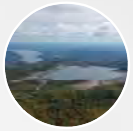
Task 7 – Visual Management Consistency Review

- Review consistency of the proposed Bad Creek II Complex with visual protection guidance established in applicable land use plans and regulations.



Task 8 – Mitigation Assessment

- Identify and assessment of mitigation measures that would address visual impacts of the proposed Bad Creek II Complex.



Task 9 – Conceptual Design of Bad Creek II Complex

- Assess aesthetic resource conditions relative to site layouts, conceptual designs, proposed construction processes, and lighting.
- Three-dimensional renderings will be produced.

Study Schedule

Task	Proposed Timeframe for Completion
Study Planning	August – December 2022
Tasks 1-2 (Existing Landscape Description and Seen Area Analysis)	January 2023 – March 2023
Tasks 3-7 (Field Investigation, Key Views Selection, Existing Visual Quality Assessment, Visual Analysis, Visual Consistency Review)	April 2023 – November 2023
Task 8 and 9 (Mitigation Assessment and Conceptual Design of Bad Creek II Complex)	Spring – Summer 2024
File Initial Study Report	January 2024
File Updated Study Report	January 2025

Recreation Study Plan

- The Commission's April 22, 2022, Scoping Document 1 identified the following as a potential resource issue:
  - Effects of proposed project construction, operation, and maintenance on recreational use in the project-affected area

- In the PAD, Duke Energy proposed to conduct a Recreation Resources Study in support of the proposed Bad Creek II Complex.

- Upstate Forever and the Foothills Trail Conservancy provided recreation related comments on the PAD.

Goals and Objectives

Four main study objectives of the Recreation Study Plan;

1. **Foothills Trail Corridor RUN Study:** assess current recreation use and identify future recreation needs, inform development of updated RMP.

2. **Foothills Trail Corridor Conditions Assessment:** evaluate the current condition of the foothills trail corridor and identify areas of potential improvements.

3. **Whitewater River Cove Existing Recreational Use Evaluation:** assess boating use of the Whitewater River Cove and inform Duke Energy on level of use disruption that may occur with Bad Creek II Complex construction.

4. **Whitewater River Cove Recreational Public Safety Evaluation:** evaluate public safety risks, including those associated with recreation at or near Whitewater River Cove that may be created or exacerbated by Bad Creek II Complex construction.

Proposed Study Area

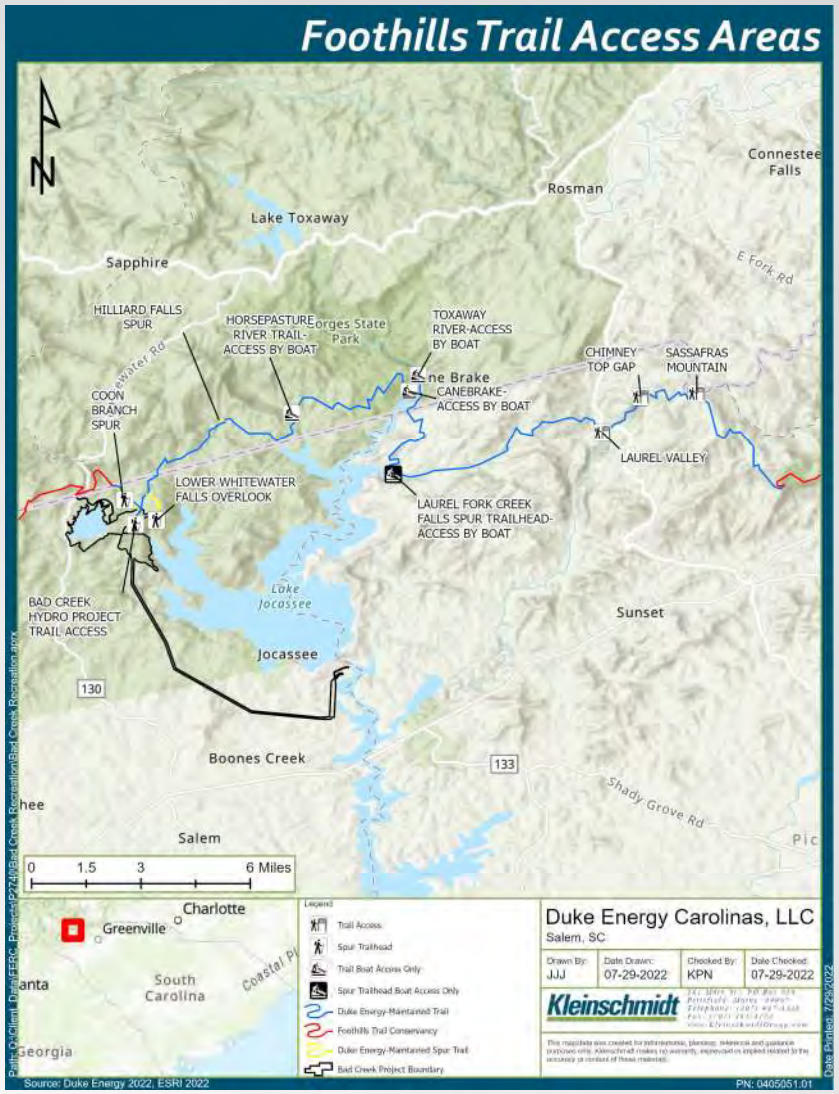
Duke Energy Foothills Trail Corridor

- Recreational Use
- Trail Condition

Proposed Study Area

Foothills Trail Access Points

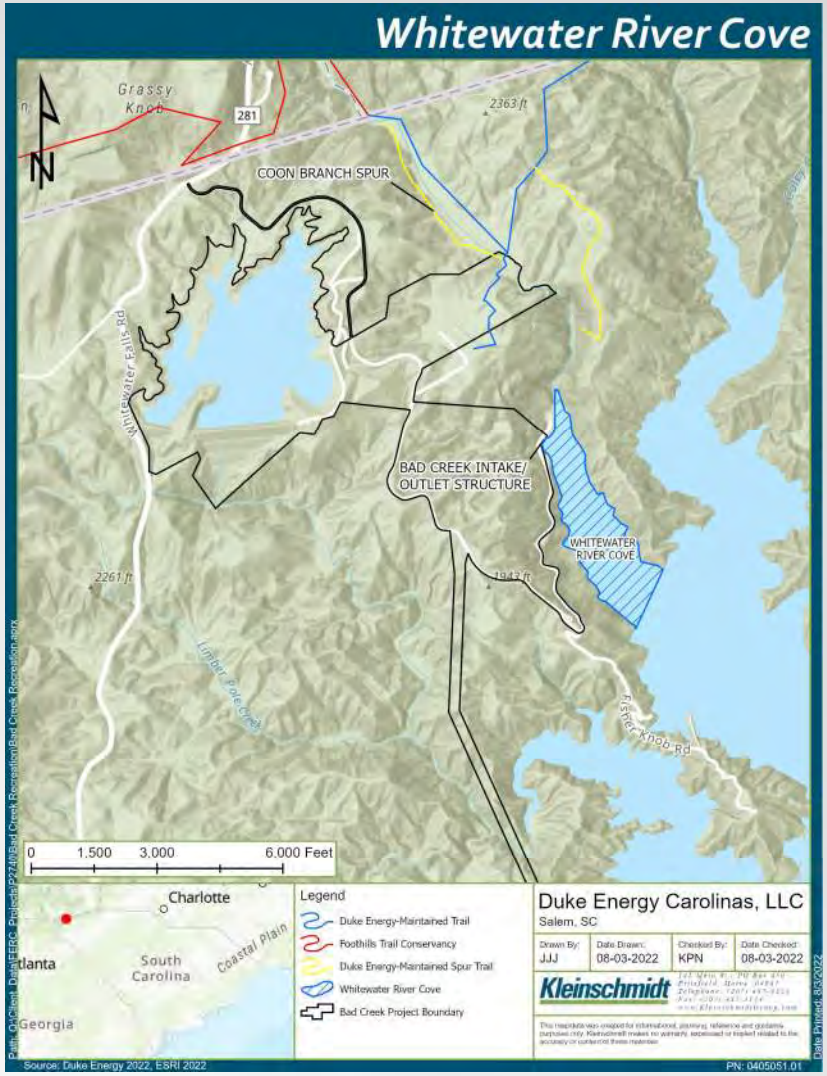
- Duke Energy maintained access points and points of interest.



Proposed Study Area

Whitewater River Cove

- Recreational Use
- Public Safety associated with potential Bad Creek II Complex construction



Project Nexus

- Although it is non-Project, the 43-mile segment of the Foothills Trail and 10 access areas are associated with the Project and are maintained by Duke Energy.
- Duke Energy plans to continue to maintain these facilities as non-Project.

Methodology

Task 1 – Foothills Trail Corridor RUN Study

- Facility Inventory
- Traffic and Trail Counters
  - March-November 2023
- User Surveys
  - March-November 2023
  - Mix of weekdays, weekends, holidays
- Analysis:
  - Trail Use
  - Parking Demand
  - Future Recreation Use
  - Recreation Needs

- Data will also inform if needed safety measures related to the Foothills Trail and facilities (if Bad Creek II project proceeds).

	Data Collection Methods			
Access Area	Inventory	Traffic Counter	Trail Counter	Surveys
Table Rock State Park *			*	
Sassafras Mountain Trail Access	*	*	*	
Chimney Top Gap Trail Access	*		*	
Laurel Valley Trail Access	*	*	*	*
Laurel Fork Creek Falls Spur Trail Access	*		*	
Toxaway River Trail Access	*		*	*
Canebrake Trail Access	*		*	
Horsepasture River Trail Access	*		*	
Lower Whitewater Falls Overlook	*		*	
Bad Creek Hydro Project Trail Access	*	*		*
Coon Branch Spur Trail Access	*	*		
Musterground Road		*		

Methodology

Task 2 – Foothills Trail Conditions Assessment

- Professional trail builder will assess conditions of the 43 miles of Foothills Trail and spur trails managed by Duke Energy.

- Analysis:
  - Trail surface and feature assessment
  - Corridor condition
  - Identification and prioritization of major maintenance needs

Methodology

Task 3 – Whitewater River Cove Existing Recreational Use

- Drone flights of the Whitewater River Cove area
  - 10 days between Memorial Day-Labor Day 2023
- Analysis:
  - Level of boating use
  - Type of watercraft
- Data will inform of potential impact of closures of the Whitewater River Cove area during construction if Bad Creek II project proceeds.

Task 4 – Whitewater Cove River Recreational Public Safety Evaluation

- A three-dimensional CFD model will be created as part of the Water Resources Study to evaluate potential water velocities
- Analysis:
  - Impact of water velocity on recreational use of the Whitewater River Cove

Study Logistics

Study Schedule

Task	Proposed Timeframe for Completion
Study Planning	**August – December 2022**
Study Tasks	**Winter 2022 – Winter 2023**
Foothills Trail RUN Study Data Collection	September 2022 – January 2023, March – November 2023
Foothills Trail Conditions Assessment	November 2022 – November 2023
Whitewater River Cove Existing Recreational Use	May – September 2023
Whitewater River Cove Recreational Public Safety Evaluation	Spring 2023 – Fall 2023
File Initial Study Report	**January 2024**

Cultural Resources Study

Cultural Resources Study Plan

- No formal study requests were received during the scoping process; however, Duke Energy will continue consultation with the Indian Tribes and other stakeholders during the preparation of the final study plan.

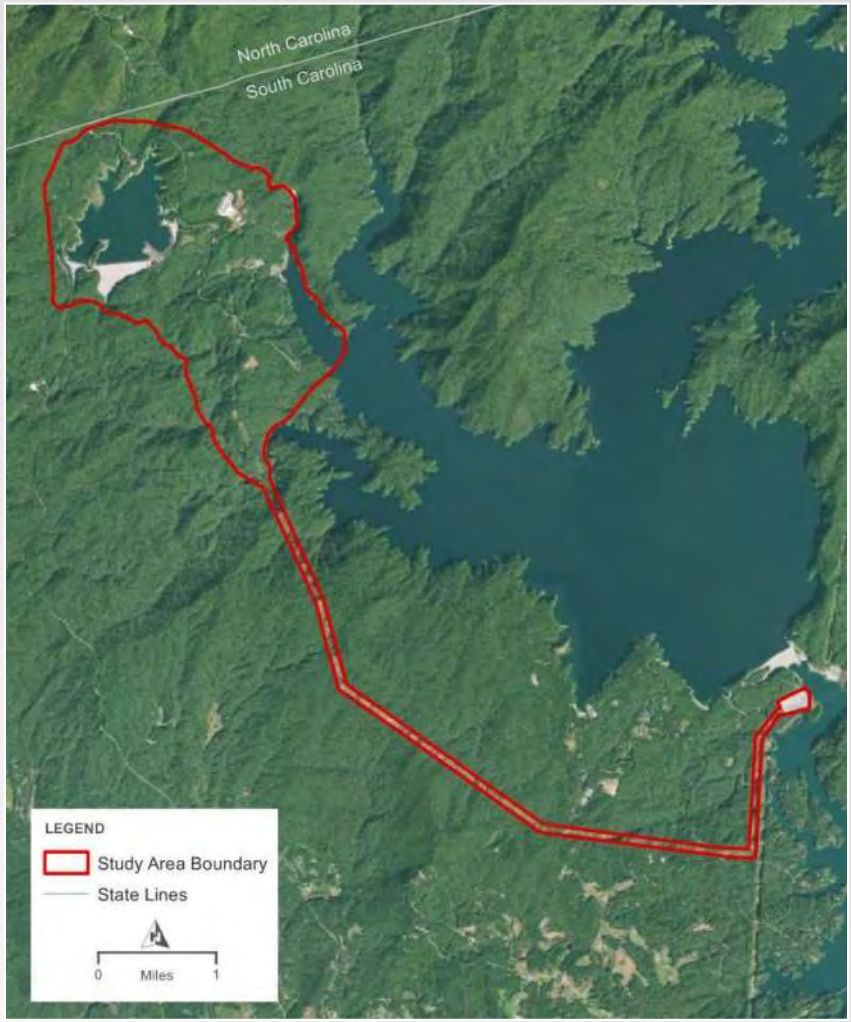
- In Section 7.1.8.3 of the PAD, Duke Energy proposed to conduct a Cultural Resources Study in support of the Bad Creek Project, including an archaeological study and an architectural survey of structures more than 40 years old.

Background and Existing Information

- Portions of the existing Project that underwent extensive land modification or that are currently under Lake Jocassee, are unlikely to contain significant archaeological resources or historical architectural resources other than the elements of the Project greater than 50 years of age.
- Portions of the Project were subject to prior cultural resource surveys.
- As obtained from the SCDAH/SCIAA ArchSite database, there are 12 known archaeological sites that are within or immediately adjacent to the Project. Three sites are potentially eligible and require additional evaluation. Nine sites were determined to be not eligible.
- The Jocassee Hydrostation is eligible.

General Study Area

- The study area for the Cultural Resources Study is the Area of Potential Effects (APE). The APE will be defined in consultation with the SHPO and THPO's.
  - Main/primary Project site
  - All lands within the Project boundary
  - Lands outside the Project boundary where cultural resources may be affected by Project-related activities
  - Upper reservoir
  - Lower reservoir (specifically, Whitewater River Cove)
  - Transmission line corridor



Project Nexus

- Presently, there is no evidence that archaeological or historic resources are being affected by the Project's existing operations. The proposed Bad Creek II Complex has the potential to effect historic properties that may be eligible for inclusion on the NRHP.

Goals and Objectives

The goal of the Cultural Resources Study is to evaluate potential impacts to historic and archaeological resources, and traditional cultural properties, due to the construction, operation and maintenance of the proposed Bad Creek II Complex.

Objective 1: Consult with the State Historic Preservation Office, Indian Tribes, and other agencies regarding the potential issues to cultural resources located within the area of potential effects for the Bad Creek II Complex.

Objective 2: Complete an architectural survey and National Register evaluation for the existing Bad Creek facilities.

Methodology

Task 1 – APE Determination

- The Project APE has tentatively been proposed. Section 106 Consultation with SHPO and Indian Tribes will finalize and document the final APE.

Task 2 – Cultural Resources Study of the APE

- A cultural resources survey of portions of the APE that will be impacted by the Project is anticipated. Shovel testing of all non-steep landforms, a pedestrian survey and/or drone survey of steeply sloped and rocky areas to look for rock shelters and petroglyphs, as well as an architectural survey of any structures on or near the Project APE that are 40+ years of age.
- Traditional Cultural Properties will be identified in consultation with Indian Tribes.
- Desktop Geomorphological assessment indicates there are six areas within the APE that have potential to contain archaeological resources that may require additional survey and deep testing if impacted by the Project..

Study Schedule

Task	Proposed Timeframe for Completion
Consultation with SHPO and other stakeholders	July-November 2022
Fieldwork, Analysis, and Reporting	Spring – Fall 2023
Initial Study Report	January 2024

Environmental Justice Study

Environmental Justice Study

- FERC has identified that an Environmental Justice review is pertinent to its NEPA analysis for the relicensing and proposed Complex development.
- Comments filed by Upstate Forever in support of an Environmental Justice Study.

What is Environmental Justice?

Environmental Justice (EJ) - The fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies.

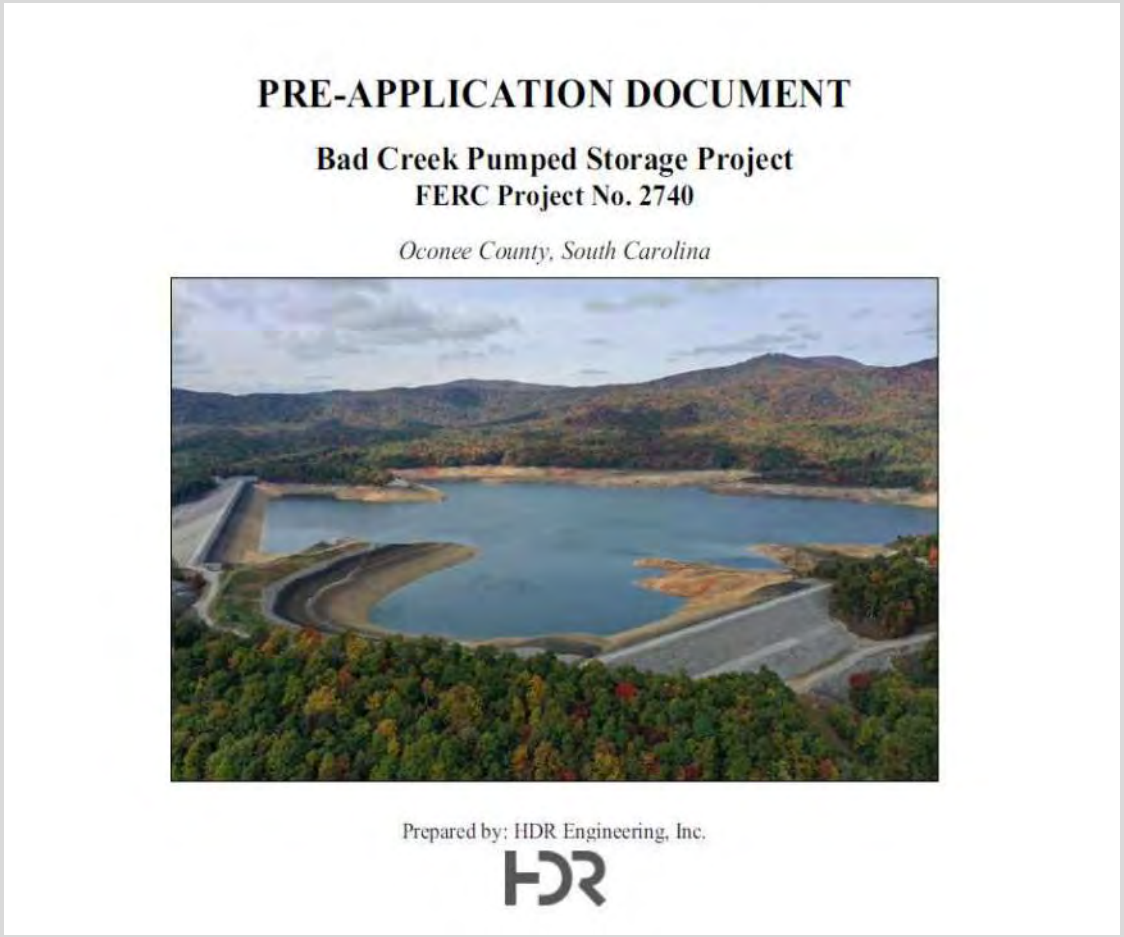
Environmental Justice Study

Additional Terms Included in the Analysis

Fair Treatment - The principle that **no group of people**, including a racial, ethnic or a socioeconomic group, **should bear a disproportionate share of the negative environmental consequences** from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies.

Disproportionate Effects - Term used in Executive Order 12898 to describe situations of concern **where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples**.

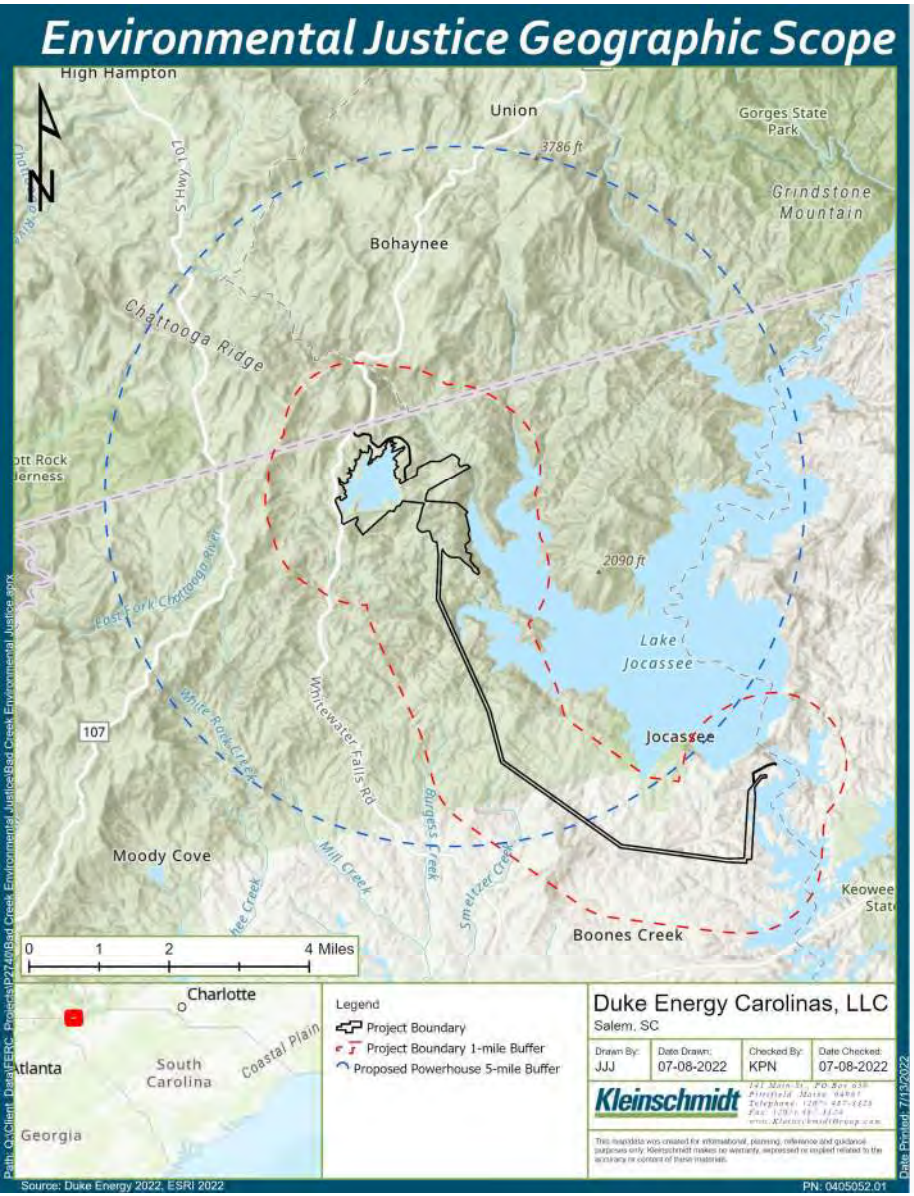
Sensitive Receptor Locations - Sensitive receptors include, but are not limited to, **hospitals, schools, daycare facilities, elderly housing and convalescent facilities**. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants.



Background and Existing Information

Study Goals and Objectives

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope



Proposed Study Area

Project Nexus

- Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities.

- Examples of resource impacts may include, but are not necessarily limited to, project-related effects on:
  - subsistence fishing, hunting, or plant gathering;
  - access for recreation;
  - and construction-or operation-related air quality, noise, and traffic.

Methodology

Consistent with Environmental Protection Agency's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016), the EJ Report will include the following:

Step 1: A table of racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic scope of analysis. (Source: U.S. Census Bureau Data).

	RACE AND ETHNICITY DATA										LOW-INCOME DATA
Geography	Total Population (count)	White Alone Not Hispanic (count)	African American (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority (%)	Below Poverty Level (%)
State											
County or Parish											
Census Tract X, Block Group X											

Methodology (cont.)

Step 2: Utilizing data within Step 1 to identify environmental justice populations by block group by applying the following methods to minority populations:

- 50% Analysis Method
- Meaningfully Greater Analysis Method

Step 3: Utilizing data within Step 1 to use the "low-income threshold criteria" method to identify environmental justice communities based on the presence of low-income populations.

- the percent of the population below the poverty level in the identified block group must be equal to or greater than that of the reference population (county)

Methodology (cont.)

Step 4: Identify non-English speaking groups within the geographic scope of analysis **that would be affected by the project**.

Describe planned outreach efforts if these groups exist within the geographic scope.

Reporting: Map Development

Map Components

- FERC Project Boundary
- Project construction areas
- Identify block groups of EJ communities based on the presence of minority population, low-income population, or both
- Sensitive receptor locations (e.g., schools, daycare centers, hospitals, etc.)

Reporting: Sensitive Receptor Locations

A table of distances of sensitive receptor locations from project facilities and proposed facilities.

Discussion of project-related effects on these locations.

Discussions of PM&E measures to avoid or minimize potential effects.

Reporting: Potential Project Effects Discussion

A discussion of potential project-related effects on any environmental justice communities, non-English speaking groups and sensitive receptor locations for all resources where there is a potential nexus between effects and communities/locations.

For any identified effects, describe whether or not any of the effects would be disproportionately high and adverse on environmental justice communities.

Public Outreach

Protection Mitigation and Enhancement Measures

To avoid and/or minimize project effects on identified communities:

- Environmental justice communities
- Non-English speaking groups
- Sensitive receptor locations

Schedule

Quarterly Progress Reports

On or around July 2023

On or around October 2023

Public Outreach Meetings – October 2023

Final Environmental Justice Report – January 4, 2024

Resource Committee Members

Type	First Name	Last Name	Company Name
Duke Technical Leader	John	Crutchfield	Duke Energy
Duke Resource Lead	Lynne	Dunn	Duke Energy
Duke Resource Lead	Ed	Bruce	Duke Energy
HDR Support	Sarah	Kulpa	HDR
Environmental Justice -Kleinschmidt Support	Alison	Jakupca	Kleinschmidt Associates
Committee Member	Sarah	Chabaane	South Carolina Department of Natural Resources
Committee Member	Pat	Cloninger	South Carolina Department of Natural Resources
Committee Member	Tom	Daniel	South Carolina Department of Natural Resources
Committee Member	Elizabeth	Miller	South Carolina Department of Natural Resources
Committee Member	Greg	Mixon	South Carolina Department of Natural Resources
Committee Member	Alex	Pellett	South Carolina Department of Natural Resources
Committee Member	Alix	Pedraza	South Carolina Department of Natural Resources
Committee Member	Dan	Rankin	South Carolina Department of Natural Resources
Committee Member	John	Haines	Friends of Lake Keowee Society
Committee Member	Terry	Keene	Advocates for Quality Development (AQD)
Committee Member	Rowdy	Harris	SC Department of Parks, Recreation & Tourism
Committee Member	Morgan	Amedee	SC Depart. Health and Environmental Control
Committee Member	Melanie	Olds	U.S. Fish and Wildlife Service

Questions

Action Items

South Carolina Department of Natural Resources

Robert H. Boyles, Jr.
Director

Lorianne Riggin, Director
Office of Environmental Programs

PO Box 12559
Charleston, SC 29422
843-953-3881 Office
millere@dnr.sc.gov

November 2, 2022

Electronic Transmission

Hon. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

REFERENCE: COMMENTS on the Proposed Study Plan, Bad Creek Pumped Storage Project (P-2740-053).

Dear Secretary Bose:

South Carolina Department of Natural Resources (SCDNR) staff have reviewed the Proposed Study Plan (PSP) prepared by Duke Energy Carolinas, LLC (Duke Energy) for the proposed relicensing of the Bad Creek Pumped Storage Project, FERC Project No. 2740 (hereafter referred to as "Bad Creek" or "Project") and offers the following comments for the Commission's consideration.

SCDNR staff have been actively involved in the stakeholder process for the relicensing of the Project since early 2022. Staff have also participated in all six Resource Teams that were formed by Duke Energy to aid in the development of the Project's PSP. Additionally, SCDNR staff attended the Bad Creek PSP meeting on September 7, 2022, conducted by Duke Energy, which included a presentation and discussion of the six study plans developed by Duke Energy. At the meeting SCDNR staff offered questions and comments that were captured in the PSP meeting summary that was distributed on to the stakeholder distribution list on October 19, 2022.

Aquatic Resources PSP

During the PSP meeting hosted by Duke Energy, the SCDNR raised concerns regarding the Desktop Entrainment Study included in the Bad Creek Pre-Application Document. The SCDNR's concerns were regarding the size and swim speeds of target species used to model the estimated entrainment at the Project. The desktop entrainment study was modeled with threadfin shad that ranged in size from 0.719 to 1.371 feet. According to the Bad Creek Entrainment Study (Barwick et al. 1994), the monthly mean length of threadfin shad captured at the Bad Creek

Pumped Storage Station from 1991-1993 ranged in size from 56-134 mm (0.18-0.44 feet). Further, the swim speeds associated with the blueback herring and threadfin shad appeared to be much higher than the capabilities of the fish. Table 2 of the report states that relevant source material was not found, therefore, the family Clupeidae swim speeds were used as surrogates for the swim speed analysis. However, the study did not include citations of where the burst swim speeds of Clupeids were sourced. With the incorporation of the high swim speeds as data elements in the desktop model, the results concluded that the species would likely not be entrained. The SCDNR disagrees that the model accurately depicts the average size range and swim speeds of target species in Lake Jocassee and requests the desktop model be rerun with data points more representative of the existing fish population. The SCDNR also requests that the source of the data incorporated into the model be provided in the report.

Recreational Resources PSP

The licensee is proposing to utilize aerial monitoring techniques (drone) to estimate the volume of recreational users in Whitewater Cove. The monitoring data will be collected for ten days from Memorial Day through Labor Day in 2023 and will include a mix of weekdays, weekends, and holidays. The SCDNR finds the currently proposed number of survey days to be insufficient in capturing the recreational use of Whitewater Cove and recommends increasing the number of survey days to twenty days. Surveying the cove for twenty days would capture approximately twenty percent of the recreational use throughout the designated time period and would be more representative of the recreational use that will be impacted by the construction of the Bad Creek II Complex.

Water Resources PSP

The SCDNR continues to have concerns regarding the impacts of spoil materials at the Project due to the proposed construction of the Bad Creek II site and looks forward to working with Duke Energy to minimize impacts to streams and wetlands. At this time, the SCDNR does not offer any additional comments on the Water Resources PSP.

The SCDNR appreciates the opportunity to provide these comments on the Bad Creek Pumped Storage Project's Proposed Study Plan. If you have any questions or need additional information, please do not hesitate to contact me by phone at 843-953-3881 or email at millere@dnr.sc.gov.

Sincerely,

Elizabeth C. Miller
FERC Coordinator, SCDNR

cc: Alan Stuart, Duke Energy
Melanie Olds, USFWS

Chuck Hightower, SCDHEC
Derrick Miller, USFS

Reference: Barwick, D.H., T.C. Folsom, L.E. Miller, and S.S. Howie. 1994. Assessment of Fish Entrainment at the Bad Creek Pumped Storage Station. Duke Power Company. Huntersville, NC.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
November 3, 2022

OFFICE OF ENERGY PROJECTS

Project No. 2740-053–South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Via FERC Service

Alan Stuart
Duke Energy Carolinas, LLC
Mail Code EC-12Q
526 S. Church Street
Charlotte, NC 28202

Subject: Staff Comments on the Proposed Study Plan for the Bad Creek Pumped Storage Project

Dear Mr. Stuart:

We have reviewed Duke Energy Carolinas, LLC's (Duke Energy) proposed study plan for the Bad Creek Pumped Storage Project (Bad Creek Project) filed on August 5, 2022, and attended the study plan meetings in Greenville, South Carolina on September 7, 2022. Pursuant to 18 C.F.R. § 5.12 of the Commission's regulations, we provide staff's comments on the proposed study plan in the enclosed schedule A.

We appreciate the opportunity to comment on your proposed study plan for the Bad Creek Project. If you have any questions, please contact Navreet Deo at (202) 502-6304, or at navreet.deo@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Enclosure: Schedule A

SCHEDULE A
COMMENTS ON THE PROPOSED STUDY PLAN

General Comments

1. Section 1.1.2, *Bad Creek II Complex Description and Location,* of the Proposed Study Plan (PSP), states that Duke Energy is presently evaluating the potential to develop a 1,400-megawatt (MW) Bad Creek II Power Complex (Complex) as part of an alternative relicensing proposal. In order for Commission staff to analyze all potential operating scenarios under any new license for the Bad Creek Project, all studies conducted as part of the Integrated Licensing Process (ILP) pre-filing period should analyze the effects of both existing operations and the construction and operation of the proposed Complex on any resources that could be affected by the project.

2. Section 1.1.2, *Bad Creek II Complex Description and Location,* of the PSP also indicates that if additional land would be needed to construct the Complex, Duke Energy would conduct a transmission line siting study "under a separate schedule and process, to comply with requirements pursuant to The South Carolina Utility Facility Siting and Environmental Protection Act…" In other words, Duke Energy proposes to conduct at least a portion of its transmission line siting study, if needed, outside of the relicensing process. In the RSP, please include in the schedule the timing for conducting the portions of the transmission line siting study elements related to the relicensing proposal. In addition, Commission staff recommends that the results of all studies related to the relicensing proposal be filed at the earliest milestone of the ILP that they become available (*i.e*., with the Initial Study Report (ISR), Updated Study Report (USR), the preliminary licensing proposal (PLP), or no later than the license application). Providing all study reports with the ISR and/or USR allows stakeholders adequate time to review the results, and for Duke Energy to consider and include any environmental protection, mitigation, and enhancement (PM&E) measures associated with the study results in the PLP and license application.

Responses to Commission Staff's PAD Comments

3. Section 5, *FERC Additional Information Requests (AIRs)*, of the PSP, provides responses to Commission staff's AIR letter, issued July 12, 2022, regarding the Pre-application Document (PAD) for the Bad Creek Project. These comments and responses pertain to the information gathering needs for the Bad Creek relicensing process. Based on Duke Energy's responses to AIR items #5, #9, #10, #11, and #13b, staff provide the following supplemental comments and AIRs:

Response #5

Duke Energy states that the potential operation of the Complex will not result in any change to the operating band of the upper reservoir 'from existing conditions.' The current license order authorizes Duke Energy to operate the upper reservoir between 2,150 feet mean sea level (msl) and 2,310 feet msl (a 160-foot fluctuation band). However, the PAD states that under normal project operation, the upper reservoir is maintained between 2,250 feet msl and 2,310 feet msl (a 60-foot fluctuation band). Please clarify whether 'existing conditions' refer to the 160-foot band or the 60-foot band in the Revised Study Plan (RSP).

Response #9

In order to provide stakeholders a complete and accurate understanding of the existing and proposed project features, and vegetation management strategies, in the RSP, please include a map displaying, and a table listing, all primary transmission line right-of-way (ROW) corridors, in the current and proposed project, including, as appropriate, the corridors identified in the PSP by Duke Energy's names: Jocassee NW 1 (1J2672 BP-#7, 1J2672#13-EP, & 5J2817 BP-EP) and Oconee NW 1 (1J2672 #7-13). On the map, please show all primary transmission ROW corridors as being within the proposed project boundary and label each transmission line corridor with Duke Energy's names. In the table, please include Duke Energy's names for each transmission line corridor, as well as the transmission ROW characteristics such as width and length, and line characteristics such as voltage.

Further, in the RSP, please explain which native grasses, wildflowers and herbaceous plants are the "desirable allelopathic" plants that became established in the Jocassee NW 1 Corridor after the 2018 aerial treatment. Also, please note that although *Lespedeza bicolor* was described as a native species in the PSP, it is a non-native invasive species. Please refer to the USDA's Plants Database (https://plants.usda.gov/home) and/or other authoritative sources to confirm origins/nativity of plants for accurate descriptions.

Lastly, the PSP states that Duke Energy uses a "bare ground mix" of herbicides to treat brush and grasses on dam faces to keep them vegetation-free, and that this same mix is used by Duke Energy's transmission department. However, based on the description of herbicide treatments in the PSP, Duke Energy doesn't appear to be targeting a "bare ground" result in the project transmission line ROW corridors. In the RSP, please clarify Duke Energy's target, resulting vegetation types for each treatment area and where

Duke Energy's "bare ground mix" of herbicides is used within the project boundary.

Response #10

Duke Energy states that "future enhancement of Monarch and pollinator habitat, within the project area, will be evaluated by the Wildlife & Botanical R[esource] C[ommittee (RC)] upon better understanding of the transmission project. These areas could then be enrolled into the CCAA [Monarch Candidate Conservation Agreement with Assurances program] acreage of protection." In the RSP please clarify what Duke Energy is referring to by "better understanding of the transmission project." If Duke Energy is referring to answering the question of whether or not Duke Energy would build a new transmission line/corridor as part of the Complex, please make that explicit. In addition, in the RSP please clarify how the existing and potential transmission line corridors would be evaluated by the Wildlife & Botanical RC for the monarch program and when the results of the evaluation would be provided to stakeholders. Please file this evaluation with the study results when available (*e.g.,* ISR, USR), PLP, or no later than the license application. Please state the reasons for including, or excluding, the existing and any proposed transmission line ROW corridor(s) for enrollment in the program.

Response #11

Duke Energy states that there were no known adverse avian interactions at the project transmission lines or switchyard during the past 3 years, and the existing transmission lines are consistent with the Avian Power Line Interaction Committee's (APLIC) and U.S. Fish and Wildlife's (FWS's) guidelines for avian protection (including conductor separation). Other than conductor separation, please clarify in the RSP whether there are avian protection measures installed on the existing transmission lines or at the switchyard (*e.g.,* marker balls, animal guards, *etc.*). In addition, please note that it is staff's understanding that APLIC is in the process of updating its 2006 and 2012 guidance documents on avian electrocution and collision. If the updated APLIC guidance documents become available during the pre-filing portion of the relicensing process, please review them, and provide an updated assessment of the existing, and any proposed, project transmission facilities in the ISR, USR, PLP, or license application (*i.e.,* as soon as feasible).

Further, Duke Energy proposes to evaluate avian protection measures to incorporate in the new transmission line design once the transmission line route is determined, and will discuss the proposed transmission line design standards with the

Wildlife & Botanical RC. In the RSP please clarify whether FWS staff will be included in the Wildlife & Botanical RC.[1]

Response #13b

In the RSP, please describe the data types included in "Duke's Natural Resources GIS Viewer", the source(s) of those data, and how frequently the data are updated. Also, please clarify whether Duke Energy's practice of conducting "a known or potential bat roosting habitat review" prior to tree cutting activities includes field surveys using the FWS's survey protocols.

Commission staff notes that Duke Energy's existing best management practices (BMPs) to avoid removal of potential roost trees greater than [or equal to] 5 inches in diameter at breast height (dbh) is the correct guidance for Indiana bats, but would not be as protective of northern long-eared bats (NLEBs)[2] or tricolored bats, which FWS recently proposed for listing as endangered under the Endangered Species Act.[3] Current BMPs for areas inhabited by NLEBs include avoiding cutting, trimming, or removing trees that are greater than or equal to 3 inches dbh during the pup season (May through July in South Carolina) or the active season (most protective). BMPs for tricolored bats will likely be developed as part of FWS's proposed listing process for the tricolored bat. Please ensure that the PLP and license application include information about the proposed tricolored bat in addition to the federally listed species listed in scoping document 2.

Duke Energy states that potential roost trees would be marked with blue paint, a 15-foot buffer would be set with blue flagging, and any hazard/danger tree within the buffer would also be marked with blue paint. In the RSP, please clarify how tree crews would distinguish between potential roost trees and hazard/danger trees if they are both marked with blue paint.

---

[1] Slide 31 from the May 2022 stakeholder meeting states that these committees were formed on June 23, 2022, but the PSP does not include a list of committee members.

[2] Please note that FWS also issued a proposed rule to reclassify the NLEB from threatened to endangered. *See* 87 Fed. Reg. 16,442-16,452 (March 23, 2022).

[3] 87 Fed. Reg. 56,381- 56,393 (September 14, 2022).

Finally, in the RSP, please elaborate on the methods used for conducting "aerial saw operations" to cut/trim trees (*e.g.,* equipment used, time of year, and frequency of this type of treatment).

Visual Resources Study

4. Section 6.2, *Task 2 – Seen Area Analysis*, of the proposed Visual Resources Study Plan, states that "[t]he initial Seen Area analysis will address the [p]roject reservoirs and directly associated facilities; [and] a subsequent viewshed analysis covering the new transmission corridor may be conducted if a new corridor is defined for the Bad Creek II Complex." However, the goals of the study include addressing "the effects of continued project operations under the [e]xisting [l]icense as well as potential construction and operation of a second powerhouse during the [n]ew [l]icense term…". Please provide information about the existing project operations and maintenance activities that affect visual characteristics, such as existing vegetation management treatments, as well as the potential changes to visual resources if the Complex is pursued. Further, the PAD indicates that Duke Energy currently envisions that the new transmission line for the Complex would be constructed parallel to the existing transmission lines within the existing transmission line ROW corridors. Therefore, we recommend that the initial viewshed (Seen Area) analysis include the existing project transmission line corridors.

5. During the PSP meeting on September 7, 2022, Duke Energy explained that the majority of the spoils from the Complex would be bare/solid rocks, with a smaller volume of fine sediment (soil, sand, clay, small stones). Duke Energy also stated that it would develop an erosion and sediment control plan with provisions for revegetation of the spoil areas. Commission staff noted that because bare rock spoils would remain in a primary to early ecological succession state[4] for longer than the spoils made up of fine sediment, and because the project area is forested with many areas dominated by deciduous trees, the viewsheds could vary seasonally during the short term (*i.e.,* during and immediately after construction) and long term (years after construction). Staff requested clarification on whether tasks 3 and 4 of the proposed Visual Resources Study Plan, which include field investigations and a desktop assessment, would include evaluations both during the spring/summer when the leaves are on the deciduous trees, and during the fall/winter when the deciduous trees have lost their leaves, to assess the potential seasonal differences in the viewsheds. Therefore, staff recommends that Duke Energy clarify the timeframes for field investigations in the RSP.

[4] Primary ecological succession is a process whereby newly formed land or bare rock (*i.e.,* an area lacking soil) is exposed during a disturbance and is then gradually colonized and inhabited by groups/communities of species. Over time, soil forms and the area is colonized by grasses and other herbaceous species, vines, and shrubs in early successional habitats.

Recreational Resources

6. Section 5.18(b)(5)(ii)(C) of the Commission's regulations requires that all proposed environmental measures must be provided in the final license application (FLA).[5] Section 2, *Goals and Objectives*, of the proposed Recreational Resources Study Plan (recreation study plan) states that Duke Energy would update the Recreation Management Plan (RMP) and file it with the license application, or shortly thereafter. Please provide, at a minimum, an outline of the major recreation measures of the plan with the preliminary licensing proposal (PLP) and the FLA for stakeholder and Commission staff's review.

7. In section 3, *Study Area*, of the recreation study plan, multiple trails are discussed that connect to Duke Energy's section of the Foothills Trail. In order for staff to understand the location of these trails, please file a map with the FLA that includes the parking areas, trailheads, and access trails to the Foothills Trail and Coon Branch Spur Trail in relation to the project boundary.

8. Section 6.2, *Task 2 – Foothills Trail Corridor Conditions Assessment*, of the recreation study plan, states that a professional trail builder will conduct an assessment from October 22 to October 23, 2022, of the "…trail head, shoulder, backslope, constructed structures (not including engineered bridges) and corridor condition." Attachment 1 to the recreation study plan includes an assessment form for recreation sites along the trail, but does not include a form specific to assessing the condition of the trail itself. In addition, no further detail on the methods of assessing the trail are provided in the study plan. Please provide: (1) additional details on how the condition of the trail will be assessed, including any template(s) of assessment form(s) that the trail builder would use; (2) any condition or maintenance issues that would be identified and tracked geospatially; and (3) the specific data, and level of detail (i.e., soil erosion, soil compaction, soil porosity, etc.), that is proposed for the final report on the Foothills Trail Corridor Conditions Assessment. Given stakeholders' comments to date, staff recommends that the assessment also include documentation of any drainage and erosion issues, as well as the locations of any littering or vandalism. If erosion is identified, it would be helpful to have notes on the possible cause(s) at each location.

9. On page 1 of the Recreation Site Inventory Form, it is unclear how the shoreline access condition will be evaluated. Please elaborate on the criteria that will be used to rank the relative shoreline access condition scores, and clarify whether the conditions of

[5] *See* Guidance on Environmental Measures in License Application; available at https://www.ferc.gov/sites/default/files/2020-04/GuidanceonEnvironmentalMeasuresinLicenseApplications.pdf.

the recreation sites in Table 6-1 will be similarly evaluated. If so, please provide criteria for the assessment(s).

Cultural Resources Study

10. Section 2, *Goals and Objectives*, of the Cultural Resources Study Plan (cultural resources study), defines the area of potential effect (APE) as all lands within the FERC-approved project boundary and lands outside of this boundary where cultural resources may be affected by project-related activities. Section 2 also states that Duke Energy intends to further define the APE in consultation with the South Carolina State Historic Preservation Officer (South Carolina SHPO) and tribes as part of the cultural resources study. As a reminder, Duke Energy must document the concurrence of the South Carolina SHPO and relevant Tribal Historic Preservation Officers (THPOs) (where tribal lands are involved) on the APE. Please document concurrence in the revised cultural resources study plan, including describing the criteria for modifying the APE based on the results of any studies.

11. Table 4-1, *Previously recorded cultural resources within and adjacent to the project*, of the cultural resources study lists 15 sites, of which 3 sites are potentially reported as eligible for inclusion in the National Register of Historic Places (National Register) and require additional evaluation. Additionally, the Lake Keowee (SHPO Site No. 0155) and Lake Jocassee (SHPO Site No. 0156) sites have not been evaluated for National Register eligibility. While the cultural resources study proposed for the Bad Creek relicensing implies that these two sites will be evaluated as part of the study, please confirm this component of the study in the RSP.

12. To the extent possible, we recommend that Duke Energy conduct National Register evaluations and assessments of project effects during the pre-application study period. National Register evaluations and assessments of effect aid Commission staff in evaluating the environmental impacts of the project on historic properties, as required under the National Environmental Policy Act. They are also important in resolving potential adverse effects to historic properties as required under section 106 of the National Historic Preservation Act. National Register eligibility and assessment of effect must be determined in consultation with the South Carolina SHPO and tribal THPOs (where resources occur on tribal lands).[6] Please include adequate time in the proposed schedule for such consultation.

13. Section 6.2, *Task 2 – Cultural Resources Survey of the APE*, of the cultural resources study plan states that Traditional Cultural Properties (TCPs) will be identified in consultation with the Tribes. Because of the potential for overlap between TCPs and

[6] 54 U.S.C. §§ 302104 and 302702

archeological sites, staff recommends that the RSP include identification of any colocation between potential TCPs and documented archaeological sites. While an archaeological site may not be eligible for listing on the National Register under the National Register criteria, it may be eligible for listing if it is associated with an eligible TCP.

Foothills Trail Conservancy
PO Box 3041
Greenville, SC 29602
www.foothillstrail.org

November 3, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: Foothills Trail Conservancy's Comments on Duke Energy's Bad Creek Pumped Storage Project (P-2740-053) Proposed Study Plan (PSP) Submittals

The Honorable Ms. Bose:

Since 1974, the Foothills Trail Conservancy (FTC) nonprofit organization has been at the forefront of collaborative efforts to create, maintain, protect, and expand the Foothills Trail – a preeminent 77-mile hiking and backpacking trail extending along the Blue Ridge Escarpment in the Carolinas. The existence of the Foothills Trail (FHT or the "Trail") is an amazing accomplishment that for 40 years has provided an epic outdoor, wilderness experience unique in the Southeast.

The FHT corridor runs through significant segments of the irreplaceable Blue Ridge Escarpment known as the Blue Wall by the Cherokee Nation. This area is filled with wildlife, expansive tree canopies, pristine streams, waterfalls, rare flora and fauna, native fish, unique birds including Bald Eagles and Loons and spectacular gorges and geology.

FTC's comments regarding Duke Energy's PSP are designed and written to achieve two goals. The first is to seek improvements and appropriate expansion in the Duke Energy PSP Recreation Study Plan. We believe such a study will clearly demonstrate to FERC and Duke Energy the need and prior commitments to upgrade, improve and expand the study of the FHT usage, corridor, infrastructure, route, parking and maintenance needs. The second goal is to seek to eliminate the provision which Duke drafted into the original Recreation Study which reserved to Duke a unilateral right to re-route or close the FHT at any time. We believe that this right to "close the trail" should be replaced with a public right and a Duke Energy obligation to transfer the Trail corridor into a public and permanently protected linear park which connects the states of NC and SC and the core of the Duke Energy customer base.

In addition to one-day adventures, the FHT offers an unusual opportunity for immersive, multi-day wilderness trips. For some people it's a training hike before going on to something bigger, like the Appalachian Trail; for others, hiking the entire FHT is a lifetime achievement. Collecting adequate data about current usage and future needs for a trail of this significance is quite different from studying a day-use or non-wilderness area.

The following description of the issues confronting a thru-hike experience is included in this document to help clarify the challenges and obstacles commonly encountered by multi-day wilderness hikers. The write-up therefore provides guidance for improvements to the proposed Recreation Study Plan which will then more accurately outline the needs for a very different

and more intensive Recreation Study than is currently proposed by Duke Energy. FTC strongly asserts that the Recreation Study should reflect fully the expanding use of the Trail and demands for wilderness experiences, including through hikes, section hikes, day hikes, and other outings and adventures. The Recreation Study should also take into account the enormous and unique value of the incredible Blue Ridge Escarpment in the Carolinas.

A Thru-Hike Experience

Those seeking to hike the entire Foothills Trail may hike it in one trip (a "thru hike"), commonly completed in five to seven days, or break it into multiple, shorter trips (a "section hike"). Either way, multi-day backpacking trips are quite different from one-day hikes – and require significantly more planning, preparation, support and infrastructure. For starters, there's the basics of transportation – FHT backpackers typically start and end at different and sometimes distant access points, so either a vehicle must be left at each end of the hike, or you must find someone to "shuttle" you. Since coordinating a start time is usually easier than knowing exactly when you'll finish, it's common to leave a vehicle at your end location and have someone drop you off at the starting location. Once dropped off, it is challenging to end your trip before you've hiked the full distance to your "finish" vehicle. (It is possible, of course, but since cell phone service and access points are limited throughout much of the Trail corridor it may involve hitchhiking with strangers and/or walking for miles along narrow, curvy roadways.)

Once on the Trail, each group is typically and completely self-supporting and unless you've coordinated a re-supply, everything you need for the trip must be carried with you. This includes everything you need to sleep, drink, eat, maintain hygiene, prevent or respond to injuries or illness, and to navigate along the Trail. With plentiful water sources along the Trail, food is often what adds the most weight to your backpack. Food selection is a balance between ensuring you'll have enough food to sustain the heavy physical exertion and avoiding taking too much, which means unnecessary effort to carry it. Many backpackers strive to pack just enough food to last them for the number of days they plan to be on the Trail. With no options for unplanned resupply along the Trail, an unexpected delay or detour during the trip could leave you hungry.

Many backpackers carefully plan anticipated camping locations to be sure they can complete the full trip in their allotted times and to maintain reasonable hiking distances each day which allows for arriving at the campsite before dark and, hopefully, before the site is full. Overnight, food and toiletries must be kept protected from black bears (and other wildlife), which are regularly active throughout the Trail region. This activity typically involves putting all "scented" supplies into either a bear-proof cannister (which can be heavy, uncomfortable to carry, and frustratingly difficult to open) or into a bag that can be hung above the reach of a curious bear – typically at least 15 feet above the ground and 10 feet away from any tree trunk. Accomplishing this task is often a challenging feat; not accomplishing it can result in loss of supplies that are critical for making it home safely. Campsites that provide a cable system for hanging food simplify this storage option and can improve safety. However, if several campers hang their supplies on the same cable, the combined weight may end up pulling all the bags much closer to the ground – and within reach of bears. Increasing the number of cable systems or adding bear-proof metal food lockers could significantly increase safety for people and wildlife.

Conditions on the Trail can change suddenly, and unexpected obstacles should be expected. Backpackers are typically prepared to navigate around a fallen tree that obscures the trail or to

locate a manageable river crossing if a bridge has been damaged by storms. However, making major changes to arrangements at the last minute due to unexpected detours or Trail closures can be complicated and may derail plans altogether. Altering plans may be especially problematic for people who have traveled significant distances and may be unable to reschedule flights, lodging, or vacation time to accommodate necessary schedule changes. All of these issues call for careful planning but also provide a unique and memorable Foothills Trail wilderness experience.

People from around the world are drawn to such natural areas and long-distance trails. For example, an estimated three million people hike a portion of the Appalachian Trail each year.[1] The FHT network today provides thousands of users an access to more than 100 miles of connected, hiking trails, provides critical wilderness retreats, "thru trail" experiences, day-hiking footpaths, helps preserve rare botanical and wildlife corridors, all of which knit together the incredible Blue Ridge Escarpment. The Blue Ridge Escarpment is widely recognized as one of the most ecologically diverse places in the world and includes numerous waterfalls, incredible vistas, many rare plants, abundant wildlife, native fisheries, and unique geology. The FHT itself is regularly recognized in national publications as the finest and most spectacular trail in South Carolina, and the related Jocassee Gorges Management Area has been included in National Geographic as one of the "Fifty of the Last Great Places—Destinations of a lifetime." The Foothills Trail and Trail corridor is truly a National treasure which must be expanded and protected forever as a critical component of the Bad Creek Relicensing and Expansion Project.

The FHT offers an impressive and rare recreational opportunity. Yet, the Trail's continued existence is fragile and rests with Duke Energy and FERC's decision regarding the relicensing and expansion of the Bad Creek Pumped Storage Hydropower facility. This Duke Energy section of the FHT is the critical connecting core and corridor which knits together all these hiking trails and the irreplaceable Blue Ridge Escarpment. This Trail must be preserved, not simply for residents of the nearby towns and counties noted in the PSP, but for people throughout the region who desire a wilderness experience. The importance of preserving forever this Duke Energy section of Trail, known as the "crown jewel" section, cannot be overstated – and cannot be delayed. With great appreciation to Duke Energy for building and maintaining this Trail, now is the critical time for the Foothills Trail to be protected in perpetuity to ensure that future generations continue to have the opportunity to experience this amazingly special place and experience.

The FTC's priority interests are rebuilding, repairing, enhancing, expanding, and permanently protecting Duke's 43-mile section of the Trail – to ensure that the exceptional experience provided by the entire Foothills Trail system continues for current and future generations. In fact, in 2022 FTC volunteers have already devoted more than 3,200 hours of maintenance and infrastructure improvements to the trail system.

[1] Appalachian Trail Conservancy https://appalachiantrail.org/explore/hike-the-a-t/thru-hiking/2000-milers/

We applaud Duke Energy's strong conservation ethic and their interest in continued support of the Trail, and we respectfully request inclusion of expanded studies, assessments and additional improvement measures as part of the Relicensing and Construction process for the expanding Bad Creek Complex. As drafted, the Proposed Recreation Study Plan is unlikely to capture accurate and appropriate recreation demands and will not adequately inform future recreation needs.

To assist in this process the Foothills Trail Conservancy is pleased to offer the following detailed comments and recommendations on Duke's Proposed Study Plan (PSP).

Sincerely,

Andrew Gleason
Foothills Trail Conservancy Board Chairman

Glenn Hilliard
Foothills Trail Conservancy Founder & Advisor

Dr. William A. Ranson
Foothills Trail Board Member

COMMENT 1: The proposed goals and objectives included in Section 2 are overly limited and should be expanded to ensure recreational needs are provided for throughout the entire next license period. FTC asserts the goals and objectives of the Recreational Study for Bad Creek should be comparable to those offered by Duke for the KT Relicensing Project (20110826 Duke PSP). Suggested goals include:

- Characterize current public recreation usage, activity, and satisfaction levels at the Project-related recreation;
- Estimate future demand for and identify needs for expanded or enhanced trails and appurtenances of the Project-related recreation throughout the entire new license period;
- Estimate current hiking and backpacking density and carrying capacity of the Project-related recreation that will provide high quality, wilderness-type experiences without causing ecological damage within these rare and sensitive habitats;
- Create a comprehensive inventory of Trail infrastructure including construction details (plans, as-builts, costs, special considerations, etc.), current condition, previous and anticipated maintenance schedules, and associated costs, for all Project-related recreation;
- Benchmark best practices for enhancing hiker and backpacker safety in the Project-related recreation;
- Characterize the economic value of recreation generated by the Project;
- Provide all data needed to inform revisions to the Recreation Management Plan (RMP).

COMMENT 2: The Duke Energy Proposed Study Plan Section 6.1.5 proposes a narrow and restricted analysis of population forecasts from very few – and only rural – counties. This is a much narrower evaluation than population discussed in the Original License Exhibit R, which notes that the "Project is located about midway between Atlanta, Georgia and Charlotte, North Carolina, with a 1970 population of about 3.5 million within a 100-mile radius." The current discussion seems particularly limited when considering that projections are for the sprawling development from Atlanta, GA and Charlotte, NC will merge into a "mega-region" – Char-lanta, with Bad Creek near the epicenter, by 2060.[2]

This predicted explosion in the population will mean significantly higher recreational needs and cannot be ignored. The limited discussion also ignores the overflowing crowds who visit the Great Smoky Mountains National Park, the Blue Ridge Parkway, the nearby SC State Parks, and the negative impact of weekend parking restrictions already imposed at times upon hikers and those wishing to use the nearby state parks in both NC and SC. The Upstate region of South Carolina features the Jocassee Gorges, included in National Geographic magazine's "50 of the Last Great Places – Destinations of a Lifetime" issue. In 2015, visitation has been continually increasing to State Parks throughout SC, with some of the highest increases in visits to parks

[2] Behold the sprawl of 2060, when Atlanta and Charlotte finally converge (https://www.atlantamagazine.com/news-culture-articles/behold-the-sprawl-of-2060-when-atlanta-and-charlotte-finally-converge/)

located in the Upstate region.[3] Since their reopening after the start of the COVID-19 pandemic, visitor use has spiked and many state parks – especially in the mountains – have begun regularly reaching capacity, having to close their gates early and turn away intended park visitors.[4] Clearly, the outdoor Recreational Use and Needs for this area of the Carolinas are enormous, outpacing current supply, and are continue to grow at an accelerated rate.

The outdoor recreation needs and demands of the surrounding Duke Energy customer base is enormous and growing rapidly. The measures of usage proposed by Duke Energy are woefully inadequate to account for the populations and population growth within this entire customer base area. At a minimum, the population area should match that which was considered in the Original License Exhibit R – from Atlanta, GA to Charlotte, NC. While the distance to these cities is slightly farther than previously indicated, closer to 130 miles vs 100 miles, travelling these distances is quite common and easily justifies their inclusion. The Foothills Trail has seen a huge leap in popularity nationally, and even globally, not just in the adjoining counties.

COMMENT 3: The general methods proposed in Section 6.1 are not appropriate for evaluating usage along a linear, long-distance hiking trail that is intended to provide a wilderness-type experience. The proposed methods present distinct challenges with capturing feedback from backpackers – the main intended use group - and will not provide adequate information to inform future needs. Additional, enhanced, and revised methodology should be provided to better capture the unique usage patterns and feedback along this unusual recreational feature.

As proposed, in-person User Surveys may not offer a suitable option for backpackers. If excited (or anxious) to get started, pushed for time to make camp, or tired after several days of hiking and camping, backpackers may be less able to allow time to thoughtfully respond to this type of in-person user survey. However, these individuals are also the best source of information regarding needs and conditions of the Trail and appurtenances. Providing forms for backpackers to self-complete at all campsites may increase responses from this critical target user group. [Pens/pencils and a box to leave completed forms should also be provided, to avoid asking backpackers to carry any extra weight while hiking.] Forms could also be made available to backpackers after completing a hike to fill out after returning home. Providing QR codes to access an online survey could be an option for day-use visitors at specific locations with a reasonable cell phone signal. However, offering QR codes along the Trail would likely result in few responses from backpackers, mainly due to lack of cell service along much of the Trail and limited willingness to utilize precious cell phone battery life for a non-essential, non-urgent task.

Adding trail registers to access locations and campsites could be a simple solution to improve the accuracy of Trail and campsite usage data. This feature could also improve safety, by creating a record of a hiking group's information and intended plans. This is common practice at

[3] State parks see highest visitation in past decade https://www.greenvilleonline.com/story/news/environment/2015/02/01/south-carolina-state-parks-nature-table-rock-paris-mountain-visits/22693229/

[4] SC State Park visitation excels prepandemic levels as more people flock outdoors https://www.wltx.com/article/news/local/sc-park-visitation-up-as-more-people-head-outdoors/101-ff77371c-98fd-4610-8d5a-815e70dc2113

other strenuous day-hiking trailheads and would be an inexpensive, efficient option to expand data collection.

Many people rely heavily on internet resources to help plan a long-distance hiking trip. A Google search for "Foothills Trail" returns seemingly endless resources - websites, interactive maps, YouTube videos, social media posts and groups, blog posts, subreddit threads, etc. Including information from these resources (number of visitors to a website, for example), could improve understanding of Trail usage and help capture non-local visitors to the Trail. Several options were utilized by Duke in the Keowee Toxaway Relicensing (20110826 Duke PSP), such as web-based and targeted electronic surveys, that would also be appropriate for the Bad Creek Project.

Additional information is likely also available from local organizations engaged in Trail operations. For example, over the past seven (7) months, the FTC has surveyed hikers from 17 states as well as from Europe. Some examples of more accurate ways to capture the usage would be to seek information from the FTC files and reports, boat and vehicle shuttle reports, and feedback from groups such as outdoor outfitter stores, shuttle drivers, and Jocassee tour operators.

A literature review should also be included that compares the Foothills Trail usage and appurtenances to other similar linear, long-distance trails providing a strenuous, wilderness-type experience. Paved trails, loop trails, or rail-trail conversions are unlikely to provide an appropriate comparison.

<u>COMMENT 4:</u> Proposed timeframes and locations for Trail and Traffic Counters will not provide sufficient data for future decisions. These times should be expanded and should target peak usage times to determine if recreational needs are currently being met and if usage is exceeding the carrying capacity of the Trail. Proposed Trail Counter locations will underreport user counts, including backpackers, and proposed Traffic Counter locations are overly limited. In fact, none of the proposed Trail Counter locations are on the actual mainstem of the Trail.

Although the Trail receives usage year-round, the proposal allows for less than a year of data collection. It also proposes to collect user surveys for only 360 total hours, or about 4.1% of the total 8,760 hours in a year. Additionally, the Study Plan schedule proposed in Section 7 is not consistent with the schedule outlined in Section 6.1.2 Traffic and Trail Counts, which indicates that this data collection work began September 15, 2022. If Section 6.1.2 is accurate, then the study plan work began before stakeholder comments were received or considered and before FERC approval was granted. Recreation plans typically focus on peak usage periods. At a minimum, the PSP should provide the rationale for the selected days/times and that they will capture peak usage. If the selected days/times do not capture peak usage, justification should be provided for their selection.

Trail Counters are currently proposed at eleven (11) total locations, including five (5) vehicle access locations, three (3) boat access locations, and three (3) spur trails. Depending on exact placement of the counter, it may only count individuals walking from a vehicle to the Trail, rather than those walking on the actual Trail. The proposed spur trails are more likely to capture information from day-hikers, rather than backpackers who may not have time or

energy to hike the extra miles offered by a spur trail. Additionally, the Coon Branch Spur Trail is not shown on the Official Map of the Foothills Trail, the Foothills Trail Guidebook, or the Foothills Trail Interactive Map. The Upper Whitewater Falls Loop Trail would be a more appropriate location for this Trail Counter.

Based on personal observation, boat access to the Trail is less popular among backpackers, which may be due to additional expense, time, or complications of coordinating this mode of transportation – so information from the boat access locations is unlikely to include backpacker usage. Rather than locate "at" the boat access locations, Trail Counters could be placed on bridges near these access locations. These bridges offer much needed river crossings for hikers and backpackers and are a draw to most types of Trail users.

Additional traffic counters should be provided at the Upper Whitewater Falls Access and at the NC 281 gravel parking area to provide insight into how usage patterns may vary between these accesses and the Bad Creek Access and parking lot. This information is essential to evaluate available capacity at these lots to handle increased traffic that would directly result if the Bad Creek Access were temporarily closed due to construction of the proposed Complex II expansion. As the closest alternative for paved, off-road parking, the Upper Whitewater Falls Access would likely receive significant increases in vehicle and hiker counts. With the potential for this "temporary" closure to last five (5) years, this is a serious issue that should be closely evaluated. If Duke closes the Bad Creek access for any extended period of time then additional and comparable access locations must be installed to ensure there is no reduction in safe parking availability.

COMMENT 5: The Parking Demand Analysis, outlined in Appendix 7, Section 6.1.4, needs to consider the extra demand placed on the Laurel Fork access parking by ATV users on the Horsepasture Road during hunting season.

These ATV users will have a truck and trailer combination that takes up several parking spots, limiting the number of users able to park and utilize specific access location.

COMMENT 6: The proposed locations and limited times for the User Survey are unlikely to capture adequate usage data from backpackers – who are one of the main intended users of this linear, long-distance trail. Additionally, the sample User Survey form included in Appendix 7, Attachment 2 is not appropriate for and will not capture important usage information associated with a linear, long-distance hiking and backpacking trail, which is intended to provide a wilderness-type experience. Significant revisions to the user survey form and enhanced data collection methods are needed.

The plan proposes only three locations for User Survey collection, including two vehicle accesses and one boat access. The boat access location may present a unique challenge for communicating with users, depending on the specific location of the survey clerk. The shoreline near the lake access may present numerous opportunities for landing a boat; these may be easily migrated by water, but are likely much slower by land so it may be challenging for the surveyor to speak directly with individuals utilizing boat access. Collecting User Surveys from a broader range of locations would provide more complete information. FTC suggests adding User Survey locations at Sassafras Mountain Trail Access, the Upper Whitewater Falls Access,

the NC 281 (gravel) access, as well as at campgrounds and during alternate hours (see Comment 3 for additional details.)

The PSP proposes that User Surveys will be collected during a four-hour shift. However, a four-hour timeframe is far too narrow to capture full Trail usage. When beginning a hike, backpackers may arrive at the access location early to allow time to reach camp before the sunset. When ending a hike, backpackers may arrive at access locations later, after hiking a full day. And during a multi-day hiking trip, backpackers may pass through access areas at any time of day. Regardless of the timing of a four-hour shift, surveys are unlikely to capture many backpackers. However, these individuals are also the best source of information regarding needs and conditions of the Trail and appurtenances.

Comment 3 discusses details of alternative options for expanding backpacker responses by allowing them to self-report at campsites, allowing them to return the survey form after completing their trip, or adding trail registers at access locations, bridges, and/or campsites. These features could provide low-cost, efficient opportunities to expand data collection, while improving safety of all Trail users.

Suggestions revisions to the data collection form include, but are not limited to:

1. #1 Add space for country of residence as well as county and state
2. #2 Revise to "How many people are in your group today?" Backpackers may not access a vehicle for many days.
3. #7 Add "backpacking", "birding", and "wildflower viewing" as additional types of uses.
4. #8 Remove "today" as too limiting for multi-day backpacking use.
5. #9: Revise to expand beyond the "facilities at this access area" – much of the Trail infrastructure is not "at" the access area – for example, there are very few bridges or campsites adjoining access areas, so the question may limit information gleaned. Also, consider revising rankings to include Unavailable (e.g., the user may have wanted that amenity but it was not provided) and Not Applicable (e.g., the user was not interested in use of this amenity)
6. #10: Expand question by adding wording "List any specific improvements you would like to see for the Foothills Trail or parking access areas, and any other comments or suggestions."
7. While turnover rate is discussed, the survey lacks a question about length of stay. Add question regarding length of stay.
8. The survey does not include experiential questions that evaluate if the Trail provided the experience the user was seeking. For example, if a user is seeking solitude, how many people are acceptable to encounter and how many people did the user encounter. If the user is seeking a wilderness-type experience, how much noise or visible non-trail infrastructure (e.g., power lines, roads) is tolerable to still obtain that experience, and how much of that disturbance was encountered.

<u>COMMENT 7:</u> The site inventory proposed in Section 6.1.1 needs to be comprehensive, including all man-made infrastructure provided as a requirement of the Original License including, at a minimum, along the 43 miles of main trail, 8 access points, and the 4 spur trails. Additionally, evaluation metrics must have clearly defined criteria to ensure consistency of information.

Having overseen construction and maintenance of these sections, Duke Energy should have access to relevant records and all details requested. The inventory should include all infrastructure that may require future maintenance, replacement, or enhancement; these include, but are not limited to: bridges, regardless of size or engineering; signs and signposts; constructed steps and handrails; kiosks; parking areas and adjoining facilities; campsites, including features such as bear cables; etc.

Requested information regarding Duke's 43-mile section includes, but is not limited to:

- Summary of recreation-related requirements from the Original License and actions taken to meet those requirements, including specific measurables.
- Status and durability of trail-related agreements with landowners.
- Copies of all trail-related legal agreements (lease agreements, etc.).
- Comprehensive inventory for all structures (e.g., parking lots, bridges, stairs, campsites), including, but not limited to structure name, structure material, year constructed, cost of installation, special considerations for construction (e.g., helicopter used for material delivery), expected lifespan, assessment of current condition, and maintenance records (including costs).
- Current conditions, such as "trail tread" and "corridor condition", must have clearly defined and useful metrics, not just an arbitrary scale with no explanation. Best practices for recreation studies typically include a narrative description of what evaluators are basing their judgement on, otherwise the results will be subjective and unrepeatable.
- Additional standard metrics should be added to better evaluate trail conditions, for example assessing trail incision and noting the existence of parallel or unauthorized paths (e.g., people are stepping off the trail or trying to take short cuts).
- Associated costs, including past land/easement procurement, trail and infrastructure construction, and trail and infrastructure repairs and maintenance.
- Schedule of anticipated maintenance needs and costs.
- Potential need for acquisition of land and/or easements to ensure existence of Trail corridor in perpetuity for future generations, including projected costs.
- Detailed map(s) of Duke's 43-mile Trail section should be added that includes, at a minimum, the following information: parcel boundaries, current property owner(s), access locations (from water and land), spur trails, land use, structures (e.g., parking lots, bridges, stairs, campsites), streams/wetlands, areas of concern (e.g., erosion, overused parking/campsites), and points of interest.
- The history of compliance, including inspection reports should be included. For example, in 2000, FERC conducted an Environmental and Public Use Inspection (EPUI), which covered 24 miles of trail and identified a range of maintenance deficiencies that included trees across the trail, footbridges in need of repair, smaller bridges that had been washed out, loose handrails, missing footing steps, soil erosion, etc.

- Erosion throughout the trail corridor is a serious concern. Within the last six years, the Trail has experienced several landslides that required rebuilding portions of the Trail. Records of erosion-related problems, best management practices (BMPs), maintenance, and repairs should be included.
- The study should include an assessment of drainage issues along the Trail, spur trails, and in campsites.

COMMENT 8: The Recreation Site Inventory Form included in Appendix 7, Attachment 1 should be revised to capture appropriate and comprehensive information for this long-distance backpacking trail. Suggestions include, but are not limited to:

1. Site Address – revise to Trail Mile
2. Road Access – include name of and distance to nearest paved and unpaved road access as well as boat access.
3. Parking (# of spaces): this is only applicable to Trail access locations/parking lots.
4. Shoreline Access Condition: this is only applicable to boat access locations. An additional question should be added to evaluate "Trail Conditions".
5. Camping: all locations have "primitive" sites only. More appropriate information would include: # tents that can be accommodated (remember, there are not tent pads that direct users to specific locations); add # of and height of bear cable(s); # primitive latrines; indicate problematic vegetation within campsites (e.g., there are several campsites with poison ivy or stinging nettle encroaching into middle of campsite areas. FTC understands it's not reasonable to eradicate these plants, but regular removal from normal travel areas should occur.
6. Remove Operations since all campsites are unmanned, year-round, and do not have fees.
7. Add criteria for non-campsite infrastructure.
8. Add question for listing observable recreation impacts and issues. For example, the current form may capture if trash cans are available, but not if they are in need of repair or maintenance.

COMMENT 9: The Original Project License's Exhibit R (August, 1980) called for certain amenities such as parking, toilet areas, etc. and these amenities should have been built and providing benefits for decades. Discrepancies from Exhibit R should be listed and an explanation provided for the deficiency.

The missing amenities may have been intended to help protect the natural areas, waters, lands and visual features of The Trail, the Blue Wall lands and the surrounding Blue Ridge Escarpment. For example, Exhibit R (page 53) indicates that a "single latrine building constructed over a percolating pit according to applicable health regulations will be provided near each camp area." However, no such facilities exist near camp locations. Instead, thousands of hand-dug individual pit "toilets" have been created in and around the existing camping areas. The impact of continuing these current unsafe and unsanitary practices may be degrading water quality of nearby streams throughout the Blue Ridge Escarpment and impacting Lakes Jocassee and Keowee.

Additional amenities and enhancements should be provided to mitigate for Duke not meeting those commitments within a reasonable timeframe. This should include additional camping areas, sanitary and appropriate toilets, and additional features to enhance the health, safety, and enjoyment of Trail users.

<u>COMMENT 10:</u> Copies of legal documents should be provided and complete information should be presented clearly, accurately, and consistently throughout text and figures.

A. Copies of all MOU and legal documents related to the Trail, access, and/or appurtenances should be provided to the stakeholders to provide transparency.
B. A copy of the *1996 Duke Power Company Lake Management Foothills Trail Maintenance Program Policy and Procedures*, which is referenced in Appendix 7, Section 3 should be provided to FERC and stakeholders.
C. The Study Area described in Appendix 7, Section 3 should specifically include all Project lands and waters that are utilized for access to or use of the Trail, in addition to the non-Project lands and waters. For example, visitors currently utilize Bad Creek Road to access the popular Bad Creek Access parking lot, including kiosk and two (2) portable toilets (aka port-a-potties). These areas must be included in the Study Area, should be labeled on all relevant maps, and any impacts or potential temporary (five-year) closures during construction should be evaluated**.**
D. Figure 3-2 includes some inaccuracies: the Bad Creek Hydro Project Trail Access is labeled with the "Spur Trail" icon but should also include the "Trail Access" icon as it is a popular location for parking and accessing the main Trail. Trail features that appear on the map should be labeled, whether or not they are provided by Duke. For example, the Upper Whitewater Falls Trail Access is missing and should be added. Musterground Road access is not shown – details about forest road access, including general schedule, should be included. The current wording for boat access locations may create confusion; by saying "Boat Access Only" it may incorrectly convey that the location is only accessible by boat when, in fact, these locations are accessible by foot (by hiking the main Trail) as well. We suggest revising these to "Boat Access to Trail" and "Boat Access to Spur Trailhead".
E. Figure 3-3 should include labels for the Lower Whitewater Falls Spur Trail, the Bad Creek Hydro Project parking area, and the Bad Creek Spur Trail should be indicated in yellow and labeled. Additionally, Musterground Road should be shown and labeled.
F. Appendix 7, Section 4 states that "no facilities other than the small segment of trail are located within the existing Project Boundary. However, Figure 3-3 appears to show at least a portion of Bad Creek Road, the Bad Creek Hydro Project Trail Access (parking lot), and the entrance to Musterground Road, each located at least partially within the Project Area. A more detailed figure should be provided that clearly shows each of these features, accurate and complete labels, and the location of the proposed Project Boundary.
G. Throughout the Recreation PSP, references are made to spur trails – sometimes referred to as 3 miles and others as 4 trails. A list of spur trails, including mileage, and a map showing locations should be included to clarify and support clear communication.

COMMENT 11: Rather than just evaluate current use, Section 6.1.6 must provide consideration of future needs for expanded, enhanced, or modified recreation resources to serve the regional population. Given the important and pristine habitats throughout the Trail corridor, it is especially important to consider the carrying capacity of the current recreation resources and evaluate if expanded options are needed to provide adequate recreation opportunities while avoiding ecological damage. These results should be used to inform collaborative decisions with the Recreational Resource Committee to update the Recreational Management Plan.

The results of this study should be utilized by Duke, qualified consultants, and the Recreation Resource Committee as the basis for (1) determining whether current use and/or projected future demand for public recreation at Project-related recreation facilities warrants consideration of possible enhancement measures during the term of the New License; (2) developing an update to the RMP for any proposed recreation facility enhancements or new construction; and (3) additional recreation requirements necessary to provide PM&E for the proposed Expansion of this facility.

In the current draft, Duke states that "Information collected during the RUN Study ***could*** [emphasis added] be used to develop an updated Recreation Management Plan…" FTC asserts that Duke ***should*** use the knowledge gained from this study and, furthermore, that updates to the RMP must be done in collaboration with the Recreation Resource Committee. Additionally, Duke should host a public meeting to allow all interested individuals, including those unable to fully participate in the stakeholder meetings, to provide input regarding the study results and proposed future plans.

As built, there are extremely limited options for hiking the Duke section of Trail. The addition of access locations, spur trails, and building connecting trails to nearby trail systems would significantly expand single and multi-day options for use For example, the original Project application included a spur trail to Lake Toxaway and to Panthertown Valley. It was never constructed. This spur trail would provide important connections and should be built. Additional spur trails to vehicle access locations in NC's Gorges State Park should be added or improved in order to allow more options for users to experience the interior segments of these spectacular areas.

Additional enhancements should be considered to ensure continued safety of Trail users and wildlife. With expanding development, shrinking bear habitat, and more people on our trails, it's no surprise that bear encounters are increasing in our area.[5] Backpackers are often the most vulnerable to dangerous bear encounters. Properly hanging a food bag is an art (especially after a long day of hiking), and black bears are becoming increasingly skilled at gaining access to food bags. Food-conditioned bears are often bolder with human encounters, sometimes becoming aggressive, and often leading to the bear being euthanized. (See https://www.usatoday.com/story/news/nation/2022/06/14/bear-euthanized-scratching-woman-child-national-park/7626099001/)

Some campsites throughout the Trail feature metal "bear bag cables", installed by FTC, for simplifying hanging food bags. These are a welcome and much appreciated addition; however,

[5] https://www.outsideonline.com/outdoor-adventure/environment/bears-north-carolina-encounters/

the combination of multiple people's food weight can make the cables fairly ineffective – with reports of the food bags hanging nearly at a human's eye level, which is likely accessible to many bears. Some National Parks and long-distance trails in bear territory provide bear proof lockers at designated campsites to simplify proper food storage and enhance safety for humans and bears. This option should be considered for campsites throughout the Trail as a preventive safety measure.

COMMENT 12: This Project is both (1) a license renewal including a 30-40 year extension for the existing Bad Creek Pumped Storage Facility, and (2) a new and second Pumped Storage Project which will practically double the power production of the Bad Creek Project. Impacts of the potential construction of the Complex II must be fully evaluated and additional mitigation should be provided both for the significantly increased capacity as well as for the construction impacts that may last up to five (5) years and cause significant disruption to use of popular recreation features.

These two distinct proposals clearly justify expanded recreational studies and increased PM&E for recreation needs – including additional features and increased and protected acreage; and most importantly, the permanent protection of the Trail, the Trail corridor and the related lands, streams and vistas along the Blue Ridge Escarpment.

Evaluating the potential expansion of the Trail corridor width is of particular importance to maintain the current nearly-wilderness user experience. Currently, Duke's large parcels of undeveloped land are providing buffer from human encroachment, as well as critical habitat that supports the resiliency of wildlife and birds, which are a valuable part of the Trail experience. If surrounding lands are developed, the Trail corridor could provide the only connection between critical habitats. Considering the anticipated acceleration of species migration due to climate change, the Trail corridor could become vital to supporting genetic diversity - or even the survival of - some wildlife and bird species. The USDA's *Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways Manual* (2008)[6] recommends minimum widths for corridors to support various species – invertebrates can utilize the narrowest corridors (100-200 feet) and large predator mammals need the largest corridors (330 feet to ≥3 miles). The Manual also notes that as "the length of the corridor increases, so should the width." Consideration must be given to the increased importance of the Trail corridor should the surrounding land develop within the next 50 years. The Recreation Study should fully evaluate the necessary width to maintain or enhance the current Trail experience, including existence of large predator mammals and birds.

A. Appendix 7, Section 3 indicates that "the study will also include an evaluation of recreation use in Whitewater Cove that may be temporarily affected if the Bad Creek II Complex is constructed." All impacts to recreation by the construction, including access to Bad Creek Road, the Bad Creek Hydro Project Trail Access (parking lot), the Bad Creek Spur Trail, and use of Musterground Road should be fully evaluated. If the Bad Creek II Complex is constructed, additional mitigation should be provided both for the significantly increased capacity as well as for the construction impacts that may last up

[6] https://www.csu.edu/cerc/researchreports/documents/ConservationBuffersDesignGuidelinesForBuffersCorridorsGreenways2008B.pdf

to five years and cause significant disruption to use of this popular parking lot, Trail access, and spur trail.

B. The Whitewater River Cove Recreational Public Safety Evaluation, outlined in Appendix 7.6.4, should also evaluate potential impacts of the Bad Creek II Complex, including during construction, on fishing throughout the impacted area. This should include both temporary and permanent impacts due to changes in flows, water quality, or habitat that may have impacts on fish health, populations, or behaviors.

C. Appendix 7, Section 4 conveys that potential closure of the Bad Creek Hydro Project Trail Access parking area would not impact Trail access without actual evaluation of these potential impacts. At best, it's premature to make this statement without data from the study. Additionally, as the most secure parking area, it is quite popular and provides important access to the Trail. Alternate parking areas may consist of a gravel lot on the side of a remote highway, where vandalism and theft are common. For example, in May 2022 at a similar nearby gravel access lot, a couple's vehicle was heavily vandalized – with multiple broken windows and a hole drilled into the gas tank.[7] Additionally, the next access point is 2.3 miles to the west and has an estimated 1,000 feet elevation change, adding an estimated 2.5 hours of "Strenuous" hiking. For those hiking a portion of the Trail, this may significantly impact trip plans and limit opportunities, especially for those relying on this access to make the "middle" section of the Trail more accessible. At a minimum, all potential impacts must be evaluated during the study to understand the severity and to inform decisions regarding mitigation requirements.

All short-term, long-term, and permanent impacts of the potential construction of the Bad Creek II Complex should be fully evaluated.

COMMENT 13: FTC should be given an opportunity to be represented during the conditions assessment. Our valuable in-depth knowledge and unique insight regarding Trail and infrastructure concerns will enhance these evaluations.

A 43-mile segment of the Foothills Trail is maintained by Duke Energy and Duke's private contractors, with coordination and assistance from the Foothills Trail Conservancy. However, FTC has remained primarily responsible for major and minor maintenance for the remaining 50-plus miles of the Trail network, including spur trails, built separately from requirements of the Original License. Duke has verbally indicated the desire to transition maintenance throughout Duke's 43-mile section of the Trail to FTC. As such, it is particularly relevant for FTC representatives to participate in the conditions assessment to better understand the extent of current conditions and anticipated maintenance, including site specific challenges associated with infrastructure projects located in this Trail section with extremely limited vehicular access.

The Foothills Tail Conservancy welcomes the opportunity to negotiate with Duke Energy any maintenance arrangements which will provide long-term continuance of the quality of the Foothills Trail, trail corridor and infrastructure.

[7] See WYFF: Thieves, vandals strike Foothills Trail parking lot, leaving hikers stranded, woman says 5/30/22

UPSTATE FOREVER

Protecting Land & Water | Advocacy | Balanced Growth

ELECTRONICALLY FILED

November 3, 2022

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Alan Stuart
Duke Energy Carolina, LLC
Mail Code EC012Q
526 Church Street
Charlotte, NC 28202

Re: **Bad Creek Pumped Storage Project (FERC No. 2740-053)**
Comments on Proposed Study Plan

Dear Secretary Bose and Mr. Stuart:

Upstate Forever is a nonprofit organization working on conservation, water quality, and sustainable development issues in the Upstate region of South Carolina. Our mission is to protect critical lands, waters, and the unique character of the Upstate of South Carolina, including the Upper Savannah Watershed where many of our members live, work, and recreate. Over the past two decades, we have worked to protect the natural assets that make the Upstate special, such as our farmlands, forests, natural areas, rivers, and clean air.

On February 23, 2002, Duke Energy ("Duke") filed a Notice of Intent and Pre-Application Document ("PAD") for its Bad Creek Pumped Storage Project (FERC No. 2740, "Project"). As part of the integrated licensing process ("ILP"), Duke held a meeting on September 7, 2002, which included a presentation of the six proposed studies in the Proposed Study Plan ("PSP") along with discussion among stakeholders, Duke Energy staff, and FERC staff. Upstate Forever has participated in the stakeholder process for the relicensing of the Bad Creek Project ("Project") since Duke Energy filed a Notice of Intent and Pre-Application document on February 23, 2002,

including most of the Resource Teams. The existing FERC license for the Project expires on July 31, 2027.

We are pleased to participate as a stakeholder for the relicensing of the Bad Creek Pumped Storage Facility. Our primary interests in this Project are related to water quality and quantity, fish and wildlife habitat, recreation resources and opportunities, and land conservation. We look forward to working with Duke Energy and other stakeholders to ensure that the new license provides for the protection, restoration, and mitigation of the natural resources within the Upper Savannah Watershed for the duration of the next license term and more. We have completed a review of the Proposed Study Plan and are pleased to offer the following comments.

Sincerely,

Chris Starker
Land Conservation Manager

WATER RESOURCES STUDY PLAN

Appendix C of the PSP describes the proposed Water Resources Study Plan, which states that there are no anticipated adverse effects to water resources or water quality due to existing operations, but that the only anticipated adverse effects would be the result of the construction of Complex II. Upstate Forever still questions the legitimacy of this statement considering that no historic water quality data has been collected for the upper reservoir and associated tributaries.

Section 6.3.7 of the PAD provided a summary of existing water quality data collected for waters within the Project Boundary and vicinity but is limited to only the upper reservoir and lower reservoir. No water quality data is included for Bad Creek or West Bad Creek, which are tributaries of the Bad Creek reservoir, Howard Creek, which receives seepage flows from the Main Dam and West Dam, or Whitewater River, which is the receiving water from daily Project operations (as well as the location of a submerged weir designed to minimize the effects of Project operations on lake stratification, protect cold-water fish habitat, and dissipate energy from discharged water). In addition, neither the upper reservoir nor its tributaries have historically been monitored for water quality, which is an erroneous oversight providing no baseline water quality data for waters in the Project vicinity.

According to the current implementation of the Waters of the US (WOTUS), Pre-2015 Regulatory Definition and Practice, the Bad Creek Reservoir is included under WOTUS and Waters of the State (WoS) protections because it was formed by the impoundment of two free-flowing rivers or streams, Bad Creek and West Bad Creek, and as such regulatory designations do apply. More information is needed for these Project-related water resources to better understand its impact on existing watershed health. Please provide a rationale for excluding these significant water resources and include measures for updating and collecting water quality data in the Revised Study Plan ("RSP").

To assess the potential impacts to water resources and water quality resulting from the construction and operation of Complex II, this Study plans to use "existing data" but does not provide any details on the which data sources will be used for this analysis, such as SCDHEC, USGS, SCDNR, or data collected by Duke. Please clarify in the RSP the data sources and how they are relevant to the Study.

In addition, the Study neglects to assess the impacts of the current project independently related to climate change. Increases or decreases in precipitation could have noticeable impacts on lake levels and therefore operation of the current facility and downstream facilities. SC has seen a dramatic increase in the frequency and intensity of extreme weather events over the past several decades, including flooding and drought. This

Study should attempt to assess climate-related impacts to water resources and project operations.

Further, Duke's current proposed study area focuses only on the Whitewater River Cove. Additional modeling beyond the length of the Cove should be evaluated to determine the extent of increased flow velocities, vertical mixing, and water quality impacts associated with the operations of Bad Creek II on Lake Jocassee, including but not limited to shoreline erosion.

Upstate Forever supports the requested assessment for the evaluation of the potential impacts on discharges to Lake Keowee with the operation of Bad Creek II to ensure that the construction of the Bad Creek II complex does not adversely impact lake levels in Lake Keowee. We also support plans to collect continuous temperature data and periodic (bi-weekly) Dissolved Oxygen (DO) measurements from three historic locations in the Whitewater River Arm in 2023 and 2024. The continuous monitoring of these water quality parameters under these conditions (two-unit operation and four upgraded units) and at the proposed locations as this data will help inform the need for future water sampling and modeling.

Upstate Forever continues to have concerns regarding the impacts of spoil materials and upland fill resulting from the proposed construction of Bad Creek Complex II ("Complex II"). The PAD estimated that approximately 4 million cubic yards of spoil material will need to be disposed because of construction, including dredging, filling, clearing, and de-watering. During the September 7 meeting ("Meeting"), Duke clarified that of the eight (8) potential sites identified for placement of upland spoils, not all would be utilized, and that the selected locations would avoid sensitive streams. Upstate Forever continues to stress that impacts to water resources resulting from construction should be avoided regardless of stream conditions, and that to minimize impacts Duke should consider alternatives such as removing the spoils to another location entirely for proper disposal. The Clean Water Act requires consideration for avoiding and minimizing impacts before a Section 404 permit can be obtained for placing fill in waters of the US, and before a water quality certification can be awarded by the State. Due to the sheer magnitude of these spoils, off-site material disposal for the excavated materials should be the only consideration to avoid impacting streams and wetlands in the project area unless such disposal methods can be justified.

AQUATIC RESOURCES STUDY PLAN

Appendix D of the PSP describes the proposed Aquatic Resources Study Plan. During the Meeting hosted by Duke Energy on September 7, the SC Department of Natural Resources ("DNR") commented on the size and swim speeds of target species used to model the estimated mortality for impingement and entrainment in the Desktop Entrainment Study ("DES") included in the Pre-Application Document ("PAD"). Specifically, DNR voiced concerns

that surrogate fish species used in the DES misrepresent existing species and provides erroneous results. We agree with DNR that the DES should be updated using appropriate input data that will provide more reliable results.

VISUAL RESOURCES STUDY PLAN

Appendix E of the PSP describes the proposed Visual Resources Study Plan, which primarily concerns the visibility of the Project and its potential impact on the quality of recreation experiences on Project related resources such as Lake Jocassee. However, other factors such as lighting standards at the Project can affect resources besides recreation, including but not limited to bird migration, aquatic species behavior, and noise pollution. At the Meeting on September 7, it was noted that lighting at the Project could attract some fish species and thereby influence impingement and entrainment. Upstate Forever recommends that Duke update this Study to assess visual impacts due to lighting on other resources based on International Dark Sky standards. Further, we also recommend that Duke Energy consider seeking the highest designation through the International Dark Sky Places conservation program for the Project and the surrounding lands, which are also owned by Duke Energy. Such a designation would be the first and only such designation in SC and likely the first landscape-scale project achieved by a utility that addresses light pollution, and would provide benefits to wildlife and ecosystems, recreation, and human health.

RECREATIONAL RESOURCES STUDY PLAN

Appendix F of the PSP describes the proposed Recreational Resources Study Plan, which includes four (4) main components:

1. A Recreation Use and Needs (RUN) Study for the 43-mile-long portion of the Foothills Trail managed by Duke Energy;
2. A Conditions Assessment of the 43-mile-long portion of the Foothills Trail managed by Duke Energy;
3. An Existing Recreational Use Characterization of Whitewater River cove; and
4. A Recreational Public Safety Evaluation of Whitewater River cove.

Due to the exclusionary nature of the Bad Creek Pumped Storage Facility, and because there is no recreational access to the Bad Creek reservoir, there is considerable emphasis on off-project recreation opportunities well outside the Project area. The Recreational component (Exhibit R) of the original license was provided through the creation and management of a 43-mile central section of the Foothills Trail ("Trail"). Exhibit R included public access and parking,

trail kiosks and directional signs, additional spur trails, and stream crossings as well as continual maintenance and operational activities for limited recreation uses, primarily hiking. This Study should include an audit of all facilities and infrastructure provided as a requirement of Exhibit R of the original license.

The Foothills Trail system provides important recreational and educational opportunities to both Upstate residents and visitors from around the world. Upstate Forever readily acknowledges the unique opportunity the Foothills Trails offers and appreciates Duke Energy's long-term dedication to the continued management and maintenance of the Trail. However, we are concerned that the Recreational Resources Study will not adequately capture the current conditions of the Trail, its ability to provide high-quality recreation experiences, or its capacity to meet the escalating rate of demand. The Upstate is experiencing unprecedented and accelerating population growth and is expected to grow rapidly for decades to come. Already our natural resources are stretched thin, and the recent pandemic has revealed how fragile and overburdened our public recreation areas have become. And yet the continued growth in development, strain on resources, and demand for recreation areas indicates that ensuring that recreation opportunities centered on the Foothills Trail continue to provide quality recreation opportunities in perpetuity and that the Foothills Trail can continue to grow to meet additional demand should be paramount in this licensing.

Visitation to public spaces saw an unprecedented spike during the recent pandemic, particularly in the Upstate. The demand for outdoor recreation areas surrounding the Bad Creek Project is no exception. Upstate Forever is concerned that the proposed methods of the RUN Study will fall short of accurately accounting for the demand and expectations of visitors to the area. We believe the Recreation Use Survey captures only limited information and its design appears outdated. Specifically, the survey instrument assumes visitors are from nearby counties and states and discounts the notion that some visitors travel here from other countries. Furthermore, the specific question related to visitors' primary reasons for visiting are in an awkward order that may lead to unintended responses (e.g., what's the difference between "boating" and "canoeing/kayaking" and why are they not listed together?). In general, the instrument will only measure what is asked and does not encourage responses that may be unique to the recreation experience such as trail conditions, campsite conditions, and general feelings of security and well-being, among other things.

Continued support of the Foothills Trail is a critical component of the New License and expansion of the recreation provisions should be considered to account for the population growth, increased demand for outdoor recreational needs, and expansion of project operations from the ongoing upgrades. More importantly, continued use of natural resources for energy production limits the ability of South Carolina residents to enjoy a large portion of the Upstate's amazing beauty, and Duke Energy must earnestly evaluate the potential for expanding

opportunities to its lands surrounding the Project. A meaningful and intentional Recreational Resource Study should include consideration for some or all of the following:

1. An endowment provided to the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system;
2. Fee-simple donations of land to be included in the Foothills Trail system, or to State resource agencies for various purposes, including recreation, habitat management, and water quality protection;
3. Conservation easements on lands owned by Duke Energy, which would protect the Foothills Trail corridor, or allows for other recreation opportunities (a conservation easement would limit specific land development practices but would allow for recreation uses and facilities, and would reserve rights to Project related activities), including the 6,700-ac tract surrounding the Project;
4. Expand the Foothills Trail system to connect with other trail systems, including the Palmetto Trail at Stumphouse Tunnel, the Panthertown trail system, the Tuskaseegee, the Art Loeb Trail, and the Appalachian Trail;
5. Designation through the International Dark Sky Places conservation program for the Project and the surrounding lands, creating the first of its kind in the State and expanding on the world-class distinction; and
6. Providing a financial contribution to the Oconee County Conservation Bank, which would then be used to protect additional lands in the County near the Project boundary.

Furthermore, government agencies mandated with multiple directives can attest that the quality of any recreation experience is directly related to the quality of its related resources, including habitat and fisheries. For example, hunters and anglers depend entirely on high-quality habitat and water resources to provide viable game. The same is true for recreation activities like hiking, backpacking, birdwatching, wildflower viewing, and other passive recreation uses. Poor land and water management leads to poor recreation experiences. Therefore, it is just as important for Duke Energy to develop a land management plan that supports the recreation activities as it is to develop a recreation management plan that supports the natural resources. We believe this Study should include an evaluation of habitat quality and, similarly, a determination of the existing carrying capacity and an estimation of future carrying capacity that minimizes impacts to recreation resources, thereby maximizing benefits to both users and existing species.

Parallel to this notion, this Study should include an analysis of current project construction, operation, and maintenance activities on ecological communities and rare,

threatened, and endangered species, as well as its effects on *potential* habitats. Furthermore, we believe this should be expanded to include the effects of non-native, invasive, and noxious species on ecological communities and potential habitat areas as well. Habitat and corridor protection is one of the most critical needs for the protection and preservation of species. Like the multi-pronged approach to studying the recreational needs of the Project – and to support both recreation and habitat provisions – Duke Energy should examine past habitat availability, current habitat availability, and determine trends for habitat loss or creation through the term of the new license based on the identified trends. This information can then be used to identify target values for habitat protection and restoration in and near the Project. Lastly, the impacts of climate change should also be evaluated and discussed. Wildlife habitat corridors may be necessary for species migration due to climate change and should be of particular interest throughout the life of the proposed new license.

WATER STRATEGY AND HYDRO LICENSING

Duke Energy Corporation
Regulated and Renewable Energy
526 South Church Street / EC12Q
Charlotte, NC 28202

December 5, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Filing of Revised Study Plan for Relicensing Studies

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11, on August 5, 2022, Duke Energy filed the Proposed Study Plan (PSP) describing the studies that the Licensee is proposing to conduct in support of relicensing the Project. The PSP provided a summary of consultation under the ILP since the filing of the PAD on February 23, 2022 and Duke Energy's responses to comments and study requests from FERC staff and stakeholders. Duke Energy is herein filing the Revised Study Plan (RSP) for the Project. The purpose of the RSP is to present the studies proposed by Duke Energy and to address, as appropriate, the comments and study requests submitted by resource agencies and other stakeholders. The RSP also provides FERC, regulatory agencies, Indian Tribes, and other stakeholders with the methodology and details of Duke Energy's proposed studies. Pursuant to the ILP, the Commission will issue a final Study Plan Determination within 30 days of the deadline for filing this RSP (i.e., by January 4, 2023).

Revised Study Plan

Since the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022 for the stakeholder Resource Committees that Duke Energy has voluntarily convened as part of the relicensing process. Duke Energy also held a combination in-person and virtual PSP meeting in Greenville, SC (and Microsoft Teams) on September 7, 2022. A summary of the PSP meeting was

prepared by Duke Energy and filed with FERC and the Project mailing list comments on October 19, 2022. Comments on the PSP were due 90 days from filing, therefore, the commenting period closed on November 5th. Comments on the PSP were considered in the development of the RSP. Duke Energy also held a virtual meeting with Resource Committee members on November 17, 2022 to review and discuss the comments received. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

Duke Energy has evaluated the study requests and comments submitted by the Commission and stakeholders, with a focus on the requests that specifically addressed the seven criteria set forth in §5.9(b) of the Commission's ILP regulations, as discussed above. Based on Duke Energy's review of the requested study and comments, FERC criteria for study requests under the ILP, and available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), in the RSP, as in the PSP, Duke Energy is proposing a total of six resource studies. These six studies consider stakeholder comments for relicensing of the existing Project as well as studies proposed by Duke Energy in the PAD for the potential construction of the Bad Creek II Complex:

1. Water Resources Study;
2. Aquatic Resources Study;
3. Visual Resources Study;
4. Recreational Resources Study;
5. Cultural Resources Study; and
6. Environmental Justice Study.

Duke Energy is filing the RSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the RSP electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2] If any party would like to request a CD containing a copy of the RSP, please contact the undersigned at the address listed below. Note that Critical Unclassified Information [CUI] pertaining to locations of protected archeological sites is being filed separately.

Comments on the RSP must be filed within 15 days of the deadline for filing this RSP, which is no later than December 20, 2022. Any proposed modifications to the RSP must address the Commission's seven ILP study criteria as presented in 18 CFR §5.9(b).

Response to Additional Information Requests

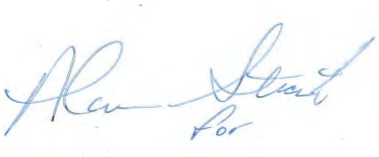
By letter to Duke Energy dated November 3, 2022, FERC staff submitted supplemental comments and requested additional clarification and/or information. Duke Energy has addressed all of the Commission's most recent Additional Information Requests in the enclosed RSP (Section 4).

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are any questions regarding this filing, please contact Alan

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://badcreekpumpedstorage.com

Stuart, Senior Project Manager, Water Strategy & Hydro Licensing at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy & Hydro Licensing
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Alan Stuart, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Rachel McNamara
Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Herb Nadler
Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

Keith Bluecloud
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Jamie Higgins
NEPA Policy Office
U.S. Environmental Protection Agency, Region IV, Atlanta Federal Center
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Tom Rice
U.S. House of Representatives (CD7)
325 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Burr
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

Office of Senator Graham
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Chris Whitmire
North Carolina House of Representatives
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Goudreau
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina
Office
P.O. Box 11649
Columbia, SC 29211-1649

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
Mayor
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Joe Moore
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

David Owens
City of Pickens, SC
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

David Bereskin
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Tyler Howe
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Gerritt Jobsis
Associate Director of Conservation
American Rivers
gjobsis@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Subject: FW: P-2740 Bad Creek Pumped Storage Project: Relicensing Filing (Revised Study Plan)
Attachments: Bad Creek_FERC 2740_RSP Transmittal_Dec.5.2022.pdf; Bad Creek Relicensing Distribution List.vcf

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Monday, December 5, 2022 7:29 PM
To: Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; amedeemd@dhec.sc.gov; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Baker, Lisa - United Keetoowah Band of Cherokee Indians <ukbthpo-larue@yahoo.com>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bereskin, David - Greenville Water <bereskind@greenvillewater.com>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bluecloud, Keith - USBIA ERO <keith.bluecloud@bia.gov>; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; rhalfacre@cityofclemson.org; nhinkle@cityofclemson.org; Dustin Wilson <Dustin.Wilson@ferc.gov>; Gerry Yantis <gcyantis2@gmail.com>; Jake Dalton <jake.dalton@transylvaniacounty.org>; Ken Gish <Ken.Gish@klgates.com>; Scott Willett <swillett@arjwater.com>; Sarah Salazar <Sarah.Salazar@ferc.gov>; Shepherd, Forest T <Forest.Shepherd@ncdenr.gov>; Smith, Heather Shirley <Heather.Smith@duke-energy.com>; Hipp, Dawn <dhipp@ors.sc.gov>; Sandonato, Anthony <asandonato@ors.sc.gov>; Gordon, Jeffrey <JGordon@ors.sc.gov>; Salter, Findlay <FSalter@ors.sc.gov>; Seaman-Huynh, Michael <mseamanhuynh@ors.sc.gov>; Murphy, Melissa Chandler <Melissa.Murphy@duke-energy.com>; Smith, Ben <Ben.Smith@duke-energy.com>; Peoples, Danielle <Danielle.Peoples@duke-energy.com>; Jeff Caldwell <jcaldwell@arjwater.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Higgins, Jamie - USEPA <higgins.jamie@epa.gov>; hightocw@dhec.sc.gov; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; emccombs@americanrivers.org; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Moore, Joe - City of Brevard NC <joe.moore@cityofbrevard.com>; n, herb - sepa.doe <herbn@sepa.doe.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Owens, David - City of Pickens, SC <dowens@pickenscity.com>; growens@gmail.com; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken -

Pickens County <kenr@co.pickens.sc.us>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Whitmire, Chris - NC House of Representatives <Chris.Whitmire@ncleg.net>; Dale Wilde <dwilde@keoweefolks.org>; suewilliams130@gmail.com; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; cloningerp@dnr.sc.gov; Tom Daniel <danielt@dnr.sc.gov>; mixong@dnr.sc.gov; Alex Pellett <PellettC@dnr.sc.gov>; RankinD@dnr.sc.gov; Amy Breedlove <BreedloveA@dnr.sc.gov>; Ross Self <SelfR@dnr.sc.gov>; quattrol@dnr.sc.gov; William T. Wood <woodw@dnr.sc.gov>; kernm@dnr.sc.gov; Scott Harder <harders@dnr.sc.gov>; More, Priyanka <morep@dnr.sc.gov>; Ken Forrester <forresterk@dnr.sc.gov>; Austen Attaway <attawaya@dnr.sc.gov>; bradleyk@dnr.sc.gov; Andrew Grosse <grossea@dnr.sc.gov>; Jennifer Kindel <kindelj@dnr.sc.gov>; simmonsw@dnr.sc.gov; Samantha Tessel <Tessels@dnr.sc.gov>; Christopher Moore <moorec@dnr.sc.gov>; taylors@dnr.sc.gov; caitlin.rogers <caitlin.rogers@catawba.com>; ejohnson@scdah.sc.gov; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Abney, Michael A <Michael.Abney@duke-energy.com>; Bennett, Jennifer Wright <Jennifer.Bennett@duke-energy.com>; Raber, Maverick James <Maverick.Raber@duke-energy.com>; Wahl, Nick <Nick.Wahl@duke-energy.com>; Churchill, Christy <Christy.Churchill@duke-energy.com>; Keener, Paul <Paul.Keener@duke-energy.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Settevendemio, Erin <Erin.Settevendemio@hdrinc.com>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>; Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>; Green, William G <Bill.Green@terracon.com>; Benjamin.Williamson <Benjamin.Williamson@duke-energy.com>; Santos, Sarah Anna <Sarah.Santos@duke-energy.com>; jphillips@greenvillewater.com
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: P-2740 Bad Creek Pumped Storage Project: Relicensing Filing (Revised Study Plan)

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the next major ILP submittal, the Revised Study Plan (RSP), which was filed with FERC by Duke Energy on December 5, 2022. The RSP describes the studies that the Licensee is proposing to conduct in support of relicensing the Project. This document also provides response to comments and requests for additional information received from FERC and relicensing stakeholders since the filing of the Proposed Study Plan in early August. Duke Energy encourages stakeholders to view the RSP on the Commission's eLibrary system (https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20221205-5088) or on the Project's public relicensing website (Bad Creek Pumped Storage Project).

Comments on the RSP must be filed directly with FERC within 15 days of the deadline for filing the RSP, which is no later than December 20, 2022.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

December 9, 2022

To: Attached Section 106 Consultation Distribution List

Subject: **Bad Creek Pumped Storage Project (FERC No. 2740)**
Consultation Regarding the Area of Potential Effects (APE)

Dear Sir or Madam:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the owner and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (Project) (Project No. 2740) located in Oconee County, South Carolina, approximately eight miles north of Salem. The Project utilizes the Bad Creek Reservoir as the upper reservoir and Lake Jocassee, which is licensed as part of the Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), as the lower reservoir.

The existing (original) license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 50-year term, with an effective date of August 1, 1977 and expires July 31, 2027. The license has been subsequently and substantively amended, with the most recent amendment on August 6, 2018, for authorization to upgrade and rehabilitate the four pump-turbines in the powerhouse and increase the Authorized Installed and Maximum Hydraulic capacities for the Project. Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Section 106 of the National Historic Preservation Act (Section 106) requires the Commission to take into account the effects of issuing a new license for the continued operation of the Project on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment[1]. Pursuant to the regulations implementing Section 106, Duke Energy is consulting with the South Carolina State Historic Preservation Officer (SHPO), ACHP, Indian Tribes, and other parties included on the attached Section 106 Consultation Distribution List to determine and document the Area of Potential Effects (APE) for Project relicensing.

Background

On April 22, 2022, FERC issued a notice to initiate informal consultation with the SHPO, as required by Section 106, the NHPA, and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2 and which designated Duke Energy as FERC's non-federal representative for conducting informal consultation, pursuant to Section 106.

On December 5, 2022, Duke Energy filed a Revised Study Plan (RSP) with the Commission describing the studies the Licensee is proposing to conduct in support of relicensing the Project,

including a Cultural Resources Study. As described in the RSP, Duke Energy preliminarily proposed to define the Study Area/APE to include lands within the FERC-approved Project boundary. It also includes any lands outside of the Project Boundary where cultural resources may be affected by Project-related activities, such as the proposed construction of the Bad Creek II Complex.

Request for Concurrence

At this time, Duke Energy is seeking concurrence from the South Carolina SHPO, Indian Tribes, ACHP, and other parties included on the attached Section 106 Consultation Distribution List regarding the APE as defined above and delineated on the attached map (Figure 1). Duke Energy believes that this definition is appropriate, as the APE currently encompasses all lands necessary for Project operations and lands that would be necessary for the proposed Bad Creek II Complex. If the results of consultation or studies conducted in support of relicensing indicate that the Project is having a potential effect on lands outside the APE, or if Duke Energy proposes to undertake Project-related activities outside of the proposed APE, Duke Energy will consult with the parties on the attached Section 106 Consultation Distribution List to refine the geographic extent of the APE and will provide FERC with consultation documentation.

Duke Energy respectfully requests that the consulting parties provide written concurrence regarding the APE presented herein within 30 days of the date of this letter (e.g., on or before January 9, 2023). If there are any questions regarding the proposed APE or the relicensing process, please do not hesitate to contact me at me at (980) 373-2079 or by email at Alan.Stuart@duke-energy.com.

Sincerely,

Alan Witten Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy

Attachment: Bad Creek Pumped Storage Project Section 106 Consultation Distribution List
Figure 1 – Map of Proposed APE

Federal Agencies

John Eddins
Archaeologist/Program Analyst
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637
jeddins@achp.gov

Kimberly Bose
Secretary
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

Keith Bluecloud
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

State Agencies

Elizabeth Johnson
Deputy State Historic Preservation Officer
South Carolina Department of Archives and History
8301 Parklane Rd.
Columbia, SC 29223

Tribes

Chief Bill Harris
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd.
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

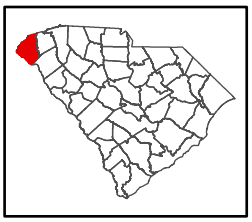
Corain Lowe-Sepeda
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447

David Hill
Principal Chief
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465

Figure 1. Bad Creek Project - Proposed APE.
Base Map: ESRI World Topographic and Hillshade Maps.

Bad Creek Project - Proposed APE



Project No.	73227248
Date:	November 2022
Drawn By:	BGG
Reviewed By:	BGG

Terracon
521 Clemson Rd. Columbia, SC
PH. (803) 741-9000 terracon.com

PROPOSED APE

BAD CREEK PUMPED STORAGE PROJECT
OCONEE CO., SC

FIGURE

1

Foothills Trail Conservancy
PO Box 3041
Greenville, SC 29602
www.foothillstrail.org

December 20, 2022

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: Foothills Trail Conservancy's Comments on Duke Energy's Bad Creek Pumped Storage Project (P-2740-053) Revised Study Plan (RSP) Submittals

The Honorable Ms. Bose:

The December 5, 2022, Revised Study Plan (RSP) clearly enumerates the key recreation comments, notes the primary stakeholder for each issue, and outlines Duke Energy's response to each comment. We appreciate Duke Energy's (Duke) consideration of these comments and the revisions offered in the RSP.

While many comments have been addressed, The Foothills Trail Conservancy (FTC) offers the following requests for further clarification and addition to the RSP.

Sincerely,

Andrew Gleason
Foothills Trail Conservancy Board Chairman

Glenn Hilliard
Foothills Trail Conservancy Founder & Advisor

Dr. Bill Ranson
Foothills Trail Board Member

Comment No.	*Stakeholder*	*Response Suggestion*
3	FERC	The Visual Resources Study Plan should call for studies which will protect the Recreational Resources as well as visual protections for the facilities and infrastructure. For example, consideration should be given to widening the Foothills Trail (FT) corridor in strategic areas to protect the visual recreation values of the Foothills Trail Corridor.
5	FERC	The original Bad Creek license submitted by Duke Energy contained a unilateral right for Duke Energy to "close or move" the Foothills Trail at any time. This unilateral right, which threatens the future existence of the Trail, should be eliminated and replaced with a right for the States of NC and SC to acquire ownership of this essential Trail corridor and it's Blue Ridge Escarpment surroundings. This current Bad Creek license extension and the Duke Energy application for a new license to construct a second powerhouse adjacent to the existing pumphouse clearly justifies additional Duke Energy recreation investment and permanent protection as a linear NC and SC State Park for the Foothills Trail and corridor. The studies for this proposal and for additional Duke Energy Recreation investments and the permanent protection of the Trail and trail corridor should be appropriately included in this RSP.
13 and 25	Foothills Trail, and FERC	The massive new Bad Creek project calling for a second powerhouse adjacent to the existing pumphouse which will double the capacity of the facility from 1,400 to 2,800 Megawatts, clearly justifies Duke Energy providing significant additional Recreation investment, which importantly should include the permanent protection and corridor expansion for the Foothills Trail. A clear commitment and start to define this recreational investment should be included for study and discussion in this RSP. Additionally, construction of the Bad Creek II Complex will likely result in significant and long-term (five-year) disruption to a popular Trail parking access and spur trail. Mitigation for this possible five-year disruption should include additional access options, that provide equivalent levels of access to the Trail.
14	Foothills Trail	FTC applauds the inclusion of an evaluation of the carrying capacity of the Trail. The refusal to provide cost information and details is disappointing; Duke has verbally indicated interest in transferring the future maintenance of their section of Trail to FTC, and having cost information will be vital to determining potential future maintenance, repair, and replacement costs, and ensuring the future existence of the Trail.
15 and Appendix F 6.1.6 Future Recreation Use Analysis	Foothills Trail	In the response to comments, Duke indicates they will expand the methodology for counties served; however, a review of the specifics within Appendix F 6.1.6 indicates that counties included by default remain unchanged – and continue to be limited to only four rural counties. Duke proposes to add population forecasts from additional counties within SC, NC, and GA – if reported on user surveys. This approach seems designed to limit the counties considered – if relying on counties included on user surveys, then why not include ALL counties included on them rather than limit to just three states? Alternatively, the counties that were considered for population estimates in the Original License Exhibit R – including Atlanta, GA to Charlotte, NC - would be appropriate and should be considered for the current evaluation.
16a and 19, and Appendix F 6.1.3 User Surveys	Foothills Trail	FTC again asserts that the proposed methodology is limited and will not provide adequate information to comprehensively evaluate Trail usage. In-person surveys should be collected during anticipated peak usage days and times. Providing QR codes at Trail Access locations may allow for limited additional information, however, cell phone service is not reliably available many of these locations, which will severely limit Trail users' ability to respond.

		Duke should offer an online survey, similar to that provided in the Keowee Toxaway Relicensing (P-2503), which would assist in obtaining more comprehensive data regarding Trail usage. Duke's concern about the ability of Trail users to accurately recollect their recreation experience is unfounded and was not suggested as a concern for Lake Keowee recreational users. As discussed in FTC's comments on the PSP, Trail users often put significant effort into planning and implementing a hiking or backpacking trip and are likely to remember significant details regarding their experience.
18	Foothills Trail	FTC's initial comment was directed toward the Laurel Fork Gap parking area, which is accessed by dirt roads - Horsepasture Road Connector and Laurel Fork Road. (Image credit: dwhike's adventures)
20a	Foothills Trail	FTC reiterates that the inventory must be comprehensive and include information on all man-made infrastructure throughout the Trail, not just at access areas. Additionally, the very existence of the Trail depends on legal access to the land on which it is located. Having clear information regarding the status and durability of trail-related agreements is essential to evaluating the Trail's continued existence into the future.
21	Foothills Trail	FTC reiterates the importance of incorporating each of these recommendations. While the Trail Corridor Conditions Assessment may provide related information, the obtaining of additional information from Trail users would provide a more comprehensive understanding of how well the Trail infrastructure is serving the needs of Trail users, and could identify significant changes in re-routing needs or infrastructure conditions that may result from fire, storms, etc. in a timely manner.
22	Foothills Trail	As the licensee responsible for implementation of all original license requirements, Duke should be able to provide a complete explanation of why certain amenities were not developed as required by Exhibit R. It appears that Duke did not meet the full requirements of their initial license and should provide mitigation for the loss of these recreational benefits over the years of the initial license.
26	Foothills Trail	FTC appreciates that an independent, third-party consultant will conduct the Trail Corridor Conditions Assessment and reiterates our request to be given an opportunity to accompany the contractor with onsite visits. FTC has valuable in-depth knowledge and unique insight that will enhance these evaluations. Additionally, as mentioned, Duke has verbally indicated interest in transitioning maintenance of this section of Trail to FTC, allowing FTC to be represented during the conditions assessment would ensure FTC members fully understand the evaluation and are more informed and better prepared should transfer of Trail maintenance to FTC be further considered.

Comment on:	*Response Suggestion*
Appendix F 3 Study Area	As worded, the study area could exclude the Bad Creek Parking Access area and the Bad Creek Road. At least portions of these areas are within the Project Area, and should be specifically included as they are important for Trail usage. Figure 3-2 should include detail boxes and labels for all spur trails within Duke's 43-mile section of Trail; Hilliard Falls and Laurel Fork Falls are currently not shown/labeled on this figure. Revisions to Figure 3 removed important infrastructure located within the Project Boundary, and deleted at least one label. Rather than include less information, Figure 3-3 should include all features located within this area, including appropriate labels. At a minimum this should include the Bad Creek Access Road and Bad Creek Parking Access features, which are located at least partially within the Project Boundary shown on this figure.
Appendix F 4 Background and Existing Information	FTC applauds Duke's intent to keep the Bad Creek Parking Access and Musterground Road open during potential construction of the Bad Creek II Complex. These features provide important Trail access and closure would result in significant disruptions to Trail usage. If they are closed, the remaining existing parking lots would not provide adequate alternatives and should require additional or enhanced access and parking spaces as mitigation for the potential five-year impacts to recreation.
Appendix F 6.1.1 Recreation Site Inventory	The Recreation Site Inventory should include all man-made features located throughout Duke's 43-mile section of trail, including those not located "at" an access area.
Appendix F 6.1.2 Traffic and Trail Counts	Traffic count data from the Bad Creek Parking Access should be the foundation for determining impacts from the potential five-year closure of the Bad Creek Parking Access Area. Traffic count data from the next closest parking/access locations (Upper Whitewater Falls, and Whitewater Falls Road on NC-281) should provide information regarding potential available capacity at alternate access locations. It should be noted that additional mitigation may be necessary, as these alternate lots provide access in a different location and would still result in disruptions to current Trail use patterns.
Appendix F 6.1.5 Trail Carrying Capacity	FTC applauds Duke for adding evaluation of the carrying capacity of the Trail. It is important to note that carrying capacity should provide estimates of how much recreational use can be accommodated while sustaining the natural resources and high-quality user experience. Carrying capacity should be evaluated by identifying major issues or concerns – the very existence of these would indicate that carrying capacity has already been exceeded.
Appendix F 6.1.7 Recreation Needs Assessment	Future needs should also consider the carrying capacity of the Trail; if the carrying capacity will likely be exceeded, additional recreation opportunities should be provided to meet future needs.
Appendix F 6.2 Task 2 Foothills Trail Corridor Conditions Assessment	Evaluation metrics must have clearly defined criteria to ensure objective evaluation and promote consistency in evaluation. For example, what constitutes "significant maintenance", "significant drainage issues, etc.? Additionally, detailed information – including photo documentation – should be included for all man-made trail features, not just those in need of "significant maintenance". Capturing a digital picture takes only seconds and would not increase costs for the study.

	Results from the most recent engineering study should be provided to FERC and stakeholders. Having the assessment focus only on “single track” standards could leave out many miles of trail in the Duke section due to the Trail following old logging/access roads. There are a total of 14.8 miles of the main trail corridor that are logging/access roads rather than single track trails, and these roads provide some of the most significant trail maintenance challenges. These roads must be maintained as roads to provide safety, heavy maintenance access, manage fire and slide issues, and for other emergency access.

UPSTATE FOREVER

Protecting Land & Water | Advocacy | Balanced Growth

ELECTRONICALLY FILED

December 19, 2022

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Alan Stuart
Duke Energy Carolina, LLC
Mail Code EC012Q
526 Church Street
Charlotte, NC 28202

Re: **Bad Creek Pumped Storage Project (FERC No. 2740-053)**
Comments on Revised Study Plan

Dear Secretary Bose and Mr. Stuart:

Upstate Forever is a nonprofit organization working on conservation, water quality, and sustainable development issues in the Upstate region of South Carolina. Our mission is to protect critical lands, waters, and the unique character of the Upstate of South Carolina, including the Upper Savannah Watershed where many of our members live, work, and recreate. Over the past two decades, we have worked to protect the natural assets that make the Upstate special, such as our farmlands, forests, natural areas, rivers, and clean air.

On February 23, 2002, Duke Energy ("Duke") filed a Notice of Intent and Pre-Application Document ("PAD") for its Bad Creek Pumped Storage Project (FERC No. 2740, "Project"). The existing FERC license for the Project expires on July 31, 2027. As part of the integrated licensing process ("ILP"), Duke held a meeting on September 7, 2002, which included a presentation of the six proposed studies in the Proposed Study Plan ("PSP") along with discussion among stakeholders, Duke Energy staff, and FERC staff, and filed a Revised Study Plan ("RSP") on December 5, 2022. Upstate Forever has participated in the stakeholder process for the

relicensing of the Bad Creek Project ("Project") since Duke Energy filed a Notice of Intent and Pre-Application document on February 23, 2002, including most of the Resource Teams.

We are pleased to participate as a stakeholder for the relicensing of the Bad Creek Pumped Storage Facility. Our primary interests in this Project are related to water quality and quantity, fish and wildlife habitat, recreation resources and opportunities, and land conservation. We look forward to working with Duke Energy and other stakeholders to ensure that the new license provides for the protection, restoration, and mitigation of the natural resources within the Upper Savannah Watershed for the duration of the next license term and more. We have completed a review of the Revised Study Plan and are pleased to offer the following comments.

Sincerely,

Chris Starker
Land Conservation Manager

GENERAL COMMENTS

The entire Proposed Study Plan is an extremely lengthy document surpassing 1,000 pages, which includes details from comments and responses to the Preliminary Application Document as well as other correspondence prior to the submission, discussion, and revisions to the Study Plan. This extraordinarily length makes it difficult for stakeholders to complete a thorough review, which can lead to missing or repetitive input from stakeholders. The RSP should be presented in a format more easily digestible by the reader and include summaries of information from previous meetings, correspondence, or supporting literature only as it relates to the proposed studies rather than every single element of the relicensing process to date. While I commend Duke for providing a thorough document with detailed information, this format seems more suited for the final licensing application rather than a document addressing resource studies specifically. This is especially true considering that the timeframe for submitting comments on the RSP is only fifteen (15) days after submission.

Furthermore, the RSP appears to be missing information throughout the appendices, including but not limited to Attachment 1 on page 150 of Part 1 of the Appendices, which should include "A Plan for Development and Management of the Foothills Trail and a Supplement to Exhibit R." This section has been left blank but could provide relevant information regarding proposed studies and stakeholder concerns related to recreation. Unfortunately, nothing is included for stakeholder review.

Comprehending the information provided throughout the Appendices section of the RSP is further obscured by the duplicative numbering of attachments, some of which seem out of place. For example, there are four (4) pages labeled as "Attachment 1" in Part I of the Appendices alone (see pages 30, 150, 314, and 436). While these would appear to be relevant to specific sections of the Appendices, that is not entirely clear as the same styles are used for section breaks that are used for other attachments, correspondence, presentations, and more. Specifically, Attachment 1 on page 314 ("Meeting Presentation") is followed by the PowerPoint presentation given at the Proposed Study Plan meeting on September 7, 2022, as well as all the comment letters submitted by stakeholders on the PSP, a section break for the November Stakeholder Resource Committee Meetings (page 426) that matches the one used on page 314, and then a section break for another Attachment 1 on page 430, this time for the "Resources Committee Meeting Presentation."

To summarize, the way the PSP and RSP are presented makes it difficult for stakeholders to find specific information relevant to individual or organizational concerns and focus areas, and its organization is somewhat confusing, therefore input provided by stakeholders may be less thorough, lacking specificity, or missing entirely. Stakeholders in general want to provide meaningful comments to help guide the relicensing process, including study plan development,

and any such input should be facilitated by making the most relevant and pertinent information easily available.

WATER RESOURCES STUDY PLAN

Neither the upper reservoir nor its tributaries have historically been monitored for water quality, which is an erroneous oversight providing no baseline water quality data for waters in the Project vicinity. Section 6.3.7 of the PAD provided a summary of existing water quality data collected for waters within the Project Boundary and vicinity but is limited to only the upper reservoir and lower reservoir. No water quality data was included for Bad Creek or West Bad Creek, which are tributaries of the Bad Creek reservoir, Howard Creek, which receives seepage flows from the Main Dam and West Dam, or Whitewater River, which is the receiving water from daily Project operations (as well as the location of a submerged weir designed to minimize the effects of Project operations on lake stratification, protect cold-water fish habitat, and dissipate energy from discharged water).

Appendix C of the PSP describes the proposed Water Resources Study Plan, which states that no additional adverse effects to water resources or water quality are anticipated due to existing operations, but that the only anticipated adverse effects would be the result of the construction of Complex II. Upstate Forever continues to question the legitimacy of this statement considering that no historic water quality data has been collected for the upper reservoir and associated tributaries. Duke has stated that it plans to include a summary of the only available historical water quality date from Howard Creek, but it is impossible to determine impacts from either current or future operations or construction when no baseline data exists, or when best available data is not referenced in the PAD or Study Plan documents.

To assess the potential impacts to water resources and water quality resulting from the construction and operation of Complex II, this Study plans to use existing data from Clemson University, Duke University, and SCDHEC that has not been provided in the PAD, PSP, or RSP and should be included or at least summarized for stakeholders to ascertain gaps in data. In addition, Duke stated in the RSP that it has no intention of assessing the impacts of the current Project related to climate change. Increases or decreases in precipitation could have noticeable impacts on lake levels, water quality, and operation of the current facility and downstream facilities. SC has seen a dramatic increase in the frequency and intensity of extreme weather events over the past several decades, including flooding and drought. This Study should attempt to assess climate-related impacts to water resources and Project operations, which is being done for other studies, but not included with the Water Resources Study.

While Duke's current proposed study area focuses only on the Whitewater River Cove, additional modeling beyond the length of the Cove should be evaluated to determine the

extent of increased flow velocities, vertical mixing, and water quality impacts associated with the operations of Bad Creek II on Lake Jocassee, including but not limited to shoreline erosion. Duke has stated that the boundaries may be extended depending upon the results of the modeling, which satisfies Upstate Forever's concerns.

Upstate Forever supports the requested assessment for the evaluation of the potential impacts on discharges to Lake Keowee with the operation of Bad Creek II to ensure that the construction of the Bad Creek II complex does not adversely impact lake levels in Lake Keowee. We also support plans to collect continuous temperature data and periodic (bi-weekly) Dissolved Oxygen (DO) measurements from three historic locations in the Whitewater River Arm in 2023 and 2024. The continuous monitoring of these water quality parameters under these conditions (two-unit operation and four upgraded units) and at the proposed locations as this data will help inform the need for future water sampling and modeling.

Upstate Forever still has concerns regarding the impacts of spoil materials and upland fill resulting from the proposed construction of Bad Creek Complex II ("Complex II"). According to the PAD, approximately 4 million cubic yards of spoil material will need to be disposed because of construction, including dredging, filling, clearing, and de-watering. During the September 7 meeting ("Meeting"), Duke clarified that of the eight (8) potential sites identified for placement of upland spoils, not all would be utilized, and that the selected locations would avoid sensitive streams. Upstate Forever continues to stress that impacts to water resources resulting from construction should be avoided regardless of stream conditions, and that to minimize impacts Duke should consider removing the spoils to another location as the primary method of proper disposal. For example, according to SCDHEC, Duke maintains an industrial landfill near the Project. Although the permit (#373303-1602) is no longer active, we suggest that Duke and stakeholders consider revisiting this landfill site for disposal of any spoils that might result from the construction of Bad Creek II. While Duke has stated in the RSP that a spoil disposal alternative analysis (including evaluation of offsite disposal) will be carried out, as required for the Clean Water Act Section 404 permit and associated 401 water quality certifications, due to the sheer magnitude of these spoils, off-site material disposal for the excavated materials should be the only consideration and other disposal methods considered only after proper justification. Upstate Forever looks forward to working with Duke Energy and Project stakeholders to minimize impacts to the streams and wetlands in the Project area associated with the construction of Bad Creek II.

VISUAL RESOURCES STUDY PLAN

Appendix E of the PSP describes the proposed Visual Resources Study Plan, which primarily concerns the visibility of the Project and its potential impact on the quality of recreation

experiences on Project related resources such as Lake Jocassee. Upstate Forever expressed concerns that factors such as lighting standards at the Project can affect resources besides recreation, including but not limited to bird migration, aquatic species behavior, and noise pollution. At the Meeting on September 7, it was noted that lighting at the Project could attract some fish species and thereby influence impingement and entrainment.

Although lighting at the existing Project is limited to safety and security purposes, Duke stated in the RSP that this Study has been revised to evaluate existing management plans and guidance documents related to impacts from lighting and that impacts are expected to be primarily limited to the construction phase for the Bad Creek II Complex. Upstate Forever would like to reiterate that Duke should conduct these evaluations based on International Dark Sky standards and that Duke should consider seeking the highest designation through the International Dark Sky Places conservation program for the Project and the surrounding lands. Such a designation would be the first and only such designation in SC and likely the first landscape-scale Project achieved by a utility that addresses light pollution, providing long-term benefits to wildlife and ecosystems, recreation, and human health.

RECREATIONAL RESOURCES STUDY PLAN

Appendix F of the PSP describes the proposed Recreational Resources Study Plan, which includes four (4) main components:

1. A Recreation Use and Needs (RUN) Study for the 43-mile-long portion of the Foothills Trail managed by Duke Energy;
2. A Conditions Assessment of the 43-mile-long portion of the Foothills Trail managed by Duke Energy;
3. An Existing Recreational Use Characterization of Whitewater River cove; and
4. A Recreational Public Safety Evaluation of Whitewater River cove.

Due to the exclusionary nature of the Bad Creek Pumped Storage Facility, and because there is no recreational access to the Bad Creek reservoir, there is considerable emphasis on off-Project recreation opportunities well outside the Project area. The Recreational component (Exhibit R) of the original license was provided through the creation and management of a 43-mile central section of the Foothills Trail ("Trail"). Exhibit R included public access and parking, trail kiosks and directional signs, additional spur trails, and stream crossings as well as continual maintenance and operational activities for limited recreation uses, primarily hiking. The Foothills Trail system provides important recreational and educational opportunities to both Upstate residents and visitors from around the world. Upstate Forever readily acknowledges

the unique opportunity the Foothills Trails offers and appreciates Duke Energy's long-term dedication to the continued management and maintenance of the Trail.

The Upstate is experiencing unprecedented and accelerating population growth and is expected to grow rapidly for decades to come. Already our natural resources are stretched thin, and the recent pandemic has revealed how fragile and overburdened our public recreation areas have become. And yet the continued growth in development, strain on resources, and demand for recreation areas indicates that ensuring that recreation opportunities centered on the Foothills Trail continue to provide quality recreation opportunities in perpetuity and that the Foothills Trail can continue to grow to meet additional demand should be paramount in this licensing.

Visitation to public spaces saw an unprecedented spike during the recent pandemic, particularly in the Upstate. The demand for outdoor recreation areas surrounding the Bad Creek Project is no exception. Continued support of the Foothills Trail is a critical component of the New License and expansion of the recreation provisions should be considered to account for the population growth, increased demand for outdoor recreational needs, and expansion of Project operations from the ongoing upgrades. More importantly, continued use of natural resources for energy production limits the ability of South Carolina residents to enjoy a large portion of the Upstate's amazing beauty. We look forward to working with Duke Energy and Project stakeholders to evaluate the potential for expanding opportunities to the lands surrounding the Project, including consideration for some or all of the following:

1. An endowment provided to the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system;
2. Fee-simple donations of land to be included in the Foothills Trail system, or to State resource agencies for various purposes, including recreation, habitat management, and water quality protection;
3. Conservation easements on lands owned by Duke Energy, which would protect the Foothills Trail corridor, or allows for other recreation opportunities (a conservation easement would limit specific land development practices but would allow for recreation uses and facilities, and would reserve rights to Project related activities), including the 6,700-ac tract surrounding the Project;
4. Expand the Foothills Trail system to connect with other trail systems, including the Palmetto Trail at Stumphouse Tunnel, the Panthertown trail system, the Tuskaseegee, the Art Loeb Trail, and the Appalachian Trail;
5. Designation through the International Dark Sky Places conservation program for the Project and the surrounding lands, creating the first of its kind in the State and expanding on the world-class distinction; and

6. Providing a financial contribution to the Oconee County Conservation Bank, which would then be used to protect additional lands in the County near the Project boundary.

Government agencies mandated with multiple directives can attest that the quality of any recreation experience is directly related to the quality of its related resources, including habitat and fisheries. For example, hunters and anglers depend entirely on high-quality habitat and water resources to provide viable game. The same is true for recreation activities like hiking, backpacking, birdwatching, wildflower viewing, nature photography, and other passive recreation uses. Poor land and water management leads to poor recreation experiences. Therefore, it is just as important for Duke Energy to develop a land management plan that supports the recreation activities.

Upstate Forever looks forward to working with Duke and Project stakeholders to develop a recreation management plan that supports the natural resources, including an evaluation of habitat quality, a determination of the existing carrying capacity, and an estimation of future carrying capacity that minimizes impacts to recreation resources while maximizing benefits to both users and existing species. Upstate Forever is pleased to see that an analysis of current Project construction, operation, and maintenance activities on ecological communities and rare, threatened, and endangered species, as well as its effects on *potential* habitats, will be addressed in the RMP, including the effects of climate change and non-native, invasive, and noxious species on ecological communities and potential habitat areas. Habitat and corridor protection is one of the most critical needs for the protection and preservation of species and wildlife habitat corridors will play a critical role in species migration and survival, particularly in the context of climate change.

Friends of Lake Keowee Society

Dedicated to the preservation and enhancement of Lake Keowee and its watershed through advocacy, conse

1209 Stamp Creek Road, Suite A
Salem, SC 29676

O: (864) 719-0599
www.keoweefolks.org

Email: folks@keoweefolks.org

December 20, 2022

The Honorable Kimberly D. Bose, Secretary
Federal Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Alan Stuart, Duke Energy FERC Licensing Manager
Duke Energy Carolina, LLC
Mail Code EC012Q
526 Church Street
Charlotte, NC 28202

RE: Bad Creek Pumped Storage Project (FERC No. 2740-053)
Comments on Revised Study Plans

Dear Secretary Bose and Mr. Stuart:

Friends of Lake Keowee Society (FOLKS), founded in 1993, is a nonprofit organization located in Salem, South Carolina. Our membership consists of over 1,000 members who live either full or part-time in this region. Our mission for 30 years has been focused on preserving the Lake Keowee watershed through advocacy, conservation, and education.

As a stakeholder on this significant Bad Creek relicensing project, FOLKS has followed the progress from the Notice of Intent and Pre-application Document (PAD) for its Bad Creek Pumped Storage Project (FERC No. 2740) through its revised study plan meetings. The meetings to date for each of the six (6) studies areas have been well presented. All comments during the presentations have been addressed and recorded in the Revised Study Plan. Overall, FOLKS has no additional requests for revised studies, and we await the updates and results of these proposed studies. We request, however, that for purposes of understanding and assessment that the existing database (not summary) for water quality and other quantifiable characteristics in both Howard Creek and the entirety of Lake Jocassee should be made available to the Project stakeholders.

The only comments that FOLKS has currently are in reference to the proposed alteration of the area for the new transmission lines. Any activities that result in land alteration or soil disturbance raise concerns for the health of waters in any affected streams and for Lake Jocassee. In addition to the disturbances around the proposed portal to the new powerhouse and associated areas (if transmission lines are added, widened, or modified in any way that affect the watershed vegetation and soils that support that vegetation) then the impacts

of those activities must be predicted, measures to mitigate the effects planned, and monitoring to confirm mitigation success continued until the effects are gone or stabilized.

The possible effects include such things as:

- Soil loss and sediment transport to the streams and lake
- Increased turbidity and suspended solids, alteration of the light field and biological production in Lake Jocassee
- Loading of sediment-associated nutrients to Lake Jocassee, especially phosphorus
- Episodic inputs of organic material from disturbances in previously forested areas

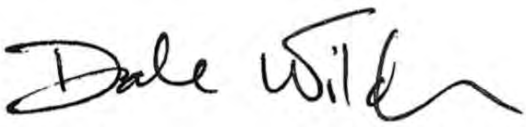
For Lake Jocassee:

1. If there is, as predicted, an increase in the frequency and magnitude of hydrodynamic fluctuations due to the operation of the additional four turbines, then there should be predicted impacts to the thermal and chemical patterns (dissolved oxygen, nutrients, etc.) in Lake Jocassee, compared to those that are currently observed, and mitigation measures, if needed, should be identified.
2. Related to this, the potential stimulation of production (or suppression of it as the case may be) in Lake Jocassee that may result should be predicted and monitored for possible future mitigation measures.
3. Any alteration of patterns of fish movement as a result of the altered hydrodynamic pattern, the thermal patterns, or any other factors related to the construction project should be predicted and monitored to determine the effects, if any, to fish populations in Lake Jocassee. This, ideally, would also predict possible future shifts in dominant species in Lake Jocassee.
4. Because we can expect changes in many factors due to climate change as well as changes in the methods and patterns of future energy production, then there should be predictions of what these changes may be and, failing that ability, identification of the range of such changes that could happen and the ways the above effects may be altered as a result.

We look forward to further involvement in this significant relicensing of the Bad Creek Pumped Storage Facility (FERC P-2740) as well as the determination of the proposed Bad Creek II Pumped Storage Facility. Both are critical infrastructures to the production of sustainable and green energy in this growing region in Upstate South Carolina. Duke Energy has been a good steward of the lands surrounding the reservoirs of Bad Creek, Jocassee, and Keowee, as well as the surrounding watershed. They have taken great care to preserve the open spaces, to conserve the wilderness areas for wildlife and recreational enjoyment, and to create an atmosphere of inclusiveness with its stakeholders.

Thank you for your consideration of the Friends of Lake Keowee Society's comments.

Sincerely,



Dale Wilde
President
Friends of Lake Keowee Society

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
January 4, 2023

OFFICE OF ENERGY PROJECTS

Project No. 2740-053–South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

Via FERC Service

Alan Stuart
Duke Energy Carolinas, LLC
Mail Code EC-12Q
526 S. Church Street
Charlotte, NC 28202

Reference: Study Plan Determination for the Bad Creek Pumped Storage Project, and the Potential Bad Creek II Complex

Dear Mr. Stuart:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Bad Creek Pumped Storage Project No. 2740 (Bad Creek Project) located in Oconee County, South Carolina, including the potential addition of a new powerhouse and facilities (Bad Creek II Complex or Complex) to be located adjacent to the existing powerhouse. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On August 5, 2022, Duke Energy Carolinas, LLC (Duke Energy) filed a proposed study plan (PSP) for six studies in support of its intent to relicense the project. The PSP addresses studies on: (1) water resources; (2) aquatic resources; (3) visual resources; (4) recreational resources; (5) cultural resources; and (6) environmental justice.

Duke Energy held a Study Plan Meeting to discuss its PSP on September 7, 2022. Comments on the PSP were filed by the Foothills Trail Conservancy, Upstate Forever, South Carolina Department of Natural Resources (South Carolina DNR), and Commission staff.

On December 5, 2022, Duke Energy filed a Revised Study Plan (RSP). Comments on the RSP were filed by the Foothills Trail Conservancy, Friends of Lake Keowee, and Upstate Forever.

General Comments

A number of the comments on the RSP do not directly address study issues. For example, several of the comments: (1) express general concerns associated with water quality, flows, and aquatic habitat conditions; (2) recommend environmental protection, mitigation, or enhancement (PM&E) measures for the Foothills Trail; or (3) request PM&E measures to address potential impacts associated with Duke Energy's construction and operation of the Bad Creek II Complex. This determination does not address such comments, but rather addresses comments specific to the merits of the proposed studies submitted pursuant to section 5.13 of the Commission's regulations and comments received thereon.

Study Plan Determination

Duke Energy's RSP is approved, with the staff-recommended modifications discussed in Appendix B. As indicated in Appendix A, of the six studies proposed by Duke, five studies are approved as filed and one is approved with modifications.

Appendix B explains the specific modifications to the study plan and the bases for modifying the proposed studies. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, staff only reference the specific study criteria that are particularly relevant to the determination. Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in Duke Energy's RSP.

Pursuant to section 5.15(c)(1) of the Commission's regulations, the Initial Study Report for all studies in the approved study plan must be filed by January 4, 2024. As required by the Commission's regulations, Duke Energy must hold an Initial Study Report Meeting within 15 days of the filing of their Initial Study Report.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, Duke Energy may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Joshua Dub at joshua.dub@ferc.gov, or (202) 502-8138.

Sincerely,

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of studies subject to this determination
Appendix B – Staff's recommendations on proposed studies

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED STUDIES

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Water Resources	Duke Energy	X		
Aquatic Resources	Duke Energy	X		
Visual Resources	Duke Energy	X		
Recreation Resources	Duke Energy		X	
Cultural Resources	Duke Energy	X		
Environmental Justice	Commission staff, Duke Energy	X		

APPENDIX B

STAFF'S RECOMMENDATIONS ON PROPOSED STUDIES

The following discusses staff's recommendations on studies proposed by Duke Energy Carolinas, LLC (Duke Energy). The recommendations are based on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)]. Except as explained below, the Revised Study Plan (RSP), filed on December 5, 2022, adequately addresses all study needs at this time.

I. Required Studies

Water Resources Study

Applicant's Proposed Study

Duke Energy proposes to conduct a Water Resources Study to evaluate the effects of current project operation, and the construction and operation of the proposed Bad Creek II Complex (Complex), on water resources and water quality within the project area. The objectives of the Water Resources Study are to: (1) conduct a literature review of existing water quality data for Lake Jocassee and Howard Creek, and identify applicable water quality standards; (2) develop a Water Quality Monitoring Plan that encompasses pre-construction, construction, and post-construction activities, and includes identification of methods for monitoring water quality and threshold values for water quality parameters; (3) use a two-dimensional hydrologic model to evaluate the downstream extent of effects (*i.e.,* vertical/horizontal mixing in Lake Jocassee) resulting from the operation of the Complex; (4) use a three-dimensional computational fluid dynamics model to: (a) evaluate water velocities and shoreline erosion in the Whitewater River arm of Lake Jocassee resulting from the operation of the Complex; and (b) evaluate the extent of vertical mixing that would occur in the Whitewater River arm and downstream of the submerged weir resulting from the operation of the Complex; (5) use the existing Computer Hydro-Electric Operations and Planning Software (CHEOPS) model to evaluate the effects of the operation of the Complex (*i.e.,* changes to water exchange rates, magnitude, and duration of flows between Bad Creek Reservoir and Lake Jocassee) on Lake Jocassee's water surface elevation; and (6) gather information related to the effects of Duke Energy's potential spoils disposal locations (*i.e.,* associated with the construction of the Complex) on streams and/or wetlands in support of Clean Water Act permitting.

Water Resources Study Plan

Comments on the Study

In its comments on the RSP, Upstate Forever states that stakeholders cannot assess Duke Energy's proposal to use existing water quality data to evaluate the effects of the construction and operation of the Complex because the referenced water quality data has not been provided or summarized in the pre-application document (PAD) or study plan documents. Upstate Forever requests that the existing water quality data be included or summarized in the Water Resources Study Plan for stakeholders to review.

Discussion and Staff's Recommendation

Duke Energy included an overview of the existing water quality data in its PAD and proposes, as part of the Water Resources Study Plan, to include a more detailed summary of historical water quality data with the initial study report (ISR) at the end of the first year of study. In addition, Duke Energy proposes collection, and inclusion in the ISR, of new water quality data and detailed modeling results, particularly focusing on issues potentially affecting high value fish habitat in the Whitewater River arm of Lake Jocassee. The Integrated Licensing Process (ILP) regulations include procedures for stakeholder review and comment on the study results presented in the ISR and for requesting study modifications based in part on the results of the first year of studies [sections 5.15(d) and 5.15(e)]. Given that the data that will be available for stakeholder review after the first study season, and the opportunity for stakeholder review and comment on the ISR, we recommended no additional data summary or collection of data beyond what Duke Energy proposes in its RSP [sections 5.9(b)(4) and 5.9(b)(7)].

Effects Of Climate Change On Water Resources

Comments on the Study

Upstate Forever states that South Carolina has seen a dramatic increase in the frequency and intensity of extreme weather events over the past several decades, including flooding and droughts. Upstate Forever contends that these weather events could have noticeable impacts on lake levels, and operation of the Bad Creek Project and downstream facilities. Upstate Forever requests that Duke Energy assess climate-related impacts to water resources and project operations as part of the Water Resources Study Plan.

Discussion and Staff's Recommendation

Duke Energy proposes to include a discussion of recent climate data, trends, and patterns and potential related impacts to the project in the Final License Application (FLA) which should provide information for staff's analysis of project-related and cumulative effects on water resources. Further, as part of the 2016 relicensing of the Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503), and in support of a 2014 New Operating Agreement (NOA) between Duke Energy, the U.S. Army Corps of Engineers, and Southeastern Power Administration, Duke Energy developed operational models (including the CHEOPS model) to evaluate the effects of future climate change scenarios (*i.e.,* temperature increases, basin inflow reduction, extended drought, and water withdrawal demands) on project operations and aquatic resources in the Savannah River Basin (Basin). Because the proposed operating range of the Bad Creek Project, including the Complex, if pursued, is consistent with the operating range evaluated during the previous climate change analysis within the Basin, it should be sufficient to meet the information need described by Upstate Forever [section 5.9(b)(4) and section 5.9(b)(7)]. Therefore, we do not recommend a new, expanded evaluation of the potential effects of climate change as part of the Water Resources Study. However, we recommend that Duke Energy include a discussion of the climate data, trends, and patterns mentioned above. We also recommend that Duke Energy include the studies[1] supporting the climate change analysis in the Keowee-Toxaway Hydroelectric Project No. 2503 relicensing and the Savannah River NOA as appendices to the Bad Creek Project FLA.

Recreation Resources Study

Applicant's Proposed Study

Duke Energy proposes a Recreation Resources Study with four main components: (1) a Recreation Use and Needs (RUN) Study; (2) a Foothills Trail Corridor Conditions Assessment (Conditions Assessment) of the 43-mile-long portion of the Foothills Trail managed by Duke Energy; (3) an Existing Recreational Use Characterization; and (4) a Recreational Public Safety Evaluation of Whitewater River Cove. Duke Energy proposes

[1] Including but not necessarily limited to: (1) Appendix E6, *Final Study Reports*, Keowee-Toxaway Hydroelectric Project No. 2503 Final License Application, 2014; and (2) Final Environmental Assessment, New Operating Agreement between U.S. Army Corps of Engineers, Southeastern Power Administration, and Duke Energy Carolinas, LLC, 2014.

to use the study to identify enhancement measures, if needed, to meet current or future demand.

The goals of the RUN Study are to assess current recreation use and identify any future recreation needs along the 43-mile segment of the Foothills Trail and associated access areas that are maintained by Duke Energy and referenced in the existing Recreation Plan for the project.[2] The data collected during the RUN Study and Conditions Assessment will be used to estimate the Foothills Trail's hiking and backpacking carrying capacity[3] and develop an updated Recreation Management Plan (RMP), as needed, for the term of any new license issued, which would support characterization of existing recreational use levels for areas that could be temporarily impacted by the Complex construction. An outline of the RMP for the project will be provided with the Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) for stakeholder and Commission staff review

The goal of the Conditions Assessment is to evaluate the current condition of the trail surface and corridor included in the 43-mile segment and identify key areas of future maintenance needs or improvements. The goal of the Whitewater River Cove Existing Recreational Use Characterization is to characterize recreation use in Whitewater River Cove and assess the level of boating use disruption that could occur associated with construction of the Complex. The goal of the Recreational Public Safety Evaluation is to evaluate potential public safety risks, specifically those associated with recreation activities at or near Whitewater River Cove, which may result from, or be exacerbated by, the Complex during the construction and operation phases.

Future Recreation Use Analysis

Comments on the Study

The Foothills Trail Conservancy (FTC) filed recommendations related to the Recreation Resources Study Plan. FTC states that, in response to comments (on the PSP), Duke Energy indicated that it would expand the number of counties analyzed as part of the study. However, FTC states that in Section 6.1.6 of Appendix F of the RSP

[2] Duke Energy filed a copy of the 1980 Recreation Plan on July 25, 2022, in response to additional information requested by Commission staff on June 16, 2022.

[3] In the context of recreation use, carrying capacity generally refers to the maximum number of visits or visitors that can be accommodated in a park or related area, such as a trail.

the list of counties included remains unchanged and continues to be limited to only four rural counties.[4]

Discussion and Staff Recommendation

Although, Duke Energy agrees to expand the counties that would be surveyed in response to comments on its PSP, it appears that Duke Energy did not update the list of counties in Appendix F of the RSP. Therefore, for clarity, we recommend that Duke Energy modify Appendix F to include the additional counties that Duke Energy agreed to include in the survey.

User Surveys

Comments on the Study

FTC asserts that the proposed Recreation Study survey methodologies would not provide adequate information to comprehensively evaluate trail usage. To enhance in-person surveys, FTC requests that Duke Energy conduct in-person surveys during anticipated peak usage days and times. To address concerns that cellular phone service may not be available to access the online survey via the proposed quick response (QR) code method at remote locations of the Foothills Trail, FTC recommends that Duke Energy provide a web site in addition to a QR code to access the user survey.

Discussion and Staff Recommendation

Duke Energy has proposed to collect in-person surveys on a mix of 30 weekdays, weekend days, and holidays from March through November in 4-hour shifts occurring between 8:00 am and 8:00 pm. As proposed, this approach is more robust than many generally accepted survey methodologies and likely would include adequate peak usage periods [section 5.9(b)(6)]. Therefore, we do not recommend a change to Section 6.1.3, *User Surveys* to add more in-person surveys during anticipated peak usage periods. Regarding FTC's request for a web site address for the online survey, posting the web site address alongside the QR code on the online survey signs would provide stakeholders an option to make note of the web address and complete the user survey when they have adequate cellular coverage or at their convenience, from a computer. This low-cost modification to the methods of this study could allow for more stakeholders to participate in the user survey [section 5.9(b)(7)] should it prove difficult for stakeholders to use the QR code.

[4] Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC.

Trailer Parking

Comments on the Study

In response to the RSP, FTC filed comments regarding the assessment of parking demand. Specifically, FTC states that during the hunting season, Horsepasture Road ATV (all-terrain vehicle) users who park a vehicle with a trailer at the Laurel gap parking area take up more than one parking space, limiting the number of users able to park there. Therefore, FTC recommends that Duke Energy's study consider the extra demand placed on the Laurel Fork Gap parking area during hunting season due to users parking vehicles with trailers.

Discussion and Staff Recommendation

Adding a traffic counter at the Laurel Fork Gap parking area would provide a more comprehensive analysis of parking demand, including identification of any future enhancement measures needed at this site as a result of trailer parking. Therefore, given the relative low cost and modest effort involved in collecting this information [section 5.9(b)(7)], we recommend adding a traffic counter during hunting season at the Laurel Fork Gap parking area.[5]

Recreation Site Inventory Form

Comments on the Study

In comments on the RSP, FTC reiterates the importance of incorporating each of its eight recommendations, relating to the Recreation Site Inventory Form made in comments on the PSP. Specifically, FTC recommends collecting information on the site's: (1) address; (2) road access; (3) parking spaces; (4) shoreline access conditions; (5) campsites; (6) operations; (7) non-campsite infrastructure; and (8) impacts and issues. In the RSP, Duke Energy states that it will add recommendations 1 through 3 and 6 to the form. Duke Energy notes that information on shoreline access conditions (recommendation 4) will be collected during the Conditions Assessment. Duke Energy partially adopts the addition of campsite information (recommendation 5). Duke Energy does not add the non-campsite information (recommendation 7), because it already includes non-campsite infrastructure on the form. Duke Energy does not propose to add

[5] Pneumatic traffic counters are widely used to count vehicles, and can be calibrated to count multiple axles as one vehicle. *See* Methods for visitor monitoring in recreational and protected areas: An overview, Muhar, Amberger, and Brandenburg, 2002.

questions on impacts and issues (recommendation 8) because it already includes a space on the form to indicate if major repairs are needed.

In answer to Duke Energy's response to stakeholder comments on the PSP, FTC states that, while the Conditions Assessment may provide information related to shoreline access condition, obtaining additional information from trail users would provide a more comprehensive understanding of how well the trail infrastructure is serving the needs of trail users. FTC adds that including such information in the Recreation Site Inventory Form could help identify significant changes in routing needs or infrastructure conditions that may result from fire, storms, *etc.*, in a timely manner.

Discussion and Staff Recommendation

Duke Energy revised the Recreation Site Inventory Form in its RSP to incorporate some of FTC's recommendations which should adequately capture important data from respondents regarding the condition of recreation facilities [section 5.9(b)(4)]. Therefore, we do not recommend including FTC's additions to the Recreation Site Inventory Form. In the specific case of the campsite information, (recommendation 5), although Duke Energy proposes to add the number and height of bear cables and the number of latrines to the Recreation Site Inventory Form in response to stakeholder comments on the PSP, this information was not included on the Recreation Site Inventory Form submitted with the RSP. Therefore, we recommend that Duke Energy add an entry to collect this information on the form. Including this item on the form would help Duke Energy to collect valuable information about how the adequacy of trail amenities [sections 5.9(b)(6) and 5.9(b)(7)].

Foothills Corridor Conditions Assessment

Comments on the Study

FTC requests that it be present when Duke Energy's proposed, independent, third-party consultant conducts the Conditions Assessment. FTC states that it has in-depth knowledge and unique insight about the Foothills Trail that will enhance the evaluations. FTC also asserts that allowing FTC representation during the Conditions Assessment would ensure FTC members fully understand the results of the evaluation and are more informed and better prepared should trail maintenance responsibilities be transferred to FTC in the future. FTC also requests that detailed information be recorded in the Conditions Assessment, including photo documentation, for all human-made features. Finally, FTC states that the Foothills Trail includes both single track trail segments and logging and access roads, and that Duke Energy's proposal to focus only on the single track trail segments could exclude 14.8 miles of the Foothills Trail from being assessed

during the Conditions Assessment. Duke Energy did not respond to this comment on the RSP.

Discussion and Staff Recommendation

While having FTC representatives present during the evaluation could have collaborative value, there would be logistical issues that could increase the cost and effort involved in conducting the study with an unclear known benefit. The complete study results, including photo documentation of structures in need of significant maintenance or replacement, will be presented in the ISR, which stakeholders will have the opportunity to review and comment upon. Therefore, we do not recommend requiring that FTC members be present during all Conditions Assessment tasks as a requirement of the Recreation Resources Study. The request for more detailed information regarding the Conditions Assessment is already addressed by Duke Energy's proposal to identify and record information about structures in the trail corridor, including collecting geospatial coordinates for each site [section 5.9(b)(4)]. Regarding the portions of the trail following logging and access roads, Duke Energy has committed in its overall Recreation Study Plan to assess the entire 43 miles of the Foothills Trail that it is required to maintain under its current license. Making it clear that these trail segments are included in the Conditions Assessment would ensure that the study is comprehensive, because it would be certain to include the entire 43 miles of trail, rather than just the 28.2 miles of single track trail segments. Therefore, we recommend that Duke Energy include the 14.8 miles of trail that follow logging and access roads in the Conditions Assessment [section 5.9(b)(6)].

Study Area

Comments on the Study

FTC recommends minor changes to improve clarity in the Study Area section of the proposed RUN Study. FTC states that, as worded, the study area could exclude the Bad Creek Parking Access area and Bad Creek Road. FTC recommends that Figure 3-2 include detail boxes and labels for all spur trails (including Hilliard Falls and Laurel Fork Falls) within the 43-mile portion of trail to be studied by Duke Energy. FTC also states that that the location of access areas and at least one map label were removed in revisions to Figure 3-3 between the PSP and RSP and should be restored.

Discussion and Staff Recommendation

Adding all spur trails within the 43-mile portion of trail to be studied by Duke Energy to the RUN Study and Figure 3-2, as well as restoring the infrastructure items previously included in labels in the PSP RUN Study Figure 3-3, would ensure that

information on the Bad Creek Parking Access area, Bad Creek Road, and other access points is included in the ISR [section 5.9(b)(4)]. Therefore, we recommend that the RUN study, as represented in Figure 3-2 and Figure 3-3 of Appendix F3, *Study Area,* of the proposed RUN Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy.

Trail Carrying Capacity

Comments on the Study

FTC recommends that the carrying capacity of the Foothills Trail be evaluated, including identifying major issues or concerns that could limit carrying capacity. FTC states that it is important to estimate how much recreational use can be accommodated while sustaining the natural resources and high-quality experiences.

Discussion and Staff Recommendation

Duke Energy's methodology for the overall Recreation Study is consistent with generally accepted practice in the scientific community but adding detail on the carrying capacity analysis would produce more interpretable study results. The discussion should describe a standard carrying capacity methodology that typically involves a desired condition (*e.g.,* what level of crowding should be allowed), indicator variables (*e.g.*, number of people on trails, number of large parties of people, number of fire rings, *etc.*) to be used to support the desired condition. Duke Energy should describe the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. The carrying capacity analysis could integrate the results of the RUN Study and inform development of PM&Es for the project [sections 5.9(b)(3), 5.9(b)(6), and 5.9(b)(7)].

Telephone Memo

To: Public Files
From: Dustin Wilson
Date: February 9, 2023
Dockets: P-2740-053
Project: Bad Creek Hydroelectric Project

Subject: Consultation with Tribes for the Bad Creek Hydroelectric Project No. 2740-053

On March 9, 2022, Rachel McNamara, staff of the Division of Hydropower Licensing of the Federal Energy Regulatory Commission (Commission) issued letters initiating Tribal consultation for the relicensing process for the Bad Creek Hydroelectric Project No. 2740 (Bad Creek Project). The letters were sent to the Catawba Nation, Cherokee Nation, Eastern Band of Cherokee Indians, and the United Keetoowah Band of Cherokee Indians. Ms. McNamara followed up with the addressed Tribes via email on March 10 and April 27 to determine if any Tribes would be interested in participating in consultation for the Bad Creek Project.

On April 27, 2022, Stephen Yerka of the Eastern Band of Cherokee Indians requested a meeting to discuss the Commission's licensing process, how the Tribe can fully participate, Tribal interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between the Commission and the THPO. No other requests were received. Ms. McNamara followed up with Mr. Yerka on April 27. Mr. Yerka replied on April 27 and stated he would try to get some potential dates to Ms. McNamara soon. Ms. McNamara never received the potential meeting dates from Mr. Yerka.

WATER STRATEGY AND HYDRO LICENSING

Duke Energy Corporation
Regulated and Renewable Energy
526 South Church Street / EC12Q
Charlotte, NC 28202

March 30, 2023

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 1

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (i.e., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The Commission approved the RSP with modifications on January 4, 2023.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II Complex. These studies are:

- Water Resources Study
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

Duke Energy is filing this Study Progress report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Rachel McNamara
Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Herb Nadler
Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

Keith Bluecloud
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Oglethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Jamie Higgins
NEPA Policy Office
U.S. Environmental Protection Agency, Region IV, Atlanta Federal Center
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Tom Rice
U.S. House of Representatives (CD7)
325 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Burr
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

Office of Senator Graham
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Chris Whitmire
North Carolina House of Representatives
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Goudreau
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
P.O. Box 11649
Columbia, SC 29211-1649

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
Mayor
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Joe Moore
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

David Owens
City of Pickens, SC
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

David Bereskin
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Tyler Howe
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

Non-Governmental

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Bad Creek Pumped Storage Project
Relicensing Study Progress Report No. 1
March 30, 2023

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed

six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines

In addition, Duke Energy provides the following clarifications regarding the Discussion and Staff Recommendations included in the Study Plan Determination (SPD):

- FERC recommended that Duke Energy modify the Recreation Study Plan to include the additional counties that will be used during the future recreation use analysis. As stated in the RSP, Duke Energy will include Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC and any counties in SC, NC, and GA that are reported on the recreation user surveys. Since recreation user surveys have not been completed yet, Duke Energy is unable to list what counties will be reported at this time.
- FERC recommended that Duke Energy include the 14.8 miles of trail that follow logging and access roads in the Conditions Assessment. As stated in the RSP, Duke Energy will include the entire 43 miles of trail, including 28.2 miles of singletrack trail segments and

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

14.8 miles of trail that follow logging and access roads, in the Conditions Assessment. Although the Trail Solutions guide on building singletrack will be used as a base for trail condition analysis, this will not exclude non-singletrack trail segments from analysis.

- FERC recommended that the RUN Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy. Duke Energy will prepare detailed maps of the Duke Energy-maintained, 43-mile portion of the Foothills Trail that identify parcel boundaries, current property owner(s), access locations, spur trails, structures, and facilities/amenities. In addition, as stated in the RSP, two traffic counters will be installed at the Bad Creek Hydro Project Trail Access (i.e., Bad Creek Parking Access Area and Bad Creek Road) and user surveys will be collected at this site.
- FERC requested additional details on the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. Duke Energy held a Recreation Resource Committee Meeting on March 28, 2023 to discuss the carrying capacity methodology with Jeremy Wimpey of Applied Trails Research in attendance.

The following sections summarize progress implementing the relicensing studies as of March 15, 2023.

3.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: Historical Lake Jocassee and Howard Creek water quality data collected by Duke Energy and Clemson University are being compiled and summarized.
- **Water Quality Monitoring in the Whitewater River Arm**: Data collection for the first field season will begin in June 2023 and extend through September 2023.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** Velocity effects and vertical mixing will be evaluated by first developing a 2-dimensional hydraulic model to determine the boundaries of the velocity effects. The effort to develop the 2D model has been initiated by Duke Energy. Once the boundaries of the velocity effects have been determined, a CFD model will be developed for that portion of Lake Jocassee potentially affected by a second discharge. The CFD output will be used to evaluate the potential effects of Bad Creek II

operation on stratification in Lake Jocassee. Initial model output is projected to be available in third quarter 2023.

- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model will be used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee reservoir level fluctuations. Initial model results are anticipated to be available in the third quarter of 2023.
- **Future Water Quality Management Plan (WQMP) Development:** Work to develop the WQMP will begin in 2024 after the other Water Resources Study components are complete and additional information is available regarding the construction of a second powerhouse. The WQMP, which will be developed in consultation with the Water Resources, Aquatic Resources, and Wildlife and Botanical Resources Resource Committees (RCs), will likely not be included in the final Water Resources Study. Duke Energy anticipates the WQMP will be developed as a separate standalone management plan and included in the Draft and/or Final License Application.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

4.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment:** The previously completed desktop entrainment study has been updated based on stakeholder comments received since the filing of the Pre-Application Document. It will be provided directly to Aquatic Resources RC members and discussed during the spring 2023. A meeting has been scheduled with the Aquatics Resource Committee on April 6, 2023 to discuss the study results. The final report will be provided to the RC members during the fourth quarter of 2023.
- **Desktop Studies on Pelagic and Littoral Habitat Effects:** This effort will use results of the CFD and CHEOPS modeling from the Water Resources Study. CFD modeling results will be used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results will be used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects.

- **Mussel Surveys and Stream Habitat Quality Surveys:** Fieldwork for the surveys will begin in July 2023 to evaluate construction of the Bad Creek II Complex.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

5.0 VISUAL RESOURCES STUDY

Preliminary work has begun to develop the existing landscape description and to build the viewshed model that will be used for the Seen Area Analysis. As communicated during the Joint RC meeting in February 2023, Duke Energy plans to work with Recreation & Visual Resources RC members during the summer of 2023 to identify Key Views. Photographs will be taken from the Key Views in November 2023 during leaf-off conditions.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

6.0 RECREATIONAL RESOURCES STUDY

The components of the Recreation Resources Study and status of each are provided below:

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data collection began in September 2022 with a break in February 2023. Data collection is on-going and scheduled to continue through November 2023.
- **Foothills Trail Condition Assessment**: Duke Energy has retained a consultant to complete the evaluation. Fieldwork will begin in spring 2023. Duke Energy anticipates distributing a draft study report for Recreation RC review in the fourth quarter of 2023.
- **Whitewater River Cove Existing Recreational Use Evaluation**: Drone flights to capture recreational boating in the Whitewater River Cove will begin in May 2023. Duke Energy anticipates distributing a draft study report to Recreation Resources RC members in the fourth quarter of 2023.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling velocity data developed in the Water Resources Study with the Whitewater River Cove recreational use data captured during the 2023 boating season. The draft report will be distributed to Recreational Resources RC members in the spring 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

7.0 CULTURAL RESOURCES STUDY

The archaeological survey began in March and is scheduled to be complete by August 2023. Duke Energy anticipates the draft survey report will be distributed to the South Carolina State Historic Preservation Office, federally-recognized Indian Tribes, and other consulting parties in the fourth quarter of 2023.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

8.0 ENVIRONMENTAL JUSTICE STUDY

Data compilation and analysis of EJ communities has begun. Duke Energy anticipates distributing a draft study report to the Operations RC during the second quarter of 2023. Preliminary results indicate there may be no adverse effects to EJ communities, so the public outreach meeting included in the study plan may not be warranted. The need for such a meeting will be discussed with the Operations RC during the summer of 2023 in conjunction with its review of the draft study report.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

Subject: FW: Bad Creek FERC Project No. 2740 - Relicensing Study Progress Report 1
Attachments: 2023.03.30_Bad Creek Project_Study Progress Report 1.pdf

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Friday, March 31, 2023 10:31 AM
To: amedeemd@dhec.sc.gov; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Baker, Lisa - United Keetoowah Band of Cherokee Indians <ukbthpo-larue@yahoo.com>; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Wes Cooler <wes.cooler@mac.com>; Andy Douglas <adoug41@att.net>; Fell, Aiden - SCDPRT <afell@scprt.com>; Andrew Gleason <andrewandwilla@hotmail.com>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; glenn@hilliardgrp.com; Erika Hollis <ehollis@upstateforever.org>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rice, Garry S <Garry.Rice@duke-energy.com>; Lorianne Riggin <rigginl@dnr.sc.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Chris Starker <cstarker@upstateforever.org>; Dale Wilde <dwilde@keoweefolks.org>; suewilliams130@gmail.com; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; cloningerp@dnr.sc.gov; Tom Daniel <danielt@dnr.sc.gov>; mixong@dnr.sc.gov; Alex Pellett <PellettC@dnr.sc.gov>; RankinD@dnr.sc.gov; Amy Breedlove <BreedloveA@dnr.sc.gov>; quattrol@dnr.sc.gov; William T. Wood <woodw@dnr.sc.gov>; kernm@dnr.sc.gov; Scott Harder <harders@dnr.sc.gov>; More, Priyanka <morep@dnr.sc.gov>; Ken Forrester <forresterk@dnr.sc.gov>; Austen Attaway <attawaya@dnr.sc.gov>; bradleyk@dnr.sc.gov; Andrew Grosse <grossea@dnr.sc.gov>; Jennifer Kindel <kindelj@dnr.sc.gov>; simmonsw@dnr.sc.gov; Samantha Tessel <Tessels@dnr.sc.gov>; Christopher Moore <moorec@dnr.sc.gov>; taylors@dnr.sc.gov; caitlin.rogers <caitlin.rogers@catawba.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Abney, Michael A <Michael.Abney@duke-energy.com>; Bennett, Jennifer Wright <Jennifer.Bennett@duke-energy.com>; Raber, Maverick James <Maverick.Raber@duke-energy.com>; Wahl, Nick <Nick.Wahl@duke-energy.com>; Churchill, Christy <Christy.Churchill@duke-energy.com>; Keener, Paul <Paul.Keener@duke-energy.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Settevendemio, Erin <Erin.Settevendemio@hdrinc.com>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>; Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>; Green, William G <Bill.Green@terracon.com>; Benjamin.Williamson <Benjamin.Williamson@duke-energy.com>; Santos, Sarah Anna <Sarah.Santos@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Shepherd, Forest T <Forest.Shepherd@ncdenr.gov>; Peoples, Danielle <Danielle.Peoples@duke-energy.com>; mills.dorn@terracon.com; Ziegler, Ty <ty.ziegler@hdrinc.com>; jphillips@greenvillewater.com; ejohnson@scdah.sc.gov; Todd Branham <epicrides@gmail.com>; Terry Keane <jtk7140@gmail.com>; Gerry Yantis <gcyantis2@gmail.com>; Huff, Jen <Jen.Huff@hdrinc.com>; ellen.morton <Ellen.Morton@duke-energy.com>; jhains@g.clemson.edu
Subject: Bad Creek FERC Project No. 2740 - Relicensing Study Progress Report 1

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning Bad Creek Relicensing Stakeholders,

Please find attached to this email the first Study Progress Report filed with the Federal Energy Regulatory Commission (FERC) supporting the ongoing Bad Creek Pumped Storage Project relicensing effort. These study progress reports are required under the Integrated Licensing Process and are issued quarterly.

As you may recall, FERC issued their Study Plan Determination earlier this year approving our Revised Study Plan (RSP). We are now beginning to conduct those studies outlined in the RSP and for those interested in study details please visit www.badcreekpumpedstorage.com for more information. We are now meeting frequently with our established Environmental Resource Committees and plan to continue to heavily engage those resource committees during the study conduct phase of relicensing.

Thank you for your meaningful participation in the relicensing of the Bad Creek Project. We look forward to working with stakeholders throughout the 2023 study season, including sharing study results with you as they become available.

If you need something, we are always available to assist you so please don't hesitate to ask.

Thank you !
Alan

Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

WATER STRATEGY AND HYDRO LICENSING

Duke Energy Corporation
Regulated and Renewable Energy
526 South Church Street / EC12Q
Charlotte, NC 28202

June 28, 2023

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 2

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (i.e., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The Commission approved the RSP with modifications on January 4, 2023.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II Complex. These studies are:

- Water Resources Study
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

Duke Energy is filing this Study Progress report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Herb Nadler
Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711
herbn@sepa.doe.gov

Keith Bluecloud
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Keith.bluecloud@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Oglethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Jamie Higgins
NEPA Policy Office
U.S. Environmental Protection Agency, Region IV, Atlanta Federal Center
61 Forsyth St S.W.
Atlanta, GA 30303-8931
higgins.jamie@epa.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Tom Rice
U.S. House of Representatives (CD7)
325 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Burr
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

Office of Senator Graham
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Chris Whitmire
North Carolina House of Representatives
136 Whitmire Farms Dr
Brevard, NC 28712
Chris.Whitmire@ncleg.net

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.wood@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
P.O. Box 11649
Columbia, SC 29211-1649

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Joe Moore
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
joe.moore@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

David Owens
City of Pickens, SC
P.O. Box 217
Pickens, SC 29671
dowens@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

Jeff Boss
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Cherokee Nation of Oklahoma
P.O. Box 948
Tahlequah, OK 74465

Tyler Howe
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Lisa Baker
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
ukbthpo-larue@yahoo.com

Non-Governmental

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Bad Creek Pumped Storage Project
Relicensing Study Progress Report No. 2
June 28, 2023

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines

In addition, Duke Energy provided the following clarifications regarding the Discussion and Staff Recommendations included in the SPD in Study Progress Report No. 1:

- FERC recommended that Duke Energy modify the Recreation Study Plan to include the additional counties that will be used during the future recreation use analysis. Duke Energy will include Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC and additional counties in SC, NC, and GA that are reported on the recreation user surveys. Since recreation user surveys have not been completed yet, Duke Energy is unable to list what counties will be reported at this time.
- FERC recommended that Duke Energy include the 14.8 miles of trail that follows logging and access roads in the Conditions Assessment. Duke Energy is evaluating the entire 43 miles of trail, including 28.2 miles of single-track trail segments and 14.8 miles of trail that follow logging and access roads in the Conditions Assessment.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

- FERC recommended that the RUN Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy. Duke Energy will prepare detailed maps of the Duke Energy-maintained, 43-mile portion of the Foothills Trail that identify parcel boundaries, current property owner(s), access locations, spur trails, structures, and facilities/amenities. Two traffic counters have been installed at the Bad Creek Hydro Project Trail Access (i.e., Bad Creek Parking Access Area and Bad Creek Road) and user surveys are being collected at this site.
- FERC requested additional details on the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. Duke Energy held a Recreational Resources Study Resource Committee (RC) meeting on March 28, 2023, to discuss the carrying capacity methodology.

The following sections summarize progress implementing the relicensing studies since Study Progress No. 1 was filed.

3.0 POTENTIAL TEMPORARY ACCESS ROAD

Duke Energy is evaluating the development of a temporary access road to the Fisher Knob community for use during Bad Creek II construction. The gravel service road would be approximately 3.7 miles long, primarily follow an existing unmaintained logging road on property owned by Duke Energy, and would only be maintained during construction of Bad Creek II. The current routes under consideration are shown on Figure 1.

The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been modified to assess the potential effects of the temporary access road as further discussed below. In addition, Duke Energy will be conducting a natural resources assessment of the proposed route to identify potential terrestrial and aquatic resources requiring additional evaluation. The results of this assessment will be shared directly with the Wildlife and Botanical Resources RC.

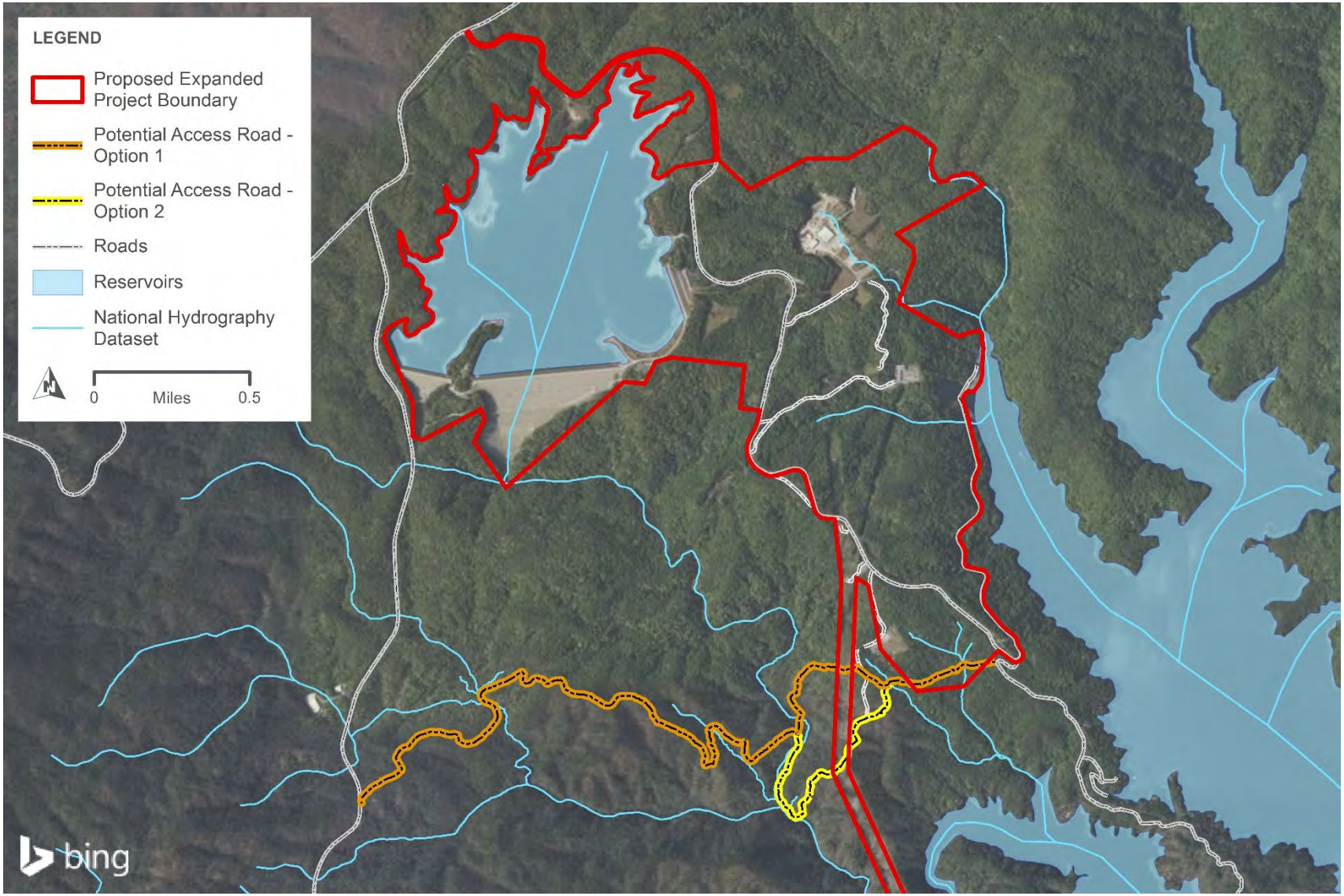


Figure 1. Potential Temporary Access Road

4.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: Historical Lake Jocassee and Howard Creek water quality data collected by Duke Energy and Clemson University have been compiled and summarized. A virtual meeting was held on May 16 with the Water Resources Study RC to discuss findings of the existing water quality study effort; the draft report will be distributed to the Committee by June 30.
- **Water Quality Monitoring in the Whitewater River Arm**: Water quality instrumentation was deployed at three locations in the Whitewater River arm of Lake Jocassee, May 22-23, 2023. Data collection began in June 2023 and will extend through September 2023.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** Development of the 2D model to estimate the downstream boundary of velocity effects from the Project is complete, and Duke Energy is currently performing CFD model runs under various water level elevations and Project operational scenarios. Additional flow and temperature data will be collected in the Whitewater River cove to support model validation. Model output is projected to be available in third quarter 2023. A hybrid in-person/virtual meeting with the Water and Aquatic Resources RCs is scheduled for July 27, and the agenda for this meeting includes an update by Duke Energy on the CFD model development and results.
- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model will be used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee reservoir level fluctuations. Generation and pumping dispatch curves are being updated for the model and work has begun to develop performance measures. Initial model results are anticipated to be available in the third quarter of 2023. As noted above, Duke Energy will provide an update on CHEOPS modeling activities to the relevant RCs at the upcoming July 27 meeting.
- **Future Water Quality Management Plan (WQMP) Development:** Work to develop the WQMP will begin in 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate a temporary access road (Figure 1). Potential water quality effects associated with the temporary access road would be addressed in the WQMP.

5.0 AQUATIC RESOURCES STUDY

The Aquatic Resources RC met on April 6, 2023. During that meeting, Duke Energy was asked to modify the methodology for the desktop entrainment study and mussel and stream habitat quality surveys.

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment:** The updated desktop entrainment study report was provided to Aquatic Resources RC members and discussed at an Entrainment Consultation Meeting held with the Aquatic Resources RC on April 6, 2023. The outcome of this meeting was to update the entrainment analysis to include additional factors such as historical operations data, influence of operations with the addition of solar usage, pumping periods (2, 4, 6, 8, 10, and 12 hours), time period (day versus night), lake levels, and water temperature. The final report will be provided to the RC members during the fourth quarter of 2023.
- **Desktop Studies on Pelagic and Littoral Habitat Effects:** This effort will use results of the CFD and CHEOPS modeling from the Water Resources Study. CFD modeling results will be used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results will be used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. See Section 4.0 for an update on the CFD and CHEOPS modeling.
- **Mussel Surveys and Stream Habitat Quality Surveys:** Fieldwork for the surveys will begin in July 2023 to evaluate construction of the Bad Creek II Complex. In accordance with the approved study plan, stream habitat assessments for streams in potential upland spoil locations will be completed with the U.S. Environmental Protection Agency Rapid Bioassessment Protocol (USEPA RBP) Stream Habitat Assessment data form. The North Carolina Stream Assessment Method (NCSAM) will also be completed to provide additional information regarding stream quality and function. Duke Energy is currently consulting with the South Carolina Department of Natural Resources (SCDNR; calls held

on May 24 and June 21, 2023) regarding stream surveys for waters crossed by the potential temporary access road described in Section 3.0 and the spoil disposal areas.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan. The methodology for stream habitat and biological assessments for streams crossed by the temporary access road and spoil areas is currently under development in consultation with the SCDNR.

6.0 VISUAL RESOURCES STUDY

The viewshed model has been developed. Duke Energy has scheduled a July meeting with the Recreational Resources RC to identify potential Key Views. Photographs will be taken from the Key Views in November 2023 during leaf-off conditions.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan. The temporary access road route has been incorporated into the viewshed model.

7.0 RECREATIONAL RESOURCES STUDY

The Recreational Resources RC met on March 28, 2023, to discuss the Recreational Resources Study methodology and schedule. The components of the Recreational Resources Study and status of each are provided below:

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data were collected at Musterground Road between September 2022 and mid-January 2023, and again between March 20 and May 10, 2023. Data collection at the other access areas began in March 2023 and is scheduled to continue through November 2023.
- **Foothills Trail Condition Assessment**: Fieldwork began in May 2023. Duke Energy anticipates distributing a draft study report for Recreation RC review in the fourth quarter of 2023.
- **Whitewater River Cove Existing Recreational Use Evaluation**: Drone flights to capture recreational boating in the Whitewater River cove began Memorial Day weekend. Duke Energy anticipates distributing a draft study report to Recreational Resources RC members in the fourth quarter of 2023.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling velocity data developed in the Water Resources Study with the

Whitewater River cove recreational use data captured during the 2023 boating season. The draft report will be distributed to Recreational Resources RC members in the spring 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

8.0 CULTURAL RESOURCES STUDY

The archaeological survey began in March and is scheduled to be complete by August 2023. Duke Energy anticipates the draft survey report will be distributed to the South Carolina State Historic Preservation Office, federally-recognized Indian Tribes, and other consulting parties in the fourth quarter of 2023.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the geographic scope of the study area has been expanded to encompass the proposed temporary access road (Figure 1). Duke Energy will be consulting with the South Carolina State Historic Preservation Office (SCSHPO) and Tribes to formally document the change to the Area of Potential Effect, as originally conveyed via letter dated December 9, 2022.

9.0 ENVIRONMENTAL JUSTICE STUDY

Duke Energy distributed the draft study report to the Operations RC on June 6, 2023. The report identified Environmental Justice (EJ) communities within the 5-mile buffer area. However, results indicate there may be no adverse effects to EJ communities, so the public outreach meeting included in the study plan may not be warranted. The need for such a meeting will be discussed with the Operations RC during the summer of 2023 in conjunction with its review of the draft study report.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan.

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, June 28, 2023 1:57 PM
To: Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; amedeemd@dhec.sc.gov; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Baker, Lisa - United Keetoowah Band of Cherokee Indians <ukbthpo-larue@yahoo.com>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bereskin, David - Greenville Water <bereskind@greenvillewater.com>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bluecloud, Keith - USBIA ERO <keith.bluecloud@bia.gov>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Goudreau, Chris, NCWRC <chris.goudreau@ncwildlife.org>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Higgins, Jamie - USEPA <higgins.jamie@epa.gov>; hightocw@dhec.sc.gov; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Moore, Joe - City of Brevard NC <joe.moore@cityofbrevard.com>; n, herb - sepa.doe <herbn@sepa.doe.gov>; Olds, Melanie - USFWS <melanie_olds@fws.gov>; Owens, David - City of Pickens, SC <dowens@pickenscity.com>; growens@gmail.com; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred -

NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Whitmire, Chris - NC House of Representatives <Chris.Whitmire@ncleg.net>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; Alison Jakupca <Alison.Jakupca@KleinschmidtGroup.com>
Subject: Bad Creek FERC Project No. 2740 - Relicensing Study Progress Report 2

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning Bad Creek Relicensing Stakeholders,

Please find attached to this email the second Study Progress Report filed with the Federal Energy Regulatory Commission (FERC) supporting the ongoing Bad Creek Pumped Storage Project relicensing effort. These study progress reports are required under the Integrated Licensing Process and are issued quarterly.

As you may recall, FERC issued their Study Plan Determination earlier this year approving our Revised Study Plan (RSP). We are making excellent progress on those studies outlined in the RSP and for those interested in study details please visit www.badcreekpumpedstorage.com for more information. We are now meeting more frequently with our established Environmental Resource Committees and plan to continue to actively engage those resource committees during the study conduct phase of relicensing.

Thank you for your meaningful participation in the relicensing of the Bad Creek Project. We look forward to working with stakeholders throughout the 2023 study season, including sharing study results with you as they become available.

If you need something, we are always available to assist you so please don't hesitate to ask.

Thank you !
Alan

DUKE ENERGY.
Alan W. Stuart
Senior Project Manager, Water Strategy & Hydro Licensing
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, - EC12Q | Charlotte, NC 28202
Office 980-373-2079 | Cell 803-640-8765

WATER STRATEGY AND HYDRO LICENSING

Duke Energy Corporation
Regulated and Renewable Energy
526 South Church Street / EC12Q
Charlotte, NC 28202

September 27, 2023

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 3

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (i.e., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The Commission approved the RSP with modifications on January 4, 2023.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II Complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

Duke Energy is filing this Study Progress report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Goudreau
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.goudreau@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Donna Owen
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
donnaowen@pickenscity.com

Gregory Dietterick
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

David Bereskin
Greenville Water
P.O. Box 687
Greenville, SC 29602
bereskind@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
415 S. Pine St
Walhalla, SC 29691
abrock@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Bad Creek Pumped Storage Project
Relicensing Study Progress Report No. 3
September 27, 2023

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

In addition, Duke Energy provided the following clarifications regarding the Discussion and Staff Recommendations included in the SPD in Study Progress Report No. 1:

- FERC recommended that Duke Energy modify the Recreation Study Plan to include the additional counties that will be used during the future recreation use analysis. Duke Energy will include Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC and additional counties in SC, NC, and GA that are reported on the recreation user surveys. Since recreation user surveys had not yet been completed yet, Duke Energy was unable to list what counties would be reported at that time.
- FERC recommended that Duke Energy include the 14.8 miles of trail that follows logging and access roads in the Conditions Assessment. Duke Energy is evaluating the entire 43 miles of trail, including 28.2 miles of single-track trail segments and 14.8 miles of trail that follow logging and access roads in the Conditions Assessment.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

- FERC recommended that the Recreation Use and Needs (RUN) Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy. Duke Energy will prepare detailed maps of the Duke Energy-maintained, 43-mile portion of the Foothills Trail that identify parcel boundaries, current property owner(s), access locations, spur trails, structures, and facilities/amenities. Two traffic counters have been installed at the Bad Creek Hydro Project Trail Access (i.e., Bad Creek Parking Access Area and Bad Creek Road) and user surveys are being collected at this site.
- FERC requested additional details on the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. Duke Energy held a Recreational Resources Study Resource Committee (RC) meeting on March 28, 2023, to discuss the carrying capacity methodology.

In its Study Progress Report No. 2, Duke Energy provided information on a potential temporary access road to the Fisher Knob community. The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were expanded to incorporate the areas potentially affected by the temporary road.

The following sections summarize progress implementing the relicensing studies since Study Progress Report No. 2 was filed.

3.0 WATER RESOURCES STUDY

The Water Resources RC and Aquatics Resources RC met jointly on July 27, 2023.

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: Historical Lake Jocassee and Howard Creek water quality data collected by Duke Energy and Clemson University have been compiled and summarized. The draft report was distributed to Water Resources RC members for their review on June 28, 2023, with comments due by August 28, 2023. Organizations that provided comments on the draft report include Friends of Lake Keowee Society (FOLKS) and Upstate Forever; U.S. Fish and Wildlife Service (USFWS). Advocates for Quality Development (AQD) reviewed the report but had no comments. Duke Energy addressed stakeholder comments in the final study report, which is provided in Attachment A.

- **Water Quality Monitoring in the Whitewater River Arm**: Water quality instrumentation was deployed at three locations in the Whitewater River arm of Lake Jocassee, May 22-23, 2023. Data collection began in June 2023 and will extend through September 2023. Duke Energy has made nine field visits to download dataloggers and collect water quality profile data (DO and temperature) since initial deployment. During three of these trips, water velocity at depth was measured with an acoustic Doppler current profiler (ADCP) across several transects in the Whitewater River arm to collect verification data for CFD model results.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** Development of the CFD model and model runs under various Lake Jocassee water level elevations and Project operational scenarios is complete. Model results were presented and discussed at the July 27, 2023, joint RC meeting; the draft report was provided to the Water Resources RC for review on September 11, 2023. Comments are due by October 11, 2023.
- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model will be used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee reservoir level fluctuations. The Water Resources and Aquatics Resources RCs reviewed performance measures that will be used to evaluate model output at the joint RC meeting on July 27; a follow-up meeting (virtual) with the South Carolina Department of Natural Resources (SCDNR) was held on August 17 to further discuss performance measures. Duke Energy expects to schedule a follow-up meeting in October 2023 with the Joint RC to review model results. Following the meeting, Duke Energy will provide the report to the Water Resources and Operations RCs for a 30-day comment period.
- **Future Water Quality Management Plan (WQMP) Development:** Work to develop the WQMP will begin in 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate a temporary access road. Potential water quality effects associated with the temporary access road would be addressed in the WQMP.

4.0 AQUATIC RESOURCES STUDY

The Water Resources RC and Aquatics Resources RC met jointly on July 27, 2023.

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment:** The desktop entrainment study report has been revised to include historical operations data, an assessment of the influence of operations with the increase of renewable energy production, pumping periods (2, 4, 6, 8, 10, and 12 hours), diurnal periods (day versus night), lake levels, and water temperature. The final report will be provided to the RC members during the fourth quarter of 2023.
- **Desktop Studies on Pelagic and Littoral Habitat Effects:** This effort will use results of the CFD and CHEOPS modeling from the Water Resources Study. CFD modeling results will be used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results will be used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. See Section 3.0 for an update on the CFD and CHEOPS modeling.
- **Mussel Surveys and Stream Habitat Quality Surveys:** Mussel surveys were completed the week of July 24, 2023. In consultation with the SCDNR per their request, Duke Energy has refined the methodology for evaluating stream habitat and potential effects to stream function resulting from construction of a temporary access road by implementing the SCDNR Stream Quantification Tool (SQT). This tool includes assessments of stream hydrology, hydraulics, geomorphology, and biology. A summary of the approach to field studies related to the temporary access road and upland spoil locations is described in Attachment B. Stream habitat surveys at uplands spoil locations were completed September 11-13, 2023. Fish surveys in support of the SQT were completed in July and September 2023. A third and final fish survey will occur in October 2023. Habitat surveys for streams crossed by the temporary access road using the SCDNR SQT methodology will be completed in October 2023. Results of the mussel, fish, and stream habitat surveys will be summarized in a report to be shared with the Aquatic Resources RC in Q4 2023.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has been expanded to include the temporary access road.

5.0 VISUAL RESOURCES STUDY

The Recreational Resources RC met on July 27, 2023, to discuss the Visual Resources Study and hear an update on the Recreational Resources Study.

The viewshed model has been developed. The Recreational Resources RC identified six potential Key Views during the July 27, 2023, meeting. Photographs will be taken from the Key Views in November 2023 during leaf-off conditions. The Recreational Resources RC will review the resulting photos and select four for use with the remaining visual resources study tasks.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan. The temporary access road route has been incorporated into the viewshed model.

6.0 RECREATIONAL RESOURCES STUDY

The Recreational Resources RC met on July 27, 2023, to discuss the Visual Resources Study and hear an update on the Recreational Resources Study.

The components of the Recreational Resources Study and status of each are provided below:

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data were collected at Musterground Road between September 2022 and mid-January 2023, and again between March 20 and May 10, 2023. A traffic counter was reinstalled at Musterground Road in early September 2023 and will continue to collect data through mid-January 2024. Data collection at the other access areas began in March 2023 and is scheduled to continue through November 2023.
- **Foothills Trail Condition Assessment**: Fieldwork began in May 2023. Duke Energy anticipates distributing a draft study report for Recreation RC review in the fourth quarter of 2023.
- **Whitewater River Cove Existing Recreational Use Evaluation**: Drone flights to capture recreational boating in the Whitewater River cove began Memorial Day weekend and ended Labor Day. Duke Energy anticipates distributing a draft study report to Recreational Resources RC members in the fourth quarter of 2023.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling velocity data developed in the Water Resources Study with the

Whitewater River cove recreational use data captured during the 2023 boating season. The draft report will be distributed to Recreational Resources RC members in the spring 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

7.0 CULTURAL RESOURCES STUDY

The archaeological survey began in March and was completed in August 2023. Duke Energy consulted with the South Carolina State Historic Preservation Office (SCSHPO) and Tribes to modify the Area of Potential Effect (APE) to incorporate the temporary access road on September 25, 2023; concurrence from SCSHPO was received September 26, 2023.

Duke Energy anticipates the draft survey report will be distributed to the South Carolina State Historic Preservation Office, federally recognized Indian Tribes, and other consulting parties in the fourth quarter of 2023.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the geographic scope of the study area has been expanded to encompass the proposed temporary access road.

8.0 ENVIRONMENTAL JUSTICE STUDY

Duke Energy distributed the draft study report to the Operations RC on June 6, 2023, with comments due by July 6, 2023. The report identified Environmental Justice (EJ) communities within the 5-mile buffer area. Results indicate there would be no adverse effects to EJ communities associated with the relicensing of Bad Creek or construction of Bad Creek II, so the public outreach meeting included in the study plan is not warranted. No substantive comments were provided on the draft EJ report, so the report has been finalized and is included in Attachment C. No additional work is anticipated in association with the study.

Variance from Approved Study Plan

The study has been completed in accordance with the approved study plan.

9.0 WILDLIFE AND BOTANICAL UPDATE

The Wildlife and Botanical RC met (virtually) on July 31, 2023, to discuss updates regarding endangered species, the potential temporary access road, avian protection along the transmission

line corridor, and Clean Water Act permitting. A meeting summary was provided to the Wildlife and Botanical RC on August 14, 2023.

In consultation with the SCDNR, and in anticipation of information needed to support Clean Water Act permitting for Bad Creek II construction, Duke Energy also conducted herpetological surveys at potential spoil areas from September 11 to 13, 2023. Results will be summarized and shared with the Wildlife and Botanical RC.

Attachment A: Summary of Existing Water Quality Data and Standards

This page intentionally left blank.

SUMMARY OF EXISTING WATER QUALITY AND STANDARDS

FINAL REPORT

WATER RESOURCES STUDY

Bad Creek Pumped Storage Project
FERC Project No. 2740

Oconee County, South Carolina

September 12, 2023

This page intentionally left blank.

WATER RESOURCES STUDY REPORT
BAD CREEK PUMPED STORAGE PROJECT
FERC PROJECT NO. 2740
TABLE OF CONTENTS

Section	Title	Page No.
1	Project Introduction and Background	1
2	Study Goals and Objectives	2
3	Study Area	2
4	Description of Project Waters	4
4.1	Overview	4
4.2	Water Quality Standards and Use Classifications	5
4.3	Compliance with SCDHEC State Standards	8
5	Lake Jocassee	9
5.1	Data Analysis Methods	10
5.2	Water Quality Monitoring Stations	13
5.3	Water Quality Summary Results	13
5.3.1	Temperature	13
5.3.2	Dissolved Oxygen	18
	Note: (--) indicates no DO saturation data were collected at Station 565.4	24
5.3.3	pH	24
5.3.4	Phosphorus	25
5.3.5	Nitrogen	26
5.3.6	Chlorophyll a	28
5.3.7	Conductivity	29
5.3.8	Turbidity	30
5.4	Summary Pre construction vs. Post Construction Comparison	37
6	Howard Creek	40
6.1	Data Analysis Methods	40
6.2	Water Quality Monitoring Stations	42
6.3	Present-day Water Quality Summary Results	44
6.4	Compliance with SCDHEC State Standards	51
6.5	Summary Pre construction vs. Post Construction Comparison	52
6.6	Recent Howard Creek Aquatics Sampling Summary	56
7	Need for Protection, Mitigation, and Enhancement Measures to Protect Water Quality	57
8	Future Work	59
9	Variances from FERC-approved Study Plan	60
10	Germane Correspondence and Consultation	60
11	References	60

Section **Title** **Page No.**

LIST OF TABLES

Table 4-1. Bad Creek Project Construction or other Significant Events 5
Table 4-2. Surface Water Classifications of Waterbodies within Lake Jocassee Watershed 6
Table 4-3. South Carolina Numeric State Water Quality Standards for Parameters Assessed in Project Waters 7
Table 5-1. Water Quality Monitoring Station Periods of Record 13
Table 5-2. Water Temperature in Surface Waters of Lake Jocassee 17
Table 5-3. Average and Standard Deviation of Surface Temperatures, Pre vs. Post Operations . 18
Table 5-4. Dissolved Oxygen in Surface Waters of Lake Jocassee 22
Table 5-5. DO Saturation in Surface Waters of Lake Jocassee 24
Table 5-6. pH in Surface Waters of Lake Jocassee 25
Table 5-7. Phosphorus in Surface Waters of Lake Jocassee 26
Table 5-8. Total Nitrogen in Surface Waters of Lake Jocassee 27
Table 5-9. Chlorophyll a in Surface Waters of Lake Jocassee 29
Table 5-10. Conductivity in Surface Waters of Lake Jocassee 30
Table 5-11. Monitoring Stations and Years of Data 32
Table 5-12. Monitoring Station 564.1 Data Collection Details 33
Table 5-13. Monitoring Station 564.0 Data Collection Details 35
Table 5-14. Monitoring Station 560.0 Data Collection Details 35
Table 5-15. Turbidity in Surface Waters of Lake Jocassee 36
Table 5-16. Average and Standard Deviation of Depth-Averaged Temperatures, Pre vs. Post Operations 38
Table 5-17. Average and Standard Deviation of Surface Dissolved Oxygen, Pre vs. Post Operation 38
Table 5-18. Depth-Averaged Turbidity Values (NTU) over Construction Periods 40
Table 5-19. Average and Standard Deviation of Surface Turbidity, Pre vs. Post Operation 40
Table 6-1. Previous Water Quality Reports for Howard Creek 41
Table 6-2. Annual Flow Data for Howard Creek (1989-1996) 45
Table 6-3. Baseflow Discharge (cfs) for Howard Creek (1993) 46
Table 6-4. Water Quality Baseflow Conditions for Howard Creek H/1, 1993 47
Table 6-5. Water Quality Baseflow Conditions for Howard Creek H/2, 1993 47
Table 6-6. Water Quality Baseflow Conditions for Howard Creek H/6, 1993 48
Table 6-7. Water Quality Baseflow Conditions for Howard Creek H/7, 1993 49
Table 6-8. Water Quality Baseflow Conditions for Howard Creek H/9, 1993 49
Table 6-9. Range of Annual Water Quality Baseflow Data for Howard Creek, 1993 50
Table 6-10. Comparison of Water Quality Data: Pre construction vs. Post construction 52

Section **Title** **Page No.**

LIST OF FIGURES

Figure 3-1. Study Area for Desktop Review of Lake Jocassee and Howard Creek 3
Figure 5-1. Water Quality Monitoring Stations in the Whitewater River Arm of Lake Jocassee 12
Figure 5-2. Station 564.1 Pre Bad Creek Operation (top) Showing Temperature Stratification vs. Post Operation (bottom) Showing Mixing in the Water Column 16
Figure 5-3. Station 564.0 Downstream of the Weir Showing Temperature Stratification for Pre and Post Operations 16
Figure 5-4. Station 564.1 Pre Bad Creek Operation (top) Showing DO Stratification vs. Post Operation (bottom) Showing Mixing in the Water Column 21
Figure 5-5. Station 564.0 Downstream of the Weir Showing Stratification for Pre and Post Operations 21
Figure 5-6. Surface Turbidity in the Whitewater River Arm Over Construction Periods 36
Figure 6-1. Howard Creek Monitoring Sites (Abernathy et al. 1994) 44
Figure 6-2. Comparison of Pre and Post Construction TSS Values 53
Figure 6-3. Comparison of Pre and Post Construction Turbidity Values 53
Figure 6-4. Comparison of Pre and Post Construction DO Concentration 54
Figure 6-5. Comparison of Pre and Post Construction DO Saturation 54
Figure 6-6. Comparison of Pre and Post Construction pH Values 55
Figure 6-7. Comparison of Pre and Post Construction pH Values 55

Appendices

Appendix A – Duke Energy Water Quality Field and Sample Collection Procedures
Appendix B – Existing Water Quality Data Tables
Appendix C – Turbidity in Whitewater River Cove

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µS/cm	microsiemens per centimeter
Bad Creek (or Project)	Bad Creek Pumped Storage Project
Bad Creek II Complex	Bad Creek II Power Complex
Bad Creek Reservoir	Upper Reservoir
BOD_5	5-day biochemical oxygen demand
CFR	Code of Federal Regulations
cfs	cubic feet per second
DO	dissolved oxygen
Duke Energy or Licensee	Duke Energy Carolinas, LLC
ft	feet
ft msl	feet above mean sea level
FERC or Commission	Federal Energy Regulatory Commission
I/O structure	Bad Creek inlet/outlet structure
KT Project	Keowee-Toxaway Hydroelectric Project
m	meter
mg/L	milligrams per liter
mi^2	square miles
MOU	Memorandum of Understanding
NTU	Nephelometric turbidity units
ORW	Outstanding Resources Waters
RSP	Revised Study Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
stdev	standard deviation
TN	Trout Natural
TKN	Total Kjeldahl Nitrogen
TPGT	Trout Put, Grow, and Take
TR	Trout Waters
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WQMP	Water Quality Monitoring Plan

1 Project Introduction and Background

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the owner and operator of the 1,400-megawatt Bad Creek Pumped Storage Project (Project) (FERC Project No. 2740) located in Oconee County, South Carolina, approximately eight miles north of Salem. The Project utilizes the Bad Creek Reservoir as the upper reservoir (Upper Reservoir) and Lake Jocassee, which is licensed as part of the Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), as the lower reservoir.

The existing (original) license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 50-year term, with an effective date of August 1, 1977 and expiration date of July 31, 2027. The license has been subsequently and substantively amended, with the most recent amendment on August 6, 2018 for authorization to upgrade and rehabilitate the four pump-turbines in the powerhouse and increase the Authorized Installed and Maximum Hydraulic capacities for the Project.[1] Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process, as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11 of the Commission's regulations, Duke Energy developed a Revised Study Plan (RSP) for the Project and proposed six studies for Project relicensing. The RSP was filed with the Commission and made available to stakeholders on December 5, 2022. FERC issued the Study Plan Determination on January 4, 2023, which included modifications to one of the six proposed studies (Recreational Resources Study).

This report includes the findings for Task 1 (Summary of Existing Water Quality and Standards) of the Water Resources Study. The Water Resources Study is ongoing in support of preparing an application for a new license for the Project in accordance with 18 CFR §5.15, as provided in the RSP.

[1] *Duke Energy Carolinas LLC, 164 FERC ¶ 62,066 (2018)*

2 Study Goals and Objectives

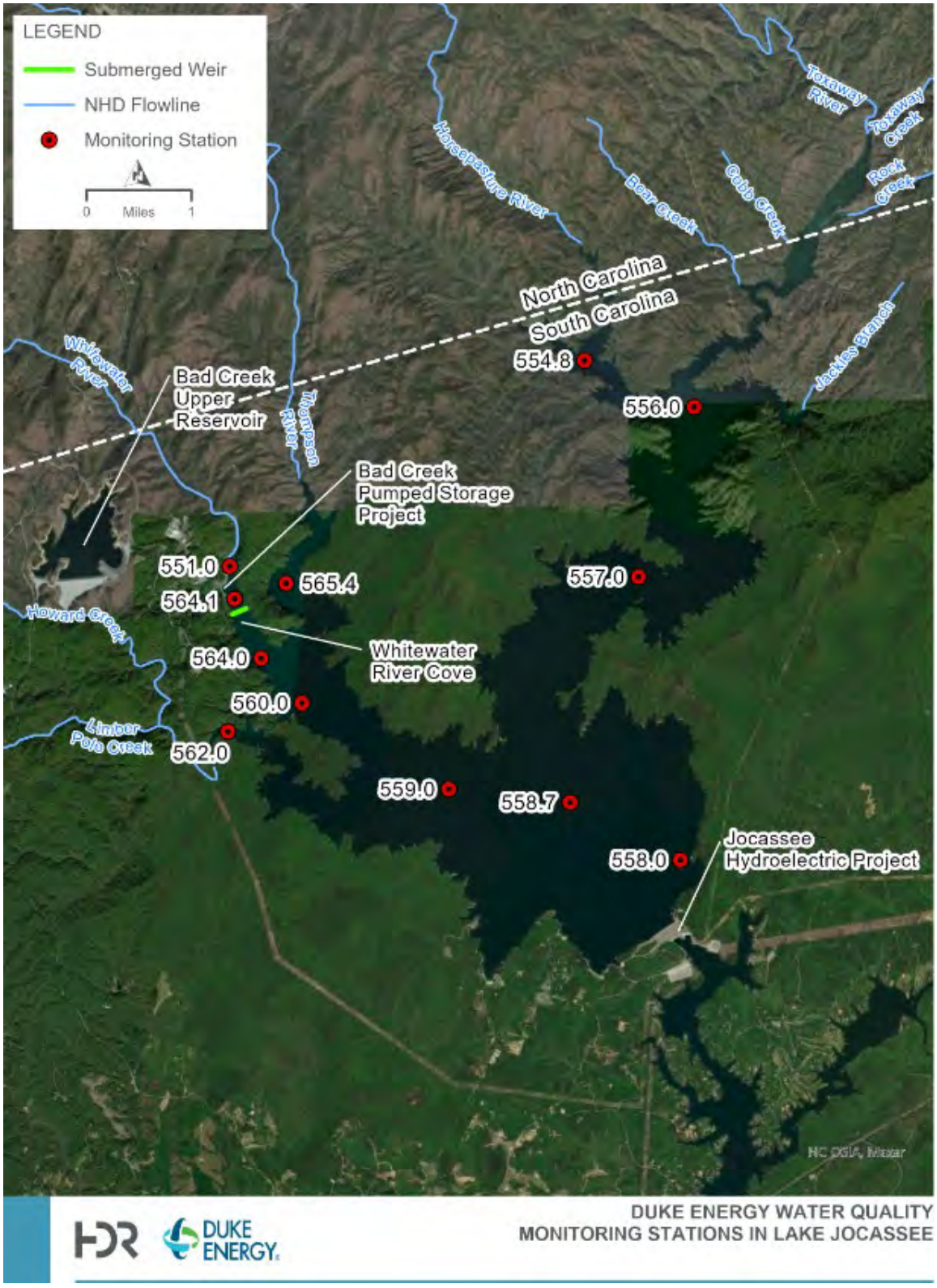
Tasks carried out for the Bad Creek Water Resources Study employ standard methodologies that are consistent with the scope and level of effort described in the RSP filed with the Commission on December 5, 2022. This report was developed in support of Task 1 of the Water Resources Study (Summary of Existing Water Quality Data and Standards) and is intended to provide sufficient information to support an analysis of the potential Project-related effects on water resources with clear nexus to the Project.

The main goal of this desktop review is to compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations, while addressing stakeholder concerns.

3 Study Area

The study area for the desktop review of existing water quality data includes Lake Jocassee (i.e., the lower reservoir) and Howard Creek (Figure 3-1), a tributary to Lake Jocassee that flows in a southeasterly direction along the downstream side of the Project dams. These are the waterbodies potentially impacted by the Project[2].

[2] Note that water quality monitoring in the Bad Creek Reservoir is not safe (due to rapid, large fluctuations in water level elevation and typically continuous Project operation) nor is it considered meaningful, given the short retention time of Bad Creek Reservoir. Due to pumping and generating cycles, retention time is approximately 3 days if only a single pump-turbine unit is operating. There are no existing water quality data in the Upper Reservoir; it is used only for Project operations and there is no public access.



Note: NHD = U.S. Geological Survey (USGS) National Hydrology Database

Figure 3-1. Study Area for Desktop Review of Lake Jocassee and Howard Creek

4 Description of Project Waters

4.1 Overview

The Project is located in the Blue Ridge physiographic province in the headwaters of the Savannah River basin. The Savannah River basin has an area of approximately 10,577 square miles (mi^2) and drains portions of the Blue Ridge, Piedmont, and Coastal Plain regions.

The Project uses the Bad Creek Reservoir as its upper reservoir, which has a drainage area of approximately 1.5 mi^2. Construction of the Project began in December 1985 and major work was completed by December 1990 (see Table 4-1); initial filling of the Bad Creek Reservoir began in January 1991. Prior to impoundment, Bad Creek and West Bad Creek were tributaries of Howard Creek (a tributary to Lake Jocassee) located near the toe of the Main Dam and West Dam, respectively. Howard Creek flows from its headwaters (northwest of the Project) and through the southern border of the Project Boundary with a drainage area of approximately 4.3 mi^2 at its downstream confluence with Limber Pole Creek. Seepage through the two earthen dams now flows into Howard Creek near the toe of each dam. Average seepage flows from the Main Dam and the West Dam are approximately 5.0 cubic feet (ft) per second (cfs) combined. Water from Bad Creek Reservoir is exchanged directly with Lake Jocassee. Due to the small drainage area of Bad Creek Reservoir, inflows are minimal and have limited to no effect on water quality or Project operations.

Lake Jocassee, which operates as the lower reservoir for the Project, was formed by impounding the Keowee River at river mile 343.6, just downstream of the confluence of the Whitewater and Toxaway rivers. Lake Jocassee has a drainage area of 145 mi^2, a surface area of approximately 7,980 acres, and approximately 92 miles of shoreline at full pond (1,110 ft above mean sea level [msl]). Water from Lake Jocassee flows directly into Lake Keowee, which was formed by impounding the Keowee River and the Little River, and the two impoundments are connected through an excavated canal creating one large impoundment. Duke Energy has monitored water quality conditions in Lake Jocassee in some capacity since the reservoir's formation in 1973.

During Project construction, excavated rockfill was hauled to the western shore of Whitewater River cove (also called Whitewater River arm), transported out into the lake on barges, and placed in the water to construct an underwater weir approximately 1,800 ft downstream of the

Project inlet/outlet (I/O) structure (weir midpoint coordinates 35.0015, -82.991509). The existing submerged weir is approximately 567 ft wide and 455 ft long with a crest elevation of approximately 1,060 ft msl. It was installed to help minimize the effects of Project operations on the natural stratification of Lake Jocassee and dissipate the energy of the discharging water from the Project's I/O structure.

For reference, Table 4-1 includes a list of significant construction (or other) events at the Project.

Table 4-1. Bad Creek Project Construction or other Significant Events

Date	Event
October 30, 1984	Project access road construction begins
December 12, 1985	Begin tunnel excavation construction
April 18, 1986	Begin main cofferdam construction
Spring 1986	Begin construction of West Abutment of Main Dam
December 6, 1986	Complete intake channel excavation
April 17, 1987	Complete main access shaft
September 14, 1987	Complete Powerhouse cavern
September 25, 1987	Complete excavation of tunnels
February 24, 1989	Complete reservoir grouting
June 11, 1990	Complete West Dam construction
July 23, 1990	Complete East Dike construction
October 10, 1990	Complete Main Dam construction
December 27, 1990	Water up power tunnel
March 15, 1991	Initial reservoir filling
March 1991	Commercial operation – Unit 1 and 2
September 1991	Commercial operation – Unit 3 and 4
August 16-17, 1994	Tropical Storm Beryl

4.2 Water Quality Standards and Use Classifications

North Carolina and South Carolina have assigned state water quality standards commensurate with a designated use of a waterbody and both states have similar categories of designated use. Some of the tributaries flowing into Lake Jocassee are wholly within North Carolina, some are wholly within South Carolina, and some flow through both states. Variations of sub-sets of general classifications between the two states exist; however, both states have recognized and distinguished between general use to maintain and support aquatic life and general contact recreation, trout habitats, and high value resource areas.

Under the authority of the South Carolina Pollution Control Act, the South Carolina Department of Health and Environmental Control (SCDHEC) Water Classification & Standards establishes appropriate water uses and protection classifications, as well as general rules and specific water quality criteria to protect existing water uses, establish anti-degradation rules, protect public welfare, and maintain and enhance water quality. Streams with the following Water Classifications are found in the Project vicinity: Outstanding Resources Waters (ORW); Trout Natural (TN); and Trout Put, Grow, and Take (TPGT). The Whitewater River is classified as ORW, Howard Creek is classified as TN, and Whitewater River tributaries are classified as ORW and TPGT (SCDHEC 2021; NCDEQ 2021). Lake Jocassee is designated as TPGT. TPGT waters are freshwaters suitable for supporting growth of stocked trout populations and a balanced indigenous aquatic community of fauna and flora. These waters are also suitable for contact recreation and as a drinking water supply source after conventional treatment. A summary of the designated use classifications for the Lake Jocassee watershed is provided in Table 4-2. Note the only waterbodies considered in this report are Lake Jocassee and the portion of Howard Creek downstream of the Project dams.

Table 4-2. Surface Water Classifications of Waterbodies within Lake Jocassee Watershed

Name	State	Description	Surface Water Classification
Bear Camp Creek	NC	From source to state line	C; TR
Bear Creek	NC	From source to state line	C; TR
Bear Creek	SC	Portion of the creek from state line to Lake Jocassee	TN
Corbin Creek	SC	The entire creek tributary to Devils Fork	ORW (TPGT)
Devils Fork Creek	SC	Portion of the creek from confluence of Corbin Creek and Howard Creek to Lake Jocassee	TN
Horsepasture River	NC	From a point approximately 0.60 mile downstream of N.C. Hwy 281 (Bohaynee Rd) to state line	B; TR, ORW
Howard Creek	SC	Portion of the creek from its headwaters to 0.3 mile below Hwy 130 upstream of the flow augmentation system at the Bad Creek Bad Creek Main Dam.	ORW (TPGT)
Howard Creek*	SC	The portion below Bad Creek Dam to Lake Jocassee	TN
Lake Jocassee*	SC	The entire lake	TPGT
Laurel Fork Creek	SC	The entire creek tributary to Lake Jocassee	TN
Limber Pole Creek	SC	The entire creek tributary to Devils Fork	TN
Rock Creek	SC	Portion of the creek within South Carolina	TN
Thompson River	NC	From source to state line	C, TR
Thompson River	SC	Portion of the river from state line to Lake Jocassee	TN

Name	State	Description	Surface Water Classification
Toxaway River	NC	From dam at Lake Toxaway Estates, Inc. to state line	C
Whitewater River	NC	From Little Whitewater Creek to state line	C, TR, HWQ
Whitewater River	SC	Portion of the river from state line to Lake Jocassee	ORW (TPGT)
Write Creek	SC	The entire creek tributary to Lake Jocassee	ORW (TPGT)
Coley Creek	SC	The portion of the creek in SC	TPGT
Devils Hole Creek	SC	The entire creek tributary to Lake Jocassee	TPGT
Jackie's Branch	SC	The entire creek tributary to Lake Jocassee	TN
Mill Creek	SC	The entire creek tributary to Lake Jocassee	TPGT

* Evaluated in this report

B- Primary Recreation, Fresh Water; C- Aquatic Life, Secondary Recreation, Fresh Water; HQW- High Quality Waters; ORW- Outstanding Resource Waters; TN- Trout-Natural; TPGT- Trout-Put, Grow, and Take; TR- Trout Waters

Sources: SCDHEC 2020, 2021; NCDEQ 2021

A summary of water quality standards for South Carolina applicable to Project waters (i.e., Blue Ridge; trout waters) is included in Table 4-3. Note that nutrient criteria (i.e., phosphorous, nitrogen, chlorophyll a) in the state of South Carolina apply only to lakes and reservoirs, not rivers and streams. Numeric nutrient criteria are based on an ecoregional approach which takes into account the geographic location of the lake and are applicable to lakes of 40 acres or more (SCDHEC 2020). In evaluating the effects of nutrients on the quality of lakes and other waters of the state, SCDHEC may consider, but not be limited to, such factors as the hydrology and morphometry of the waterbody, the existing and projected trophic state, characteristics of the loadings, and other control mechanisms to protect the existing and classified uses of the waters (SCDHEC 2020).

Table 4-3. South Carolina Numeric State Water Quality Standards for Parameters Assessed in Project Waters

Parameter	South Carolina Water Quality Standard
Temperature (applies to heated effluents only)	Not to exceed 2.8°C (5°F) above natural temperatures up to 32.2°C (90°F) Trout Waters: Not to vary from levels existing under natural conditions, unless determined some other temperature shall protect the classified uses
Dissolved Oxygen	Daily average not less than 5.0 milligrams per liter (mg/L) Instantaneous low of 4.0 mg/L Trout Waters: Not less than 6.0 mg/L
pH	Between 6.0 and 8.5 Trout Waters: between 6.0 and 8.0
Turbidity	Freshwater Lakes Only: Not to exceed 25 NTUs provided existing uses are maintained.

Parameter	South Carolina Water Quality Standard
	Trout Waters: Not to exceed 10 NTUs or 10% above natural conditions, provided existing uses are maintained.
Phosphorus	Blue Ridge – Shall not exceed 0.02 mg/L. Piedmont – Shall not exceed 0.06 mg/L.
Nitrogen	Blue Ridge – Shall not exceed 0.35 mg/L. Piedmont – Shall not exceed 1.5 mg/L.
Chlorophyll a	Blue Ridge – Shall not exceed 10 µg/L. Piedmont – Shall not exceed 40 µg/L.

Source: SCDHEC 2020

4.3 Compliance with SCDHEC State Standards

One important goal of the Clean Water Act, the South Carolina Pollution Control Act, and the State Water Quality Classifications and Standards is to maintain the quality of surface waters to provide for the survival and propagation of a balanced indigenous aquatic community of fauna and flora (SCDHEC n.d.). The degree to which aquatic life is protected is assessed by comparing important water quality characteristics and the concentrations of potentially toxic pollutants with numeric criteria. Support of aquatic life uses is determined based on the percentage of numeric criteria excursions and, where data are available, the composition and functional integrity of the biological community (SCDHEC n.d.).

South Carolina water quality standards and thresholds are listed above in Table 4-3. The SCDHEC assessment methodology (SCDHEC n.d.) states that grab samples or samples collected at a depth of 0.3 meters are considered to be a surface measurement; this is consistent with Duke Energy's surface measurement methods. For the purpose of assessment, only surface samples are used in standards comparisons and trend assessments (SCDHEC n.d.). Note that the SCDHEC and U.S. Environmental Protection Agency (USEPA) do not define the sampling method or frequency of sampling for water quality to compare to criteria, other than indicating it should be "representative" (SCDHEC n.d.).

For temperature and dissolved oxygen (DO) standards, if the percentage of criterion excursions is greater than 10 percent, but less than or equal to 25 percent, the criterion is partially supported. If the percentage of criterion excursions is 10 percent or less across the dataset, the criterion is said to be fully supported (SCDHEC n.d.).

For turbidity, phosphorus, total nitrogen, and chlorophyll a, if the individual criterion is exceeded in more than 25 percent of the samples, the criterion is considered not supported. If the criterion is exceeded in more than 10 but less than 25 percent, sites are evaluated on a case-by-case basis to determine if local conditions indicate that classified uses are impaired. If the criterion is exceeded in less than 10 percent of the samples, the criterion is considered fully supported (SCDHEC n.d.).[3]

5 Lake Jocassee

Lake Jocassee is classified as an oligotrophic waterbody exhibiting low productivity, low nutrient concentrations, and high clarity. Generally, DO concentrations (as well as percent DO saturation) remain relatively high due to the low productivity (slow consumption of oxygen due to limited biological activity and benthic decomposition rates) (Dobson and Frid 2009). It is a monomictic lake experiencing seasonal thermal stratification (summer) and mixing (winter); however, the lake's geomorphological characteristics sometimes result in minor mixing between the upper and lower levels of the water column, allowing for thermal stratification to persist for several years without turn-over (Duke Power Company 1995).

Lake Jocassee is included in the highest water quality classification (i.e., excellent rating) as designated by SCDHEC and preservation of existing conditions is recommended, with most tributaries within the watershed fully supporting their designated use. It is one of only a few reservoirs in South Carolina possessing the necessary aquatic habitat (water temperature and DO) to support both warmwater and coldwater (salmonid [trout]) fisheries year-round (USACE 2014). SCDHEC has consistently identified Lake Jocassee, as well as downstream Lake Keowee, among the cleanest South Carolina reservoirs based on previous data and recent data continue to indicate Lake Jocassee fully supports aquatic life and recreational designated uses (USACE 2014).

[3] Note that the goal of the standards for aquatic life uses is the protection of a balanced indigenous aquatic community; therefore, biological data are the ultimate deciding factor, regardless of chemical conditions. If biological data show a healthy, balanced community, the use is considered supported even if chemical parameters do not meet the applicable criteria (SCDHEC n.d).

5.1 Data Analysis Methods

Water quality datasets for Lake Jocassee were received directly from Duke Energy's Environmental Science Group in July 2022 (Microsoft Excel®). Methods for water quality data collection, calibration, data entry, and quality control have followed Duke Energy standard operating procedures (SOPs) and guidelines, which have been reviewed and updated periodically since inception of the environmental monitoring program. Duke Energy's most recent water quality monitoring SOPs are the Duke Energy Water Quality Field Procedure (ESFP-SW-0503, Rev1) and the Duke Energy Water Chemistry Sample Collection ESFP-SW-0504, Rev0), which are included for reference in Appendix A.

To satisfy the objective of summarizing existing water quality conditions and comparing them to conditions that existed prior to Project construction, Lake Jocassee water quality data were pooled and separated into two time periods: pre operations and post operations. Because Units 1 and 2 began commercial operation in March 1991 (see Table 4-1), the post operation period (also called post construction period) is 1991-2020. The start year for data from the pre operation/pre construction period is not consistent between monitoring stations but on average, data measurements began in the late 1970's. The pre operation period is considered any year prior to 1991.

Vertical water column measurements were averaged for every 15-foot interval for each month of the year[4] to show average seasonal trends for each of the following water quality parameters:

- Temperature (degrees Celsius [°C])
- Dissolved oxygen (mg/L)
- Dissolved oxygen percent saturation (%)
- pH (Standard units)
- Phosphorus (mg/L)
- Nitrogen (mg/L)
- Chlorophyll a (mg/L)
- Conductivity (microsiemens per centimeter [µS/cm])

[4] Winter months include December through February, spring is March through May, summer is June through August, and fall is September through November.

Water quality data are summarized in Section 5.3 and accompanying detailed data tables are provided in Appendix B for depth and surface-averaged measurements for individual monitoring stations shown on Figure 3-1.

Because water in the Whitewater River arm is directly exchanged with waters of the Upper Reservoir, a separate water quality analysis was carried out for three existing monitoring stations in the Whitewater River cove since those stations are most impacted by Project operations (Stations 564.1, 564.0, and 560.0 shown on Figure 5-1). For the Whitewater River cove analysis, a third time period covering the years during Project construction (1985-1991) was evaluated in addition to pre and post construction.

Turbidity values (vertical profiles) were also assessed at the three Whitewater River cove locations to identify; (1) potential relationships between past project construction activities (or other external drivers such as major storms) and increased turbidity, (2) downstream extent of turbidity impacts in Whitewater River cove, and (3) approximate length of time for elevated turbidity levels to recover. Turbidity data are compiled and presented in a format that shows pre construction, construction, and post construction conditions. This information can be used to help inform future potential water quality/turbidity impacts due to the potential construction of Bad Creek II.

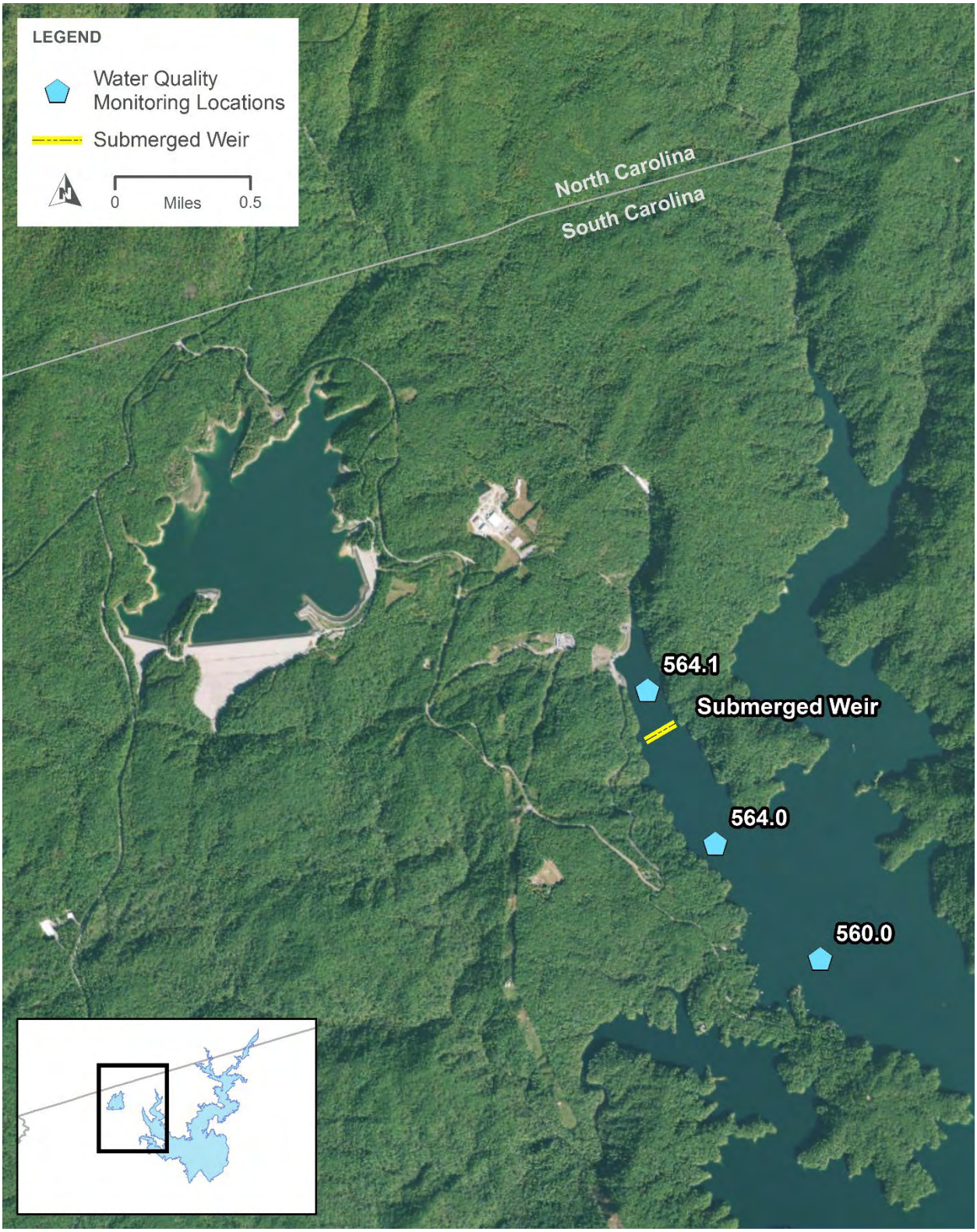


Figure 5-1. Water Quality Monitoring Stations in the Whitewater River Arm of Lake Jocassee

5.2 Water Quality Monitoring Stations

Twelve water quality monitoring stations have been routinely measured by Duke Energy over the last 40 years (Figure 3-1). Depth-averaged and surface data are included in Appendix B for each station. Periods of record for each monitoring station are provided in Table 5-1. Minimum reading elevations[5] (ft msl) at each monitoring station are also presented in Table 5-1. Normal maximum pond elevation is 1,110 ft msl and normal minimum pond elevation is 1,080 ft msl.

Table 5-1. Water Quality Monitoring Station Periods of Record

Monitoring station	Start Year	End Year	Minimum Reading Elevation (ft)
558.7	1987	2015	763
558.0	1975	2020	757
559.0	1987	2015	793
560.0*	1975	2015	826
562.0	1980	2015	965
565.4	1987	1994	918
551.0	1975	2011	1083
564.0*	1976	2015	865
564.1*	1987	2017	960
557.0	1975	2015	820
554.8	1986	2015	945
556.0	1975	2015	918

*Whitewater River arm

As stated previously, water quality at Stations 564.1, 564.0, and 560.0 in the Whitewater River arm were assessed separately over three periods since those locations are most impacted by Project construction and operation due to proximity. The data from these stations also provide information on the function of the submerged weir. Additionally, turbidity values are summarized at the three monitoring stations in the Whitewater River arm (discussed in Section 5.3.8).

5.3 Water Quality Summary Results

5.3.1 Temperature

Water temperature dictates the types of biota that can survive in a waterbody, affects metabolic rates and photosynthesis, influences the rates of chemical reactions, and impacts the physical

[5] Minimum reading elevations are at or near the reservoir bottom for each monitoring station.

capacity of water to hold DO. Water temperature is also important because of its influence on water chemistry; the rate of chemical reactions generally increases at higher temperatures (USGS 2018a). Thermal stratification in a lake is a seasonal phenomenon that occurs from late spring to late fall in temperate regions. In the summer, the uppermost layer of water is warmed by the sun and cooler water in the lower water column begins to separate from the top, resulting in a warmer layer of water at the top (i.e., epilimnion) and a heavier/denser layer of water at the bottom (i.e., hypolimnion). The thinner layer that separates the warmer upper waters from the cooler bottom waters is the metalimnion or thermocline, which acts as a barrier that prevents mixing and heat exchange between the epilimnion and hypolimnion. During winter, there is usually little temperature stratification as the entire lake cools. In Lake Jocassee, the depth of the thermocline varies between locations in the lake (based on depth and geomorphology) as well as between seasons.

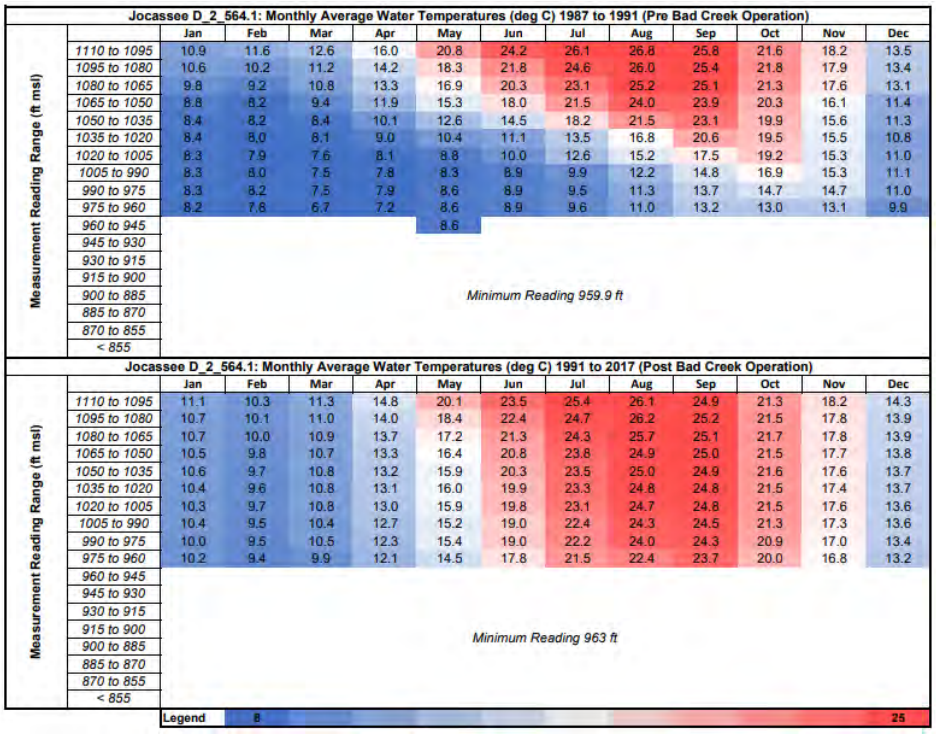
Because temperatures at depth determine patterns of stratification (i.e., warmer water in the upper water column, cooler water at depth), depth-averaged temperatures were assessed during this desktop review as well as surface water temperatures. Over the entire reservoir at all depths, Lake Jocassee winter temperatures range between 0 and 17°C, with an average of 10°C. Thermal stratification is not prevalent in the winter months (December – February) and at some stations, February temperatures vary by less than one degree between surface and bottom waters. Spring temperatures range from 5 to 25°C with an average of 11°C. Stratification begins to form in the upper third of the water column as temperatures continue to warm towards late spring. Summer temperatures range from 7 to 30°C with an average of 15°C. Stratification continues to develop through summer and extends further down into the water column. Fall temperatures range from 7 to 28°C with an average of 15°C. Stratification peaks in early fall and begins to wane as temperatures cool. All data tables showing temperatures and patterns of stratification for each monitoring station are included in Appendix B.

Bad Creek operational impacts to temperature are limited to monitoring Station 564.1 in the Whitewater River cove, which is between the I/O structure and submerged weir (see Figure 5-1). Monthly average temperatures within the water column at this location are nearly uniform after 1991 (post Bad Creek operation) (Figure 5-2). Vertical mixing from Bad Creek operations eliminates any stratification at this monitoring station regardless of season. The pre construction

depth-averaged temperature at Station 564.1 is 13.9°C, and the post construction average temperature at Station 564.1 (through 2017) is 17.2°C, a difference of 3.3°C.

Monitoring Station 564.0 (see Figure 5-3) is located downstream of the submerged weir and in contrast to Station 564.1, stratification is prevalent at this location after 1991. There is very little difference in temperature profiles between pre and post Bad Creek operations at Station 564.0. This is primarily due to the presence of the submerged weir, which limits mixing downstream of the weir structure (i.e., mixing is confined to the portion of the Whitewater River cove upstream of the submerged weir).

Tables of monthly averaged temperature profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B. Additionally, tables of data showing depth-averaged temperatures for pre construction, construction, and post construction in the Whitewater River arm indicating changing stratification trends are included in Appendix B.



Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	11.6	12.6	16.0	20.8	24.2	26.1	26.8	25.8	21.6	18.2	13.5
1095 to 1080	10.6	10.2	11.2	14.2	18.3	21.8	24.6	26.0	25.4	21.8	17.9	13.4
1080 to 1065	9.8	9.2	10.8	13.3	16.9	20.3	23.1	25.2	25.1	21.3	17.6	13.1
1065 to 1050	8.8	8.2	9.4	11.9	15.3	18.0	21.5	24.0	23.9	20.3	16.1	11.4
1050 to 1035	8.4	8.2	8.4	10.1	12.6	14.5	18.2	21.5	23.1	19.9	15.6	11.3
1035 to 1020	8.4	8.0	8.1	9.0	10.4	11.1	13.5	16.8	20.6	19.5	15.5	10.8
1020 to 1005	8.3	7.9	7.6	8.1	8.8	10.0	12.6	15.2	17.5	19.2	15.3	11.0
1005 to 990	8.3	8.0	7.5	7.8	8.3	8.9	9.9	12.2	14.8	16.9	15.3	11.1
990 to 975	8.3	8.2	7.5	7.9	8.6	8.9	9.5	11.3	13.7	14.7	14.7	11.0
975 to 960	8.2	7.8	6.7	7.2	8.6	8.9	9.6	11.0	13.2	13.0	13.1	9.9
960 to 945					8.6							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

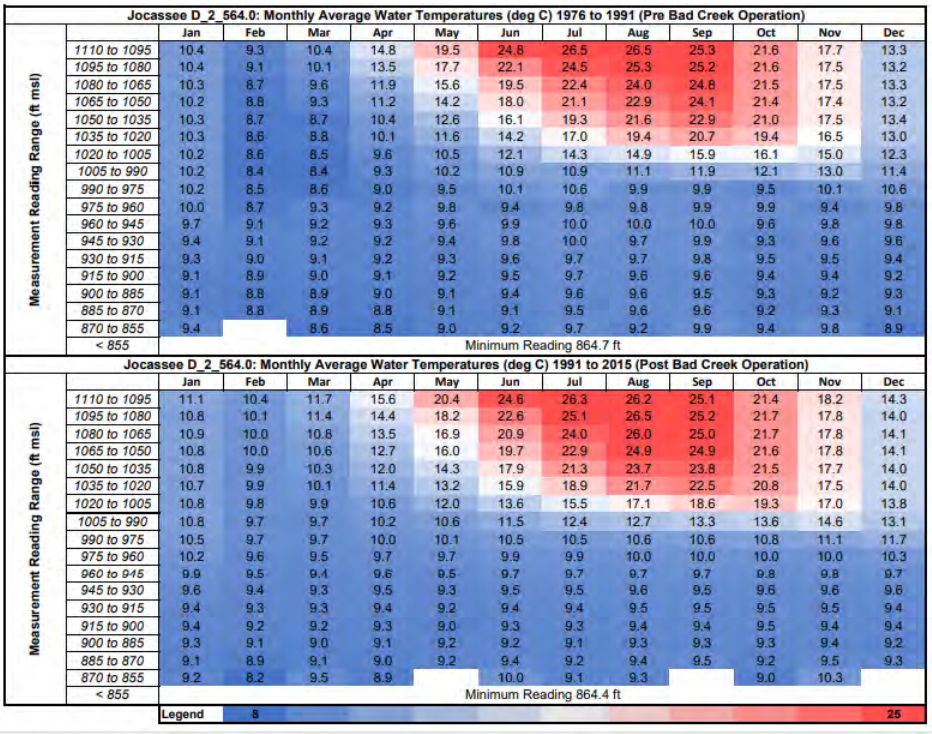
Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1991 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.3	11.3	14.8	20.1	23.5	25.4	26.1	24.9	21.3	18.2	14.3
1095 to 1080	10.7	10.1	11.0	14.0	18.4	22.4	24.7	26.2	25.2	21.5	17.8	13.9
1080 to 1065	10.7	10.0	10.9	13.7	17.2	21.3	24.3	25.7	25.1	21.7	17.8	13.9
1065 to 1050	10.5	9.8	10.7	13.3	16.4	20.8	23.8	24.9	25.0	21.5	17.7	13.8
1050 to 1035	10.6	9.7	10.8	13.2	15.9	20.3	23.5	25.0	24.9	21.6	17.6	13.7
1035 to 1020	10.4	9.6	10.8	13.1	16.0	19.9	23.3	24.8	24.8	21.5	17.4	13.7
1020 to 1005	10.3	9.7	10.8	13.0	15.9	19.8	23.1	24.7	24.8	21.5	17.6	13.6
1005 to 990	10.4	9.5	10.4	12.7	15.2	19.0	22.4	24.3	24.5	21.3	17.3	13.6
990 to 975	10.0	9.5	10.5	12.3	15.4	19.0	22.2	24.0	24.3	20.9	17.0	13.4
975 to 960	10.2	9.4	9.9	12.1	14.5	17.8	21.5	22.4	23.7	20.0	16.8	13.2
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend 8 25

Figure 5-2. Station 564.1 Pre Bad Creek Operation (top) Showing Temperature Stratification vs. Post Operation (bottom) Showing Mixing in the Water Column



Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.4	9.3	10.4	14.8	19.5	24.8	26.5	26.5	25.3	21.6	17.7	13.3
1095 to 1080	10.4	9.1	10.1	13.5	17.7	22.1	24.5	25.3	25.2	21.6	17.5	13.2
1080 to 1065	10.3	8.7	9.6	11.9	15.6	19.5	22.4	24.0	24.8	21.5	17.5	13.3
1065 to 1050	10.2	8.8	9.3	11.2	14.2	18.0	21.1	22.9	24.1	21.4	17.4	13.2
1050 to 1035	10.3	8.7	8.7	10.4	12.6	16.1	19.3	21.6	22.9	21.0	17.5	13.4
1035 to 1020	10.3	8.6	8.8	10.1	11.6	14.2	17.0	19.4	20.7	19.4	16.5	13.0
1020 to 1005	10.2	8.6	8.5	9.6	10.5	12.1	14.3	14.9	15.9	16.1	15.0	12.3
1005 to 990	10.2	8.4	8.4	9.3	10.2	10.9	10.9	11.1	11.9	12.1	13.0	11.4
990 to 975	10.2	8.5	8.6	9.0	9.5	10.1	10.6	9.9	9.9	9.5	10.1	10.6
975 to 960	10.0	8.7	9.3	9.2	9.8	9.4	9.8	9.8	9.9	9.9	9.4	9.8
960 to 945	9.7	9.1	9.2	9.3	9.6	9.9	10.0	10.0	10.0	9.6	9.8	9.8
945 to 930	9.4	9.1	9.2	9.2	9.4	9.8	10.0	9.7	9.9	9.3	9.6	9.6
930 to 915	9.3	9.0	9.1	9.2	9.3	9.6	9.7	9.7	9.8	9.5	9.5	9.4
915 to 900	9.1	8.9	9.0	9.1	9.2	9.5	9.7	9.6	9.6	9.4	9.4	9.2
900 to 885	9.1	8.8	8.9	9.0	9.1	9.4	9.6	9.6	9.5	9.3	9.2	9.3
885 to 870	9.1	8.8	8.9	8.8	9.1	9.1	9.5	9.6	9.6	9.2	9.3	9.1
870 to 855	9.4		8.6	8.5	9.0	9.2	9.7	9.2	9.9	9.4	9.8	8.9
< 855	Minimum Reading 864.7 ft											

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.4	11.7	15.6	20.4	24.6	26.3	26.2	25.1	21.4	18.2	14.3
1095 to 1080	10.8	10.1	11.4	14.4	18.2	22.6	25.1	26.5	25.2	21.7	17.8	14.0
1080 to 1065	10.9	10.0	10.8	13.5	16.9	20.9	24.0	26.0	25.0	21.7	17.8	14.1
1065 to 1050	10.8	10.0	10.6	12.7	16.0	19.7	22.9	24.9	24.9	21.6	17.8	14.1
1050 to 1035	10.8	9.9	10.3	12.0	14.3	17.9	21.3	23.7	23.8	21.5	17.7	14.0
1035 to 1020	10.7	9.9	10.1	11.4	13.2	15.9	18.9	21.7	22.5	20.8	17.5	14.0
1020 to 1005	10.8	9.8	9.9	10.6	12.0	13.6	15.5	17.1	18.6	19.3	17.0	13.8
1005 to 990	10.8	9.7	9.7	10.2	10.6	11.5	12.4	12.7	13.3	13.6	14.6	13.1
990 to 975	10.5	9.7	9.7	10.0	10.1	10.5	10.5	10.6	10.6	10.8	11.1	11.7
975 to 960	10.2	9.6	9.5	9.7	9.7	9.9	9.9	10.0	10.0	10.0	10.0	10.3
960 to 945	9.9	9.5	9.4	9.6	9.5	9.7	9.7	9.7	9.7	9.8	9.8	9.7
945 to 930	9.6	9.4	9.3	9.5	9.3	9.5	9.5	9.6	9.5	9.6	9.6	9.6
930 to 915	9.4	9.3	9.3	9.4	9.2	9.4	9.4	9.5	9.5	9.5	9.5	9.4
915 to 900	9.4	9.2	9.2	9.3	9.0	9.3	9.3	9.4	9.4	9.5	9.4	9.4
900 to 885	9.3	9.1	9.0	9.1	9.2	9.2	9.1	9.3	9.3	9.3	9.4	9.2
885 to 870	9.1	8.9	9.1	9.0	9.2	9.4	9.2	9.4	9.5	9.2	9.5	9.3
870 to 855	9.2	8.2	9.5	8.9		10.0	9.1	9.3		9.0	10.3	
< 855	Minimum Reading 864.4 ft											

Legend 8 25

Figure 5-3. Station 564.0 Downstream of the Weir Showing Temperature Stratification for Pre and Post Operations

Surface water temperature minimum, average, and maximum values for all stations over the entire dataset are included in Table 5-2. Discrete water quality data assessed in Lake Jocassee consistently met South Carolina water quality standards for trout waters for temperature. There is no numeric threshold for temperature, however, for trout waters, narrative criteria indicate water temperatures should not vary from levels existing under natural conditions (unless determined some other temperature shall protect the classified uses), which is supported by study findings.

A comparison of pre vs. post operations for surface water at each station is provided in Table 5-3 and average surface water data are included in Appendix B. There is no clear trend in warming from pre to post operations in surface waters and temperature differences are mostly within one degree. It is important to note that surface waters are affected by ambient air temperature, therefore, any elevated temperatures under present-day conditions may be impacted by climate warming over the last three decades.[6] It is noteworthy that surface waters at Station 564.1 do not indicate the warmer temperatures noted at depth between pre and post operation periods (i.e., -0.8°C change at the surface but +3.3°C change at depth, indicative of the I/O structure at depth).

Table 5-2. Water Temperature in Surface Waters of Lake Jocassee

Lake Jocassee Surface Temperature (degrees C)			
Station	Minimum	Average	Maximum
558.7	8.20	18.59	29.02
558.0	7.10	18.44	28.22
559.0	8.10	18.81	28.90
560.0	7.10	18.87	28.47
562.0	8.10	19.23	29.20
565.4	8.50	18.84	28.50
551.0	0.20	13.48	27.24
564.0	7.40	19.15	28.61
564.1	8.50	18.99	28.40
557.0	7.10	18.81	29.23
554.8	7.70	19.24	29.15
556.0	7.30	19.04	29.12

[6] A climate assessment is beyond the scope of this desktop study, however, a summary of climate trends in the region will be assessed and reported in the license application.

Table 5-3. Average and Standard Deviation of Surface Temperatures, Pre vs. Post Operations

Monitoring Station	Temperature (°C)				Difference of Averages
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	18.3	6.1	18.6	6.1	0.3
558.0	18.1	6.4	18.6	6.1	0.5
559.0	18.4	6.3	18.9	6.1	0.5
560.0	18.5	6.4	19.1	6.1	0.6
562.0	18.6	6.5	19.4	6.3	0.8
565.4	18.9	6.6	18.8	6.2	-0.1
551.0	13.3	6.0	14.7	7.2	1.4
564.0	19.0	6.6	19.2	6.0	0.2
564.1	19.7	6.2	18.9	5.8	-0.8
557.0	18.2	6.4	19.1	6.2	0.9
554.8	19.3	6.5	19.2	6.4	-0.1
556.0	18.7	6.5	19.2	6.3	0.5

5.3.2 Dissolved Oxygen

5.3.2.1 Dissolved Oxygen Concentration

Dissolved oxygen is a measure of how much oxygen is dissolved in the water and is the amount of oxygen available to living aquatic organisms. The concentration of DO in surface water is affected by temperature and has both a seasonal and a daily cycle. In winter and early spring, when water temperature is low, DO concentrations are typically higher as cold water can hold more DO than warm water. In summer and fall, when the water temperature is high, the DO concentration is often lower (USGS 2018b). Similar to temperature, DO typically shows patterns of stratification in large, deep reservoirs like Lake Jocassee. Just after summer stratification is established, the hypolimnion is rich in DO from the early spring mixing of the lake. However, because the metalimnion acts as a barrier between the epilimnion and hypolimnion, the hypolimnion is essentially cut off from oxygen exchange with the atmosphere and the deepest parts of the lake can become hypoxic (i.e., DO concentrations less than 2 mg/L) to anoxic (i.e., depleted of oxygen). Lake Jocassee is very deep in some places, and it is not unusual for DO to be depleted at depth. Because near-surface waters are used by most forms of aquatic life, DO concentrations measured at the water surface or in near-surface waters are used to assess the health of a waterbody (instead of DO at depth). Because depth-averaged values are not

considered when determining the health of the waterbody (i.e., SCDHEC standards only apply to water at the surface as explained in Section 4.3), these data are provided for context, however, average surface water values are also provided below for each season and as minimum, maximum, and average for each station in Table 5-4. All data (depth and surface) are included in Appendix B.

The position of the thermocline varies from location to location and between seasons, as is typical for large, deep reservoirs, therefore, an overall trend of DO values are provided herein. Lake Jocassee winter DO concentrations (throughout the water column) are between 0 and 14 mg/L, with an average of 7 mg/L. In deeper portions of Lake Jocassee, winter DO stratification is characterized by a rapid decline in DO in the lower half of the water column, with the upper half generally at constant values. The average winter surface (i.e., measurement depth 0.3 meter) DO over the entire dataset is 9.4 mg/L. Winter stratification is less prevalent in shallower portions of the lake.

Spring DO concentrations range from 0 to 13 mg/L with an average of 8 mg/L. DO concentrations remain consistent throughout the spring months and some stratification is present in the deepest sections of the lake. Average spring surface DO (0.3 m) is 9.7 mg/L.

Summer DO concentrations range from 0 to 13 mg/L with an average of 7 mg/L. Stratification becomes more pronounced throughout the lake with the transition from spring into summer. This stratification is generally limited to the lower half of the lake in both deep and shallow areas. Average summer surface DO is 8.2 mg/L.

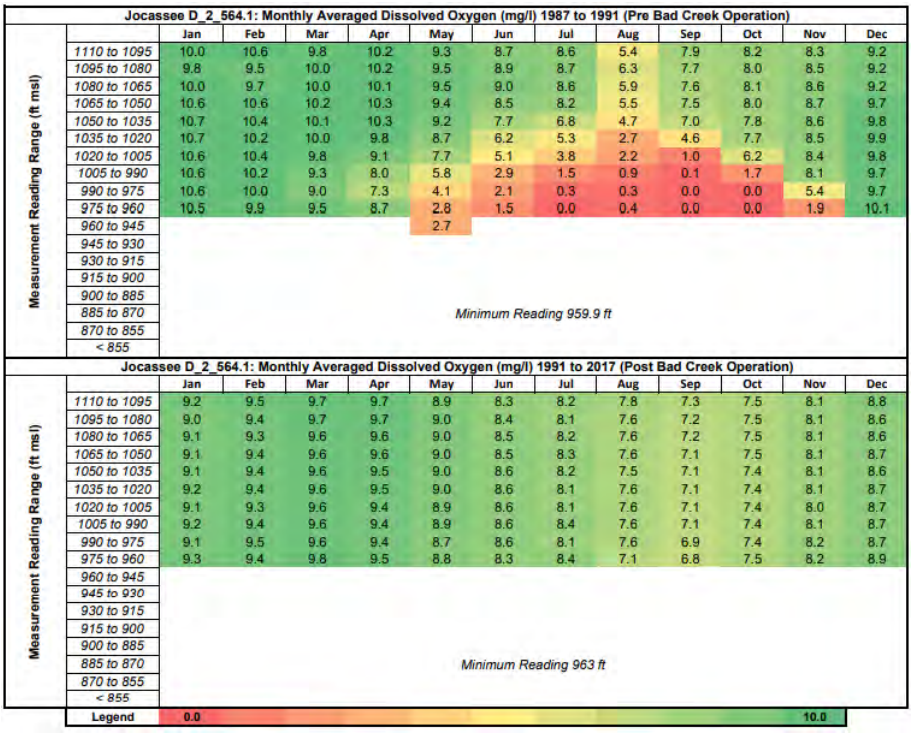
Fall DO concentrations range from 0 to 11 mg/L with an average of 6 mg/L. The most notable stratification pattern is seen in the fall where the bottom of the lake can reach anoxic levels. DO concentrations remain constant in the top third of the water column, however, significant stratification is observed in the lower water column. Average fall surface DO is 8.1 mg/L.

Tables of monthly averaged DO profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B. Additionally, tables of data showing depth-averaged DO values for pre construction, construction, and post construction in the Whitewater River arm to show changing stratification trends over time are included in Appendix B.

Similar to trends in temperature data, Bad Creek operational impacts to DO are limited to monitoring Station 564.1 between the I/O structure and submerged weir. Monthly average DO concentrations within the water column at this location are nearly uniform after 1991 (post Bad Creek operation) (Figure 5-4). Vertical mixing from Bad Creek operations does not allow for stratification at this monitoring location regardless of season.

DO stratification does occur at monitoring Station 564.0 (downstream of the weir), and there is very little difference in DO profiles between pre and post Bad Creek operation indicating the submerged weir is functioning as intended (Figure 5-5).

In general, DO concentrations in Lake Jocassee are a function of the extent of the previous winter mixing – colder winter temperatures result in deeper mixing within the reservoir, which results in higher DO concentrations the following year (USACE 2014). Multiple droughts over the reservoir's history have resulted in maximum drawdowns up to 29 ft (USACE 2014); however, the overall thermal structure of the reservoir helped to maintain DO concentrations throughout the water column and were not impacted by the drawdown events (i.e., reduced water elevation), indicating even under extreme drought conditions, DO remains above state threshold levels throughout Lake Jocassee (i.e., 6.0 mg/L) (USACE 2014).



Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.0	10.6	9.8	10.2	9.3	8.7	8.6	5.4	7.9	8.2	8.3	9.2
1095 to 1080	9.8	9.5	10.0	10.2	9.5	8.9	8.7	6.3	7.7	8.0	8.5	9.2
1080 to 1065	10.0	9.7	10.0	10.1	9.5	9.0	8.6	5.9	7.6	8.1	8.6	9.2
1065 to 1050	10.6	10.6	10.2	10.3	9.4	8.5	8.2	5.5	7.5	8.0	8.7	9.7
1050 to 1035	10.7	10.4	10.1	10.3	9.2	7.7	6.8	4.7	7.0	7.8	8.6	9.8
1035 to 1020	10.7	10.2	10.0	9.8	8.7	6.2	5.3	2.7	4.6	7.7	8.5	9.9
1020 to 1005	10.6	10.4	9.8	9.1	7.7	5.1	3.8	2.2	1.0	6.2	8.4	9.8
1005 to 990	10.6	10.2	9.3	8.0	5.8	2.9	1.5	0.9	0.1	1.7	8.1	9.7
990 to 975	10.6	10.0	9.0	7.3	4.1	2.1	0.3	0.3	0.0	0.0	5.4	9.7
975 to 960	10.5	9.9	9.5	8.7	2.8	1.5	0.0	0.4	0.0	0.0	1.9	10.1
960 to 945					2.7							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2017 (Post Bad Creek Operation)

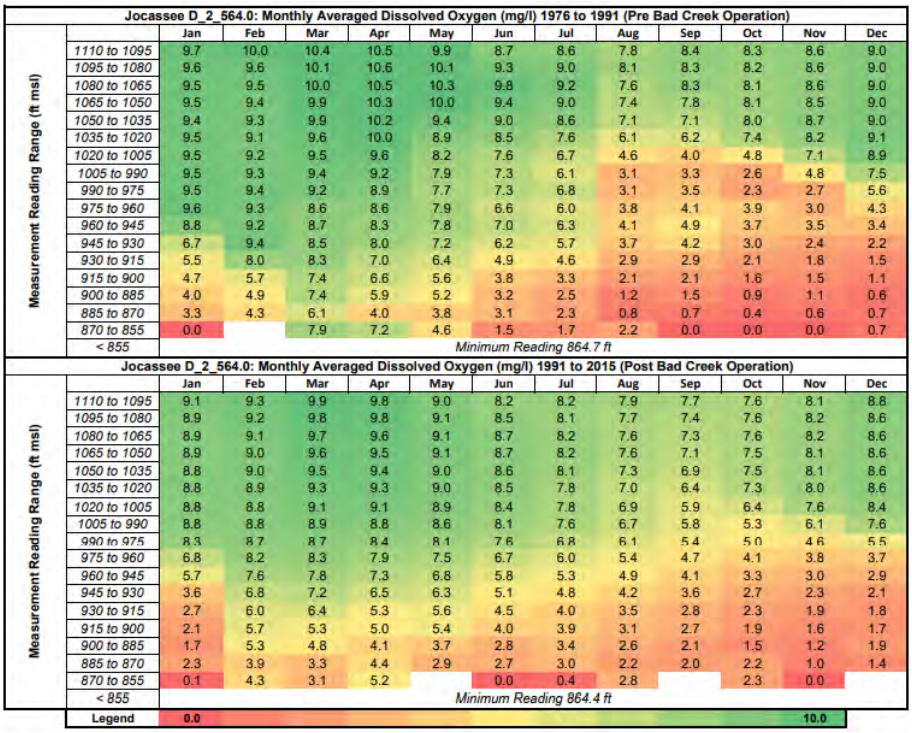
Measurement Reading Range (ft msl)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.5	9.7	9.7	8.9	8.3	8.2	7.8	7.3	7.5	8.1	8.8
1095 to 1080	9.0	9.4	9.7	9.7	9.0	8.4	8.1	7.6	7.2	7.5	8.1	8.6
1080 to 1065	9.1	9.3	9.6	9.6	9.0	8.5	8.2	7.6	7.2	7.5	8.1	8.6
1065 to 1050	9.1	9.4	9.6	9.6	9.0	8.5	8.3	7.6	7.1	7.5	8.1	8.7
1050 to 1035	9.1	9.4	9.6	9.5	9.0	8.6	8.2	7.5	7.1	7.4	8.1	8.6
1035 to 1020	9.2	9.4	9.6	9.5	9.0	8.6	8.1	7.6	7.1	7.4	8.1	8.7
1020 to 1005	9.1	9.3	9.6	9.4	8.9	8.6	8.1	7.6	7.1	7.4	8.0	8.7
1005 to 990	9.2	9.4	9.6	9.4	8.9	8.6	8.4	7.6	7.1	7.4	8.1	8.7
990 to 975	9.1	9.5	9.6	9.4	8.7	8.6	8.1	7.6	6.9	7.4	8.2	8.7
975 to 960	9.3	9.4	9.8	9.5	8.8	8.3	8.4	7.1	6.8	7.5	8.2	8.9
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend 0.0 10.0

Figure 5-4. Station 564.1 Pre Bad Creek Operation (top) Showing DO Stratification vs. Post Operation (bottom) Showing Mixing in the Water Column



Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	10.0	10.4	10.5	9.9	8.7	8.6	7.8	8.4	8.3	8.6	9.0
1095 to 1080	9.6	9.6	10.1	10.6	10.1	9.3	9.0	8.1	8.3	8.2	8.6	9.0
1080 to 1065	9.5	9.5	10.0	10.5	10.3	9.8	9.2	7.6	8.3	8.1	8.6	9.0
1065 to 1050	9.5	9.4	9.9	10.3	10.0	9.4	9.0	7.4	7.8	8.1	8.5	9.0
1050 to 1035	9.4	9.3	9.9	10.2	9.4	9.0	8.6	7.1	7.1	8.0	8.7	9.0
1035 to 1020	9.5	9.1	9.6	10.0	8.9	8.5	7.6	6.1	6.2	7.4	8.2	9.1
1020 to 1005	9.5	9.2	9.5	9.6	8.2	7.6	6.7	4.6	4.0	4.8	7.1	8.9
1005 to 990	9.5	9.3	9.4	9.2	7.9	7.3	6.1	3.1	3.3	2.6	4.8	7.5
990 to 975	9.5	9.4	9.2	8.9	7.7	7.3	6.8	3.1	3.5	2.3	2.7	5.6
975 to 960	9.6	9.3	8.6	8.6	7.9	6.6	6.0	3.8	4.1	3.9	3.0	4.3
960 to 945	8.8	9.2	8.7	8.3	7.8	7.0	6.3	4.1	4.9	3.7	3.5	3.4
945 to 930	6.7	9.4	8.5	8.0	7.2	6.2	5.7	3.7	4.2	3.0	2.4	2.2
930 to 915	5.5	8.0	8.3	7.0	6.4	4.9	4.6	2.9	2.9	2.1	1.8	1.5
915 to 900	4.7	5.7	7.4	6.6	5.6	3.8	3.3	2.1	2.1	1.6	1.5	1.1
900 to 885	4.0	4.9	7.4	5.9	5.2	3.2	2.5	1.2	1.5	0.9	1.1	0.6
885 to 870	3.3	4.3	6.1	4.0	3.8	3.1	2.3	0.8	0.7	0.4	0.6	0.7
870 to 855	0.0		7.9	7.2	4.6	1.5	1.7	2.2	0.0	0.0	0.0	0.7
< 855												

Minimum Reading 864.7 ft

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.1	9.3	9.9	9.8	9.0	8.2	8.2	7.9	7.7	7.6	8.1	8.8
1095 to 1080	8.9	9.2	9.8	9.8	9.1	8.5	8.1	7.7	7.4	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.7	9.6	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.6	9.5	9.1	8.7	8.2	7.6	7.1	7.5	8.1	8.6
1050 to 1035	8.8	9.0	9.5	9.4	9.0	8.6	8.1	7.3	6.9	7.5	8.1	8.6
1035 to 1020	8.8	8.9	9.3	9.3	9.0	8.5	7.8	7.0	6.4	7.3	8.0	8.6
1020 to 1005	8.8	8.8	9.1	9.1	8.9	8.4	7.8	6.9	5.9	6.4	7.6	8.4
1005 to 990	8.8	8.8	8.9	8.8	8.6	8.1	7.6	6.7	5.8	5.3	6.1	7.6
990 to 975	8.3	8.7	8.7	8.4	8.1	7.6	6.8	6.1	5.4	5.0	4.6	5.5
975 to 960	6.8	8.2	8.3	7.9	7.5	6.7	6.0	5.4	4.7	4.1	3.8	3.7
960 to 945	5.7	7.6	7.8	7.3	6.8	5.8	5.3	4.9	4.1	3.3	3.0	2.9
945 to 930	3.6	6.8	7.2	6.5	6.3	5.1	4.8	4.2	3.6	2.7	2.3	2.1
930 to 915	2.7	6.0	6.4	5.3	5.6	4.5	4.0	3.5	2.8	2.3	1.9	1.8
915 to 900	2.1	5.7	5.3	5.0	5.4	4.0	3.9	3.1	2.7	1.9	1.6	1.7
900 to 885	1.7	5.3	4.8	4.1	3.7	2.8	3.4	2.6	2.1	1.5	1.2	1.9
885 to 870	2.3	3.9	3.3	4.4	2.9	2.7	3.0	2.2	2.0	2.2	1.0	1.4
870 to 855	0.1	4.3	3.1	5.2		0.0	0.4	2.8		2.3	0.0	
< 855												

Minimum Reading 864.4 ft

Legend 0.0 10.0

Figure 5-5. Station 564.0 Downstream of the Weir Showing Stratification for Pre and Post Operations

The state standard for DO in trout waters is > 6.0 mg/L (instantaneous minimum). Before 1991 there were two instances of surface DO less than 6.0 mg/L: 4.6 mg/L at monitoring Station 558.0 in 1973 and 5.4 mg/L at monitoring Station 556.0 in 1976, which correspond to the first few years after the reservoir was filled in 1973. There were no instances of surface DO values less than 6.0 mg/L after 1991. Average surface water data are included in Appendix B.

Over the entire dataset, there were 4,241 surface measurements assessed; a total of five measurements were below the state standard, which accounts for 0.12 percent of the dataset (Table 5-4). Therefore, surface water DO concentrations in Lake Jocassee fully support the designated use classification (i.e., less than 10 percent criterion excursions).

Table 5-4. Dissolved Oxygen in Surface Waters of Lake Jocassee

Lake Jocassee Surface DO (mg/L)			
Station	Minimum	Average	Maximum
558.7	6.8	8.7	11.2
558.0	4.6	8.7	11.2
559.0	6.9	8.7	11.1
560.0	6.1	8.7	11.8
562.0	6.9	8.8	11.3
565.4	7.4	8.8	11.2
551.0	7.2	9.9	14.4
564.0	6.6	8.8	12.2
564.1	6.6	8.6	11.1
557.0	6.7	8.9	11.6
554.8	6.7	8.9	11.2
556.0	5.4	9.0	11.6

5.3.2.2 Dissolved Oxygen Saturation

Dissolved oxygen saturation is reported in units of percent and represents the percent of oxygen that has dissolved into water (a value typical of a given temperature). Percent saturation is indicative of the percentage of oxygen dissolved in water at a given temperature and gas pressure. Equilibrium is indicated by 100 percent saturation with higher temperatures decreasing oxygen solubility)[7]. Supersaturation, or saturation greater than 100 percent, may be observed in a reservoir as a result of the photosynthetic process by phytoplankton and other aquatic plants

[7] https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3110en.pdf

that may be present. Conversely, saturation less than 100 percent in a reservoir can be a function of microbial respiration from decomposition of organic matter.

Lake Jocassee winter DO saturation ranges from 100 percent at the surface to 0 percent at the bottom of the water column. The average winter surface (measured at 0.3 m) DO saturation is 87.2 percent. DO saturation remains constant in the upper top half of the lake and decreases from about 80 percent saturation to near anoxic levels at the reservoir bottom.

The average lake-wide spring surface DO saturation is 98.6 percent. Spring has the highest average DO saturation; spring DO saturation decreases relatively uniformly with depth, with the deepest sections of the lake generally dropping from 100 percent at the surface to 50 percent saturation at the lake bottom.

The average lake-wide summer surface DO saturation is 101.3 percent. Similar to spring values, DO saturation decreases uniformly with depth, but more sharply, generally decreasing from 100 percent at the surface to 35 percent at the lake bottom.

The average lake-wide fall surface DO saturation is 91.5 percent. As expected, fall continues the trend of decreased saturation in the lower portions of the water column, becoming anoxic near the lake bottom.

Dissolved oxygen saturation depth profile tables are provided in Appendix B (DO saturation sampling began in 1998, i.e., post Bad Creek operations) at each of the 12 monitoring stations. Additionally, depth-averaged DO percentages for pre construction, construction, and post construction in the Whitewater River arm are included in Appendix B. While no data exist prior to operations, stratification between the stations in Whitewater River cove is apparent.

Dissolved oxygen percentage in surface samples are shown in Table 5-5. There is no state standard for DO saturation, however, since Lake Jocassee supports a diverse, healthy fish community, it is assumed percentage of DO saturation is suitable for aquatic resources.

Table 5-5. DO Saturation in Surface Waters of Lake Jocassee

DO Saturation (%)			
Station	**Minimum**	**Average**	**Maximum**
558.7	65.80	93.98	108.50
558.0	68.20	93.63	106.00
559.0	62.70	94.30	109.80
560.0	53.30	93.75	107.70
562.0	66.50	96.59	112.70
565.4	--	--	----
551.0	85.80	95.51	100.80
564.0	58.30	93.84	107.20
564.1	63.00	92.27	108.20
557.0	67.80	95.99	109.60
554.8	74.80	97.26	111.90
556.0	74.00	97.04	110.80

Note: (--) indicates no DO saturation data were collected at Station 565.4

5.3.3 pH

The pH level of a waterbody is a measure of hydrogen ion concentration and is ranked on a scale of 1 (acidic) to 14 (basic). This water quality parameter affects many chemical and biological processes in the water and different organisms have different ranges of pH within which they flourish (USGS 2019). The relationship between phytoplankton and daily pH cycles is well established. Photosynthesis by phytoplankton consumes carbon dioxide during the day, which results in a rise in pH. In the dark, phytoplankton respiration releases carbon dioxide. In productive lakes, carbon dioxide decreases to very low levels, causing the pH to rise (SCDHEC n.d.). Note that the pH of a given waterbody is predominantly determined by the soil and rock type in the area. Surface waters in mountain streams in the vicinity of Lake Jocassee are typically poorly buffered and tend to have low pH values (Abernathy et al. 1994).

Typical Lake Jocassee pH values range between 5 and 10 (averaged throughout the water column) with an average of 6.2, which is considered neutral and indicative of a system with low production (i.e., little potential for algal growth). There is very little difference in pH between seasons and while there is some variation in the water column, there is very little to no pH stratification. Similar to temperature and DO trends, pH concentrations at monitoring station 564.1 are well mixed as a result of Bad Creek operations. Just downstream of the submerged

weir at monitoring Station 564.0, there is some pH variation in the water column post 1991 as the submerged weir limits vertical mixing at this location. pH profiles at this monitoring location are similar pre and post Bad Creek operations. Tables of monthly averaged pH depth profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B.

Surface pH values for all stations are included in Table 5-6 and average surface water data are included in Appendix B. Instantaneous pH surface readings were compared against the pH state standard for trout waters (6.0-8.0 Standard Units). Over the entire dataset, there were 4,253 samples assessed; a total of 2 samples were above the state standard (i.e., less than 1 percent of the dataset) and 255 samples were below the state standard (i.e., 6 percent of the dataset). Therefore, surface water pH levels in Lake Jocassee fully support the designated use classification (i.e., within 10 percent criterion excursions).

Table 5-6. pH in Surface Waters of Lake Jocassee

Surface Phosphorous (Standard Units)			
Station	**Minimum**	**Average**	**Maximum**
558.7	5.50	6.67	7.60
558.0	5.20	6.56	8.00
559.0	5.30	6.67	7.71
560.0	5.60	6.69	7.80
562.0	5.60	6.76	7.90
565.4	5.60	6.50	8.10
551.0	5.50	6.53	7.90
564.0	5.60	6.78	7.90
564.1	5.60	6.73	7.90
557.0	5.50	6.73	7.80
554.8	5.60	6.84	8.10
556.0	5.63	6.80	7.90

5.3.4 Phosphorus

Phosphorus is a common constituent of agricultural fertilizers, manure, and organic wastes in sewage and industrial effluent; too much phosphorus in a waterbody can speed up eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) (USGS 2018c). Because Lake Jocassee is not in a predominantly agricultural or industrial setting, phosphorus values are typically low.

Lake Jocassee phosphorus concentrations at depth range from 0.002 to 0.68 mg/L with an average of 0.01 mg/L. Tables of monthly averaged depth profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B. As with other water quality parameters, mixing due to Bad Creek operations creates relatively constant profiles of phosphorus in the water column at monitoring station 564.1.

Table 5-7 below shows a summary of phosphorus for the surface waters of Lake Jocassee over the entire dataset and surface water data tables are included in Appendix B. The state standard for total phosphorous in lakes and reservoirs in the Blue Ridge region of South Carolina shall not exceed 0.02 mg/L.

Over the entire dataset, there were 2,228 surface samples assessed; a total of 228 samples were above the state standard, which accounts for 9.8 percent of the dataset (Table 5-7). Therefore, surface water phosphorus concentrations in Lake Jocassee fully support the designated use classification (i.e., less than 10 percent criterion excursions).

Table 5-7. Phosphorus in Surface Waters of Lake Jocassee

Surface Phosphorous (mg/L)			
Station	**Minimum**	**Average**	**Maximum**
558.7	0.002	0.007	0.100
558.0	0.002	0.011	0.650
559.0	0.002	0.008	0.056
560.0	0.002	0.009	0.081
562.0	0.002	0.009	0.037
565.4	0.002	0.012	0.082
551.0	0.005	0.015	0.100
564.0	0.002	0.009	0.057
564.1	0.002	0.011	0.165
557.0	0.002	0.010	0.087
554.8	0.002	0.010	0.057
556.0	0.002	0.009	0.061

5.3.5 Nitrogen

Similar to phosphorus, too much nitrogen (in the forms of nitrate, nitrite, or ammonium) can cause a number of adverse effects. Excess nitrogen can cause overstimulation of growth and aquatic plant and algae. Total Kjeldahl Nitrogen (TKN) is a measure of organic nitrogen (i.e., naturally occurring) and ammonia in a water sample and provides a way to quantify the amount

of nitrogen contained in organic form (USGS 2018e). Nitrate (NO_3) is the product of aerobic transformation of ammonia and is the most common form of nitrogen used by aquatic plants while nitrite (NO_2) is usually not present in significant amounts (SCDHEC n.d.). Total nitrogen is the sum of TKN and NO_2+ NO_3.

The dataset for total nitrogen is limited in Lake Jocassee relative to other water quality parameters. Of the nearly 2,000 measurements recorded for NO_2 and NO_3, there are only 545 readings where TKN was measured, therefore, the dataset for total nitrogen includes 545 datapoints. Tables of monthly averaged total nitrogen depth profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B.

Table 5-8 below shows a summary of total nitrogen for the surface waters of Lake Jocassee over the entire dataset and surface water data tables are included in Appendix B. The state standard for total nitrogen for lakes and reservoirs in the Blue Ridge region of South Carolina shall not exceed 0.35 mg/L. Over the entire dataset, there were 545 surface samples assessed; a total of 33 samples were above the state standard, which accounts for 6.1 percent of the dataset[8] (Table 5-8). Therefore, surface water total nitrogen concentrations in Lake Jocassee fully support the designated use classification (i.e., less than 10 percent criterion excursions).

Table 5-8. Total Nitrogen in Surface Waters of Lake Jocassee

Lake Jocassee Surface Total Nitrogen (mg/L)			
Station	Minimum	Average	Maximum
558.7	0.11	0.23	0.56
558	0.11	0.23	0.59
559	0.14	0.26	0.78
560	0.11	0.23	0.55
562	0.13	0.24	0.56
565.4	0.13	0.21	0.47
551	0.12	0.16	0.20
564	0.11	0.22	0.51
564.1	0.18	0.22	0.34
557	0.11	0.21	0.54
554.8	0.12	0.21	0.48
556	0.11	0.22	0.53

[8] Note that of the 33 total nitrogen excursions, only one excursion was caused by elevated inorganic nitrogen; the remaining excursions were due to elevated organic nitrogen (i.e., TKN), which is naturally occurring.

5.3.6 Chlorophyll a

Chlorophyll allows plants (including phytoplankton [algae]) to photosynthesize, i.e., use sunlight to convert simple molecules into organic compounds. Chlorophyll a is the predominant type of chlorophyll found in green plants and is a surrogate for the amount of algae growing in a waterbody; it can be used to classify the trophic condition of a waterbody (USEPA 2022b). One of the symptoms of degraded water quality condition is the increase of algae biomass as measured by the concentration of chlorophyll a. Typically, increased chlorophyll a is a result of external nutrient inputs from surface runoff from agricultural areas with fertilizers, septic systems, sewage treatment plants, and urban runoff (USEPA 2022a). However, the Lake Jocassee watershed is largely undisturbed (i.e., forested), therefore, does not have these input sources. Rather, chlorophyll a concentrations in Lake Jocassee stem from internal loading of phosphorus from inside the lake. As stratification develops during the summer months, cooler oxygenated water settles to the bottom of the reservoir. The oxygen is consumed over the summer and fall months due to the decomposition of organic matter and uptake from fish. When this happens, it triggers the release of phosphorous from the organic matter and sediments at the bottom of the reservoir. Because Lake Jocassee is oligotrophic (i.e., high dissolved oxygen, lower amounts of organic matter, and low levels of phosphorus), phosphorus input from internal loading does not significantly increase the total phosphorus levels (or chlorophyll a concentrations) in Lake Jocassee. Tables of monthly averaged chlorophyll a depth profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B.

Table 5-9 below shows a summary of cholorphyll a for the surface waters of Lake Jocassee over the entire dataset and surface water data tables are included in Appendix B. The state standard for chlorophyll a for lakes and reservoirs in the Blue Ridge region of South Carolina Shall not exceed 10 µg/L. Over the entire dataset, there were 1,753 surface samples assessed; all samples were below the state standard, which accounts for 100 percent of the dataset (Table 5-9). Therefore, surface water chlorophyll a concentrations in Lake Jocassee fully support the designated use classification (i.e., less than 10 percent criterion excursions).

Table 5-9. Chlorophyll a in Surface Waters of Lake Jocassee

Lake Jocassee Surface Chlorophyll (ug/L)			
Station	Minimum	Average	Maximum
558.7	0.46	2.06	5.67
558.0	0.50	2.05	5.44
559.0	0.49	1.92	4.46
560.0	0.28	2.07	5.61
562.0	0.63	2.76	7.53
565.4	0.55	2.38	6.64
551.0	0.25	1.01	1.86
564.0	0.53	2.13	6.54
564.1	0.65	2.06	4.63
557.0	0.36	2.00	5.17
554.8	0.65	2.86	6.61
556.0	0.04	2.46	7.46

5.3.7 Conductivity

Conductivity is a measure of the ability of water to pass an electrical current; because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases, therefore it is an indirect measure of the saltiness of the water (USEPA 2022b). Conductivity is also directly related to rainfall runoff events as tributary inflows to Lake Jocassee carry these dissolved salts and inorganic chemicals from the watershed into the reservoir. Since rainfall is consistent through the year in the region, conductivity values in Lake Jocassee do not vary seasonally but do increase during periods of higher rainfall runoff. For example, during drier periods, conductivity in Lake Jocassee is very low ranging from 2.0 to 5.0 µS/cm. During wetter periods, conductivity ranges from 85.5 to 275 µS/cm. The overall annual average conductivity in the reservoir was approximately 18.1 µS/cm.

Similar to the other water quality parameters, conductivity values at monitoring station 564.1 on the upstream side of the submerged weir are well mixed due to Bad Creek operations. Downstream of the submerged weir at monitoring station 564.0, there is some variability in conductivity throughout the water column but the conductivity profiles at this location are similar pre and post Bad Creek operations indicating limited vertical mixing due to the submerged weir.

Tables of monthly averaged conductivity profiles for pre and post Bad Creek operational conditions at each of the 12 monitoring locations are provided in Appendix B[9].

Table 5-10 below shows a summary of conductivity for the surface waters of Lake Jocassee over the entire dataset and surface water data tables are included in Appendix B. While there is no state standard for specific conductivity, concentrations less than 500 µS/cm are generally considered to be suitable for aquatic species in southern Appalachian waters (USEPA 2020). The maximum surface conductivity measured was 34 µS/cm and the minimum was 2.0 µS/cm (Table 5-10); since Lake Jocassee supports a diverse, healthy fish community, it is assumed this range of conductivity is suitable for aquatic resources.

Table 5-10. Conductivity in Surface Waters of Lake Jocassee

Lake Jocassee Conductivity (uS/cm)			
Station	Minimum	Average	Maximum
558.7	9.10	18.33	24.00
558.0	4.70	18.16	32.00
559.0	9.00	18.23	24.00
560.0	8.00	17.58	34.00
562.0	9.10	18.29	34.00
565.4	12.00	18.05	24.00
551.0	2.00	10.65	34.00
564.0	8.00	17.90	34.00
564.1	9.00	18.41	26.00
557.0	9.00	17.80	34.00
554.8	8.50	17.85	24.00
556.0	8.50	17.38	24.00

5.3.8 Turbidity

Turbidity is a measure of the amount of suspended particles in water (quantified by the amount of light scattered) and is typically measured in Nephelometric Turbidity Units (NTU). While turbidity is not an inherent property of water like temperature and DO, it is recognized as an indicator of environmental health of a waterbody (USGS 2018d). Turbidity levels in a waterbody are typically episodic in nature and are not spatially or temporally consistent. Generally, turbidity

[9] Erroneously high conductivity readings at or near the lakebed were removed from the dataset as the conductivity measuring device likely impacted the lakebed, stirring up sediment leading to false readings.

values in a river or lake increase proportionally with increased suspended sediment in the water column. Under natural conditions, suspended sediment load contribution to a receiving waterbody increases during a rainstorm/runoff event where sediment is eroded from upland areas or stream banks and flows into surface waters. Another major contributor to upland soil/sediment erosion is construction activities; these activities are often short-lived but can result in large amounts of soil released from the land that is subsequently transported to adjacent waterbodies. Depending on the magnitude of the rain event, amount and grainsize of sediment, proximity to the point of entry, and character of a waterbody, sediment can settle out quickly after the event or may remain suspended in the water column for some time after the event, resulting in prolonged elevated turbidity, which can be detrimental to aquatic habitat. Because turbidity is simply the amount of light that can pass through water, turbidity values can increase due to any solid particles in the water, including organic material and microscopic organisms.

During original Project construction, waters of the Whitewater River cove were directly impacted by construction activities. Historical turbidity data in the Whitewater River cove at three monitoring stations (see Figure 5-1) were evaluated to determine if original construction activities resulted in a noticeable increase in turbidity values and if so, estimate how far downstream impacts extended and for how long turbidity was elevated; this was done by comparing turbidity values from (1) pre construction (<1985), construction (1985-1991)[10], and post construction (1992-2015) (see Table 5-11).

In general, turbidity data were collected once per month, however, there are notable gaps in datasets (several months or years at a time) depending on the station. Measurements were taken at varying depths along the vertical profile (i.e., varied between collection events). Data gaps and vertical depth measurement locations are shown on the turbidity data plots provided in Appendix C. Note that turbidity does not show spatial trends or patterns of stratification such as temperature and DO; turbidity measurements represent a snapshot in time and are typically driven by external factors, therefore, data points do not need to be contiguous in space or time for confidence in interpretation. Where it was obvious that a dataset had a falsely elevated

[10] Duke Energy is considering expanding the existing submerged weir with newly excavated rockfill from the proposed Bad Creek II Complex in part to help mitigate the impacts of a second I/O structure in Whitewater River cove. Assessing pre construction turbidity data and estimating impacts to turbidity during original construction may help inform water quality conditions during proposed construction of the Bad Creek II Complex.

bottom reading (due to resuspension of bed sediment) or an erroneously high measurement in the water column when compared with data above and below it, values were removed from the dataset. Of 6,682 data points, 28 data values were removed, representing less than 1.0 percent of the dataset.

Table 5-11. Monitoring Stations and Years of Data

Station	Pre construction	During construction	Post construction
564.1	N/A	Jan 1988 – Dec 1991	Jan 1992– Jan 2015
564.0	Aug 1976 – Oct 1985	Feb 1986 – Dec 1991	Jan 1992 – Jan 2015
560.0	Sept 1973 – Oct 1985	Feb 1986 – Dec 1991	Jan 1992 – Jan 2015

5.3.8.1 Results

Turbidity results are summarized by monitoring station in the sections below. To evaluate turbidity impacts at depth, this parameter was evaluated throughout the water column. Three sets of turbidity figures are provided in Appendix C for each of the three monitoring stations and include;

- Turbidity values vs. lake elevation and year for pre construction, construction, and post construction periods (three separate figures);
- Turbidity values vs. lake elevation and year for the full dataset;
- Depth-averaged turbidity values compared to the 10 NTU state standard.

5.3.8.1.1 Station 564.1

As mentioned previously, Station 564.1 is located just downstream of the Project I/O structure and immediately upstream of the submerged weir. This station receives direct inflow from the Whitewater River and is approximately 45 meters (148 ft) deep. Details of data from Station 564.1 are provided in Table 5-12. Turbidity was not measured at Station 564.1 until January 1988, therefore, there is no pre construction dataset. During the construction period, when elevated turbidity values were observed, they were elevated consistently in the water column on the same days (i.e., rather than randomly in the water column or across many different days); this likely indicates episodic events contributing increased sediment to the area (e.g., construction activities). In general, turbidity values were elevated lower in the water column vs. near the surface on all days where elevated turbidity values were observed. The depth-averaged turbidity reading at this station during the construction period was 18.5 NTU with a standard deviation

[stdev] of 51 NTU, indicating significant variance in the dataset. The dataset from Station 564.1 contains the highest turbidity values from any period or monitoring station. There were three notable instances where turbidity was elevated for several readings in a row:

- January – September 1988 (average 65 NTU); the first two readings at this station (January and February 1988) had the highest values at 476 NTU (Jan) and 202 NTU (February). Consistently elevated readings over a nine-month period are likely the results of construction activities. These values continued to decrease each month from March through September.
- July – December 1990 – Nine consecutive readings with an average of 26 NTU over the nine readings.
- April – August 1989 (average 25 NTU).

Additionally, there was one measurement on February 21, 1990, with elevated turbidity; however, because elevated turbidity values were not noted in the measurements before or after this day, this was likely due to a rain event or very short-lived construction event.

Under post construction conditions, turbidity values at all depths averaged 0.8 NTU (stdev 2.0). The maximum turbidity level measured during this time was 28 NTU.

- There were seven measurements that exceeded the state standard of 10 NTU over the post construction dataset. Six of those seven measurements occurred on the same day - August 17, 1994. This event was correlated with Tropical Storm Beryl, which made landfall in the southeastern U.S. on August 16th. The state of South Carolina suffered more damage than any other state[11].

Overall, turbidity was consistently lower when compared to values from the construction period (see Table 5-12).

Table 5-12. Monitoring Station 564.1 Data Collection Details

Period	Max Depth (m)	Average NTU	Stdev NTU	Max NTU	Count
Pre construction	N/A	N/A	N/A	N/A	N/A
Construction	45	18.5	51.0	476	480
Post construction	44	0.8	2.0	28	890

[11] https://en.wikipedia.org/wiki/Tropical_Storm_Beryl_(1994)

5.3.8.1.2 Station 564.0

Pre construction values were measured on average once per month, however, there are several periods without recorded data; the depth-averaged turbidity at Station 564.0 over the dataset was 6.6 NTU (stdev 10) and the maximum was 71 NTU (July 26, 1983). Details of data from Station 564.1 are provided in Table 5-13. Note that Project construction had not yet begun, therefore, these episodes of higher turbidity in the water column were likely due to rainfall events resulting in high inflows from Whitewater River. Elevated values were episodic and specific to the day the measurement was taken (i.e., high NTU values did not carry over to the following measurement). Higher turbidity values were associated with the same six days, listed below (all maximum values were recorded near the bottom of the lake[12]).

- 8/10/1976 (max 50 NTU)
- 3/15/1977 (max 48 NTU)
- 5/16/1978 (max 60 NTU)
- 9/12/1978 (max 38 NTU)
- 7/26/1983 (max 71 NTU)
- 8/27/1985 (max 40 NTU)

During the construction period, the average turbidity was lower than during the pre construction period with an average of 2.9 NTU (stdev 5.2) and a maximum measurement of 57 NTU. All higher NTU readings (within the water column) were associated with the same days and it is noteworthy that all elevated NTU values were at the bottom depth. The elevated turbidity values noted for Station 564.1 (extended periods of time in 1988 and 1990) were not observed at Station 564.0, indicating that elevated turbidity did not extend downstream into Whitewater River cove.

Post construction values at Station 564.0 were lower than pre construction and construction periods (see Table 5-13) with an average of 0.7 NTU (stdev 1.0) and a maximum reading of 14.0 NTU on February 20, 2012. (Note that this elevated turbidity value was from a surface measurement and decreased to <1.0 NTU just below the surface measurement).

[12] Continued decomposition of organic material early in the life of Lake Jocassee also likely contributed to elevated turbidity values

Table 5-13. Monitoring Station 564.0 Data Collection Details

Period	Max Depth (m)	Average NTU	Stdev NTU	Max NTU	Count
Pre construction	40	6.6	10	71	382
Construction	74	2.9	5.2	57	545
Post construction	74	0.5	1.2	14	1353

5.3.8.1.3 Station 560.0

During the pre construction period, the depth-averaged turbidity was 3.0 NTU (stdev 2.9) and the maximum turbidity value was 19 NTU. Note that half of the elevated turbidity values (i.e., those exceeding 10 NTU) were from a single day on September 12, 1978 (average 13.25 NTU) and includes the maximum reading. During the construction period, there was only one value that exceeded 10 NTU (bottom reading) on February 17, 1988, and during the post construction period, the average NTU was 0.7 (stdev 1.0) with a maximum NTU of 11.6, which was also a bottom reading. Details for monitoring Station 560.0 are included in Table 5-14.

Table 5-14. Monitoring Station 560.0 Data Collection Details

Period	Max Depth (m)	Average NTU	Stdev NTU	Max NTU	Count
Pre construction	60	3	2.9	19	593
Construction	82	1.5	1.0	13	462
Post construction	78	0.7	1.0	11.6	621

5.3.8.1.4 Surface Turbidity

In addition to values at depth, surface turbidity values were assessed and are provided in Table 5-15 and surface water data tables are included in Appendix B. A boxplot of surface turbidity data over all time periods is provided in Figure 5-6 to show a general summary and distribution of surface turbidity at the three stations. A boxplot is a standardized way of displaying the distribution of a dataset; it provides a five number summary, which includes the minimum, first quartile, median, third quartile, and maximum value of a dataset; the box itself extends from the first to the third quartile and a line is drawn within the box to indicate the median value of the dataset. The whiskers extend to the minimum and maximum numbers in the dataset that are not considered outliers, while outliers are plotted individually above and below the box.

Table 5-15. Turbidity in Surface Waters of Lake Jocassee

Lake Jocassee Turbidity (NTU)			
Station	Minimum	Average	Maximum
560.0	0.00	1.90	17.00
564.0	0.00	1.96	47.00
564.1	0.00	1.61	19.00

In freshwater lakes in South Carolina, turbidity is not to exceed 25 NTU provided existing uses are maintained; however, for trout waters, the threshold is not to exceed 10 NTU or 10 percent above natural conditions, provided existing uses are maintained. Over the entire dataset, there were 550 surface samples assessed; a total of 9 samples were above the state standard (i.e., 10 NTU), which accounts for 0.02 percent of the dataset (this also includes data collected during construction). Therefore, surface water turbidity levels in Lake Jocassee fully support the designated use classification (i.e., less than 10 percent criterion excursions).

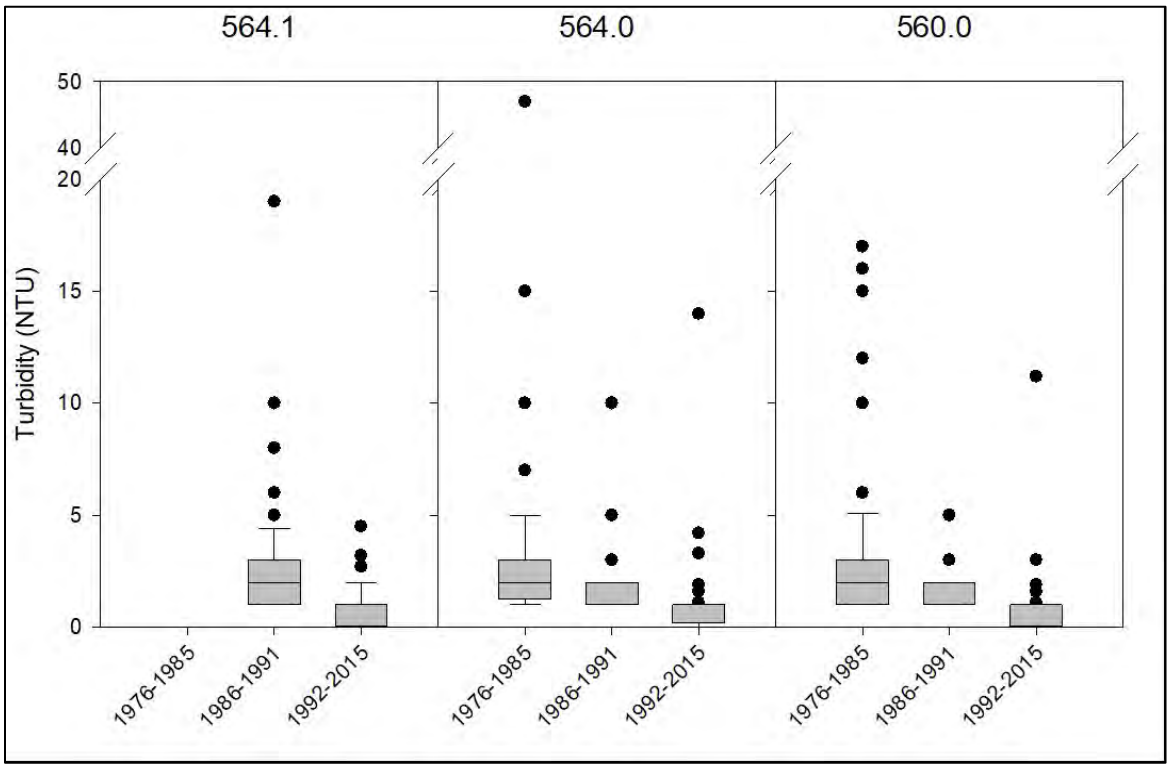


Figure 5-6. Surface Turbidity in the Whitewater River Arm Over Construction Periods

5.4 Summary Pre construction vs. Post Construction Comparison

Overall, the effect of Bad Creek operations on Lake Jocassee water quality is negligible except for the effects seen at the monitoring station upstream of the submerged weir in Whitewater River cove. Tables of water quality data at the three stations in the Whitewater River cove over the three construction periods are included in Appendix B to show trends in stratification patterns upstream and downstream of the weir and turbidity data are included in Appendix C.

Upstream of the submerged weir, data from monitoring Station 564.1 indicate mixing (from Bad Creek operations), which eliminates all stratification. Temperature and DO values have a uniform profile within the water column at Station 564.1. Immediately downstream of the submerged weir at location 564.0, post Bad Creek operation condition datasets show stratification and trends that follow trends at monitoring locations in other portions of the lake; therefore, based on this desktop review, results indicate that the submerged weir confines mixing to the upstream portion of the Whitewater River cove upstream of the submerged weir and effects of operations are not noted downstream of the weir.

Temperature - Prior to 1991 (pre operations), temperatures averaged throughout the water column in Lake Jocassee averaged between 11.7 and 15.3ºC with a standard deviation around 5ºC. After 1991, average temperatures in Lake Jocassee averaged between 12.1 and 17.2 ºC with a standard deviation around 5ºC as shown in Table 5-16. There is little difference between the pre and post operation temperature of Lake Jocassee. The variance in temperature is also reasonably consistent at each station between pre and post operations. As discussed previously, outside of Station 564.1, there are no discernable patterns that would suggest Lake Jocassee temperatures are affected by Bad Creek operations or outside the range of natural conditions and there is no pattern of warming or cooling between time periods (variation between time periods on average is less than one degree); therefore, Project operations have not impacted water temperatures in Lake Jocassee. The notable exception is the average temperature change from pre to post operations at monitoring Station 564.1; this station shows an increase of approximately 3.3°C (see Table 5-16).

Table 5-16. Average and Standard Deviation of Depth-Averaged Temperatures, Pre vs. Post Operations

Monitoring Station	Temperature (°C)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	12.5	4.9	12.1	4.8	-0.4
558.0	12.9	5.2	13.5	5.4	0.6
559.0	12.5	5.0	12.1	4.9	-0.4
560.0	11.7	4.6	12.3	4.9	0.6
562.0	15.3	5.6	16.0	5.3	0.7
565.4	14.1	5.4	13.1	4.7	-1.0
551.0	13.5	5.8	14.8	7.3	1.3
564.0	12.1	4.7	12.7	4.9	0.6
564.1	13.9	5.6	17.2	5.5	3.3
557.0	11.7	4.5	12.2	4.8	0.5
554.8	14.6	5.5	14.2	5.3	-0.4
556.0	12.8	4.9	13.4	5.2	0.6

Dissolved Oxygen - There is little difference between the pre and post operation conditions of Lake Jocassee. The variance in DO at each station is also reasonably consistent between pre and post operations. As discussed previously, outside of Station 564.1, there are no discernable patterns that would suggest Lake Jocassee DO values are affected by Bad Creek operations or outside the range of natural conditions and there is no pattern of increasing or decreasing DO between time periods (variation between time periods on average is less than 0.5 mg/L); therefore, Project operations have not impacted water temperatures in Lake Jocassee. The notable exception is the average change from pre to post operations at monitoring Station 564.1, which is immediately downstream of the Project I/O structure; this station shows an increase of approximately 1.1 mg/L and the standard deviation dropped from 3.2 to 0.8, indicating there is little variation in DO at that station due to mixing (Table 5-17).

Table 5-17. Average and Standard Deviation of Surface Dissolved Oxygen, Pre vs. Post Operation

Monitoring Station	Dissolved Oxygen (mg/L)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	6.9	2.4	6.9	1.9	0
558.0	6.5	2.8	7.0	1.8	0.5
559.0	6.5	2.7	6.5	2.2	0
560.0	6.7	2.5	6.4	2.3	-0.3

Monitoring Station	Dissolved Oxygen (mg/L)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
562.0	7.8	2.7	7.9	2.0	0.1
565.4	7.3	2.9	7.1	2.5	-0.2
551.0	9.9	1.3	9.6	1.6	-0.3
564.0	6.4	3.0	6.2	2.6	-0.2
564.1	7.4	3.2	8.5	0.8	1.1
557.0	6.8	2.9	6.8	2.3	0
554.8	7.7	3.1	7.4	2.8	-0.3
556.0	7.4	2.9	7.3	2.6	-0.1

Turbidity - Where data are available, NTU values are higher during pre construction periods than during construction and post construction periods. This is true for depth-averaged turbidity (Table 5-18) as well as surface water turbidity (Table 5-19). Pre construction data show episodic elevated turbidity values likely associated with high surface water inflows during storm events from surface runoff. Additionally, turbidity would have been naturally elevated during that time as organic material decomposed in the years following initial reservoir filling. Over the three stations monitored, the highest values of turbidity are associated with monitoring Station 564.1 immediately downstream of the Project (closest to the Whitewater River mouth) during Project construction; however, these elevated turbidity values are not noted at monitoring Station 564.0, indicating that elevated turbidity does not extend downstream into Whitewater River cove.

Additionally, data indicate that elevated turbidity values typically returned to baseline for the following measurement, indicating rapid recovery from elevated values back to normal values (i.e., within one month conservatively, based on sampling frequency). There were several periods of prolonged elevated turbidity values noted at Station 564.1 during the construction period, therefore, these data are assumed to be associated with construction activities. Future construction activities at Bad Creek could increase turbidity in the Whitewater River cove; however, these events would likely be short-lived and based on previous data, recovery in the water column is expected to be rapid.

Table 5-18. Depth-Averaged Turbidity Values (NTU) over Construction Periods

Period	Station 564.1	Station 564.0	Station 560.0
Pre construction	N/A	6.6	3.0
Construction	18.5	2.9	1.5
Post construction	0.8	0.5	0.7

Table 5-19. Average and Standard Deviation of Surface Turbidity, Pre vs. Post Operation

Monitoring Station	Temperature (°C)			
	Pre operations		Post operations	
	Average	Standard Deviation	Average	Standard Deviation
560	2.5	2.7	1.0	1.6
564	2.6	4.4	1.0	1.6
564.1	2.8	3.1	1.0	0.9

6 Howard Creek

Howard Creek is a high-gradient, third-order, headwater mountain stream. It flows from about 3,200 ft msl to 2,000 ft msl at its confluence with Limber Pole Creek and Lake Jocassee. It is typically less than 30 ft wide and 1.65 ft deep, consists mostly of pools and riffles with steep sections of chutes and waterfalls, and has an average gradient of 8.6 percent (Miller et al. 1997). Howard Creek is a popular recreation stream known for Brook Trout and Rainbow Trout fishing.

6.1 Data Analysis Methods

Pursuant to Article 34 of the original license for the Project (issued to Duke Power Company in 1977) water quality sampling studies in Howard Creek have been carried out, mainly by Clemson University, to assess impacts to Howard Creek associated with construction and operation of the Project.

This section provides an overview of 1993 data presented in Abernathy et al. (1994), which are considered representative of existing (baseline) conditions. While a comparison of water quality between pre and post construction conditions is provided herein (see Section 6.4), water quality data from previous years are documented elsewhere. The body of literature for Howard Creek water quality monitoring is relatively large and there are many notable reports describing water

quality for pre construction, construction, and post construction conditions. References for these germane reports are listed below in Table 6-1.

This report provides a summary of: (1) results from January – December 1993, which represent water quality data for Howard Creek under existing (i.e., operational) conditions and (2) changes observed in water quality between pre construction and post construction data, as presented by Abernathy et al. (1994). While baseflow water quality in Howard Creek and major tributaries was monitored from near Howard Creek's confluence with Lake Jocassee to its headwaters upstream of the Project, this data summary only considers water quality downstream of the Project as upstream waters are not considered impacted by the Project.

Table 6-1. Previous Water Quality Reports for Howard Creek

Period	Reference
Pre Construction	Dysart, B.C. III, C.S. Peralta, A.D. Ranson, A.R. Abernathy & J.B. Atkins, Howard Creek Pre construction Water Quality Monitoring: 1980, Rept. No. DPC/HC-TCR-02-0481 by Clemson University for Duke Power Co. (1981).
	Dysart, B.C. III & A.R. Abernathy, Howard Creek Pre- and Early-Construction Water Quality Monitoring: 1981, Rept. No. DPC/HC-TCR-04-0782 by Clemson University for Duke Power Co. (1982).
	Iseman, W.E., A.R. Abernathy, B.C. Dysart III & K.B. Chandler, Water Quality Investigation for the Howard Creek Basin: January 1974-June 1975, Rept. No. DPC/BC-SPR-07-0675 by Clemson University for Duke Power Co. (1975).
	Langdon, C.H. Ill, B.C. Dysart III, R.C. Roberts, R.D. Hatcher Jr. & R.C. Richards, Bottom Sediment and Discharge Studies for the Howard Creek Basin: January-June 1974, Rept. No. DPC/BC-SPR-06-0575 by Clemson University for Duke Power Co. (1975).
	Sigmon, E.B. & B.C. Dysart III, Hydrological Investigations for the Howard Creek Basin from July 1974-September 1975: Analysis of Baseflow and Storm Response, Rept. No. DPC/BC-SPR-09-1275 by Clemson University for Duke Power Co. (1975).
	Swit, F.J., B.C. Dysart III, R.D. Hatcher Jr. & C.H. Langdon Ill, Hydrological and Fluvial Sediment Investigations tor the Howard Creek Basin: April-December 1973, Rept. No. DPC/BC-SPR-01-1273 by Clemson University for Duke Power Co. (1973).
	Abernathy, A.R. & B.C. Dysart III, "Water Quality Investigation," Application for License for Bad Creek Pumped Storage Project, Vol. II, Exhibit W, App. C, Ch. IV, Duke Power Co., Charlotte (1974).
	Dysart, B.C. III, "Stream Flow and Hydrologic Analysis," Application for License for Bad Creek Pumped Storage Project, Vol. II, Exhibit W, App. C, Ch. Ill, Duke Power Co., Charlotte (1974).
Construction	Dysart, B.C. III & A.R. Abernathy, Howard Creek Early-Construction Water Quality Monitoring: 1982, Rept. No. DPC/HC-TCR-07-0683 by Clemson University for Duke Power Co. (1983).
	Dysart, B.C. III & A.R. Abernathy, Howard Creek Early-Construction Water Quality Monitoring: 1983, Rept. No. DPC/HC-TCR-09-0684 by Clemson University for Duke Power Co. (1984).
	Dysart, B.C. III & A.R. Abernathy, Howard Creek Early-Construction Water Quality Monitoring: 1984, Rept. No. DPC/HC-TCR-11-0785 by Clemson University for Duke Power Co. (1985).

Period	Reference
	Dysart, B.C. III, A.R. Abernathy & D.R. Kosik, Howard Creek Early-Construction Water Quality Monitoring: 1985, Rept. No. DPC/HC-TCR-14-0286 by Clemson University for Duke Power Co. (1986).
	Dysart, B.C. III, A.R. Abernathy & M.T. Ruane, Howard Creek Major-Construction-Phase Water Quality Monitoring: 1986, Rept. No. DPC/HC-TCR- 19-0687 by Clemson University for Duke Power Co. (1987).
	Dysart, B.C. III, A.R. Abernathy & M.A. Lancaster, Howard Creek Major-Construction-Phase Water Quality Monitoring: 1987, Rept. No. DPC/HC-TCR-22-0588 by Clemson University for Duke Power Co. (1988).
	Dysart, B.C. III, A.R. Abernathy & T.K. Ziegler, Howard Creek Major-Construction-Phase Water Quality Monitoring: 1988, Rept. No. DPC/HC-TCR-26-0889 by Clemson University for Duke Power Co. (1989).
	Dysart, B.C. Ill, A.R. Abernathy & B.S. West. Howard Creek Major-Construction-Phase Water Quality Monitoring: 1989, Rept. No. DPC/HC-TCR-30-0890 by Clemson University for Duke Power Co. (1990).
	Abernathy, A.R., B. C. Dysart Ill & W.H. Jenkins, Howard Creek Construction-Phase Water Quality Monitoring: 1990, Rept. No. DPC/HC-TCR-35-0391 by Clemson University for Duke Power Co. (1991).
	Abernathy, A.R., B. C. Dysart Ill & B.S. Rudolph, Howard Creek Construction-Phase Water Quality Monitoring: 1991, Rept. No. DPC/HC-TCR-43-0692 by Clemson University for Duke Power Co. (1992).
Post Construction	Abernathy, A.R., P.A. Augspurger & B.C. Dysart III, Howard Creek Post-construction Water Quality Monitoring: 1993, Rept. No. DPC/HC-TCR-46-0793 by Clemson University for Duke Power Co. (1993).
	Ward, A. B., Stream Water Quality Changes Associated with Construction of the Bad Creek Project Dams, Special Project Rept. for the College of Engineering, Clemson University, Clemson, S.C. (1991).
	Wood, T. H., The Environmental Significance of Elevated Concentrations of Iron, Aluminum and Calcium in the Bad Creek Project Dam Seepage Flows, M.S. thesis, Clemson University, Clemson, S.C. (1993).
	Ziegler, T.K. & B.C. Dysart Ill, Investigation of Hydrology and Sediment Yield at a Major Construction Site In Steep Mountain Terrain, Rept. No. DPC/HC-MTH-34-1290 by Clemson University for Duke Power Co. (1990).

6.2 Water Quality Monitoring Stations

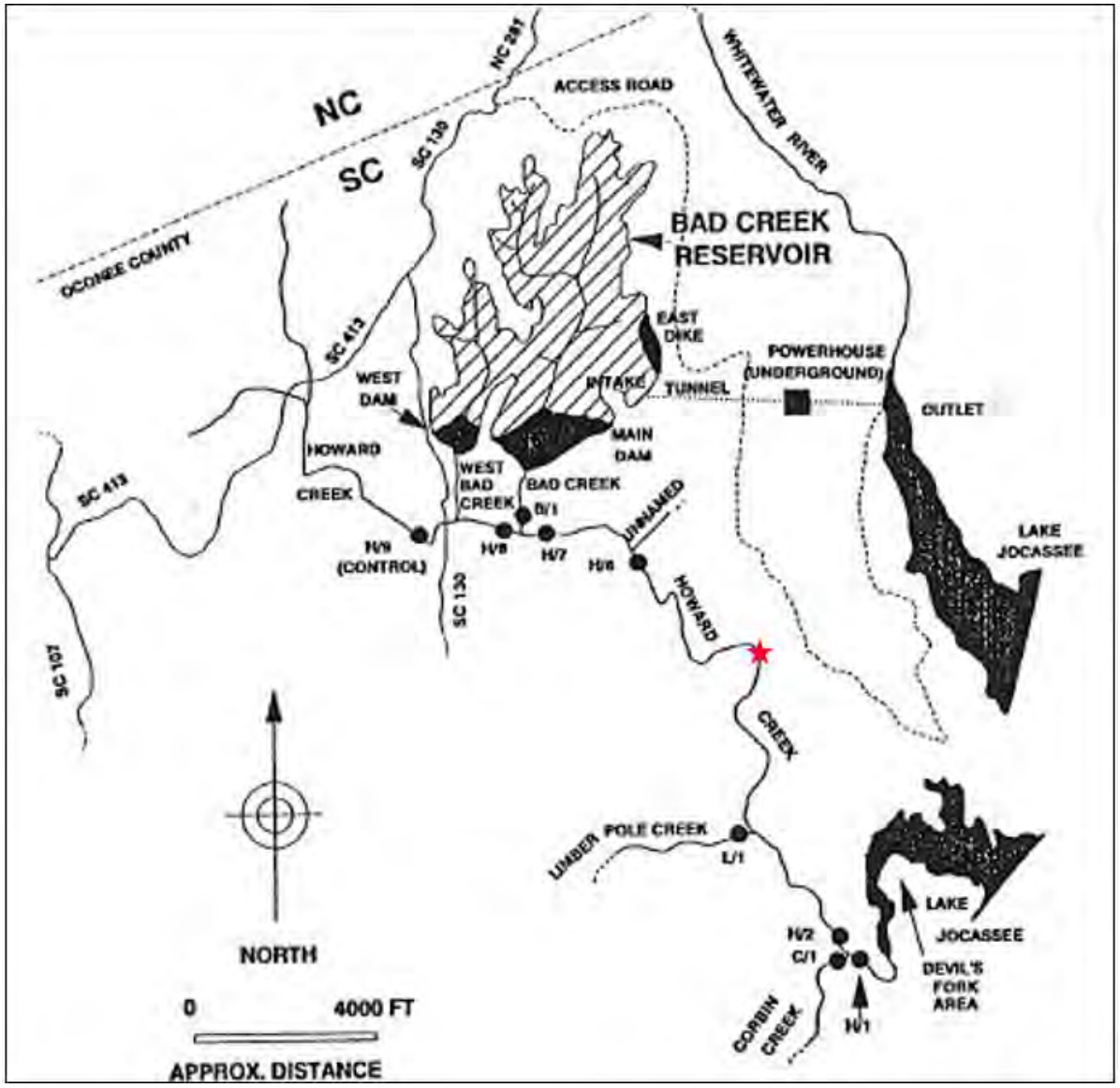
As described in Abernathy et al. (1994), water quality parameters were measured at several points along the length of Howard Creek; locations and specific parameters measured were determined in coordination and agreement with FERC, SCDHEC, and the South Carolina Department of Natural Resources (SCDNR) (formerly SC Wildlife and Marine Resources Department). During sampling, agency personnel were kept apprised of water quality monitoring activities and annual reports were submitted (Abernathy et al. 1994). The following five stations (shown on Figure 6-1) were monitored (listed from downstream to upstream) during the study:

- H/1: Between Corbin Creek and Lake Jocassee
- H/2: Between Limber Pole Creek and Corbin Creek
- H/6: Downstream from the Old Schoolhouse Road and an unnamed tributary entering from the east and upstream from Limber Pole Creek
- H/7: Just downstream from Bad Creek

- H/9[13]: Just upstream of Highway 130

Water quality parameters that were measured on a monthly basis include the following: water temperature, DO, pH, specific conductance, total alkalinity, total suspended solids (TSS), turbidity, flow rate/discharge, 5-day biochemical oxygen demand (BOD_5), fecal coliform, and total hardness. Water quality parameters that were measured on a quarterly basis include: ammonia nitrogen, nitrate/nitrite nitrogen, orthophosphate, and total phosphorus. Details on methodology used to collect water quality parameters are included in Abernathy et al. (1994).

[13] Because Station H/9 is upstream of the Project, it is not considered in this study; however, results are included for completeness.



Note: red star indicates location of USGS 02184475 retired gage on Howard Creek.

Figure 6-1. Howard Creek Monitoring Sites (Abernathy et al. 1994)

6.3 Present-day Water Quality Summary Results

Flow data from the now-retired USGS gage on Howard Creek (USGS 02184475 HOWARD CREEK NEAR JOCASSEE, SC), which drains an area of approximately 2.16 mi^2, for the available period of record (1989-1996) are provided Table 6-2. The location of the retired gage is shown on Figure 6-1 indicated by a red star symbol. USGS 02184475 is located between H/6 and H/2; data from the retired gage are comparable to flows measured during the Abernathy et al. (1994) study as indicated in Table 6-3 below (from 1993). Water quality information from each

month of the year (1993) at each location is included in Table 6-4 through Table 6-8. A description and numerical range of all water quality parameters is included in Table 6-9.

Table 6-2. Annual Flow Data for Howard Creek (1989-1996)

Water Year	Discharge (cfs)
1989	10.9
1990	12.9
1991	6.85
1992	7.08
1993	7.79
1994	6.08
1995	6.06
1996	7.4

Source: USGS 02184475 HOWARD CREEK NEAR JOCASSEE, SC
https://waterdata.usgs.gov/nwis/inventory/?site_no=02184475&agency_cd=USGS

Table 6-3. Baseflow Discharge (cfs) for Howard Creek (1993)

Station	Date	H/1	H/2	H/6	H/7	H/9
1	15 JAN	50.53	32.05	16.89	12.65	9.34
2	08 FEB	38.71	19.81	11.11	10.32	5.63
3	01 MAR	36.85	26.02	9.53	9.29	6.27
4	07 APR	48.35	32.55	16.86	11.36	8.70
5	06 MAY	45.17	33.97	17.87	13.83	9.97
6	01 JUN	28.42	15.96	8.20	8.68	3.99
7	07 JUL	16.21	12.06	5.05	5.45	2.07
8	05 AUG	15.59	9.56	6.19	4.97	1.60
9	08 SEP	12.52	10.08	4.92	4.09	1.36
10	06 OCT	9.26	9.98	3.56	3.09	0.86
11	03 NOV	98.26	8.89	3.05	3.25	0.86
12	16 DEC	13.33	12.69	6.15	15.85	2.19

Notes:

(1) Discharge values obtained for Stations H/1, H/6, and H/9 are considered to be of good quality and reliable due to cross-sections which are reasonably well suited for discharge measurements.

(2) Discharge values obtained for Station H/2 are believed to be higher than actual discharge at times due to cross-section conditions which are not well suited for obtaining accurate velocity measurements. Station H/2 has a significant amount of lateral flow. Since early 1981, special care was exercised to minimize the deviations at this Station by noting the angle of flow at each vertical.

(3) Discharge values obtained for Station H/7 are believed to be higher than actual discharge due to a large proportion of the flow being concentrated in a relatively narrow chute. Special care was exercised to minimize deviations by increasing the number of verticals.

Table 6-4. Water Quality Baseflow Conditions for Howard Creek H/1, 1993

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
1	15 JAN	7.0	8.5	13.3	11.0	0.7	6.1	13.0	7.0	5.1	2.75	3	--	--	--	--	--
2	08 FEB	12.0	11.0	15.0	11.7	1.0	6.2	13.5	7.5	1.9	2.90	2	0.08	<0.01	0.070	0.002	0.001
3	01 MAR	8.0	7.0	14.2	12.8	0.7	6.1	13.5	4.0	2.6	1.90	<2	--	--	--	--	--
4	07 APR	16.0	11.0	16.4	11.2	1.1	6.0	15.5	3.0	6.5	4.00	7	--	--	--	--	--
5	06 MAY	15.0	14.0	16.2	9.8	0.5	6.1	13.0	3.5	9.5	5.20	10	0.10	<0.01	0.072	0.005	0.021
6	01 JUN	15.5	16.0	17.4	10.2	0.8	6.2	19.0	6.5	8.6	5.85	11	--	--	--	--	--
7	07 JUL	23.0	20.0	23.5	9.1	1.1	6.0	21.2	7.0	5.9	5.30	7	--	--	--	--	--
8	05 AUG	19.0	18.5	27.0	8.3	0.9	5.9	20.5	8.0	5.2	4.05	11	0.20	<0.01	0.045	0.006	0.021
9	08 SEP	23.0	19.0	24.5	9.1	1.0	6.2	21.4	7.0	5.8	3.35	19	--	--	--	--	--
10	06 OCT	13.0	14.0	26.0	9.4	0.8	5.8	18.0	10.0	8.0	3.25	13	--	--	--	--	--
11	03 NOV	8.0	7.5	24.0	12.6	0.3	6.3	20.1	6.0	3.4	1.70	11	0.17	<0.01	0.069	0.006	0.021
12	16 DEC	4.0	7.0	23.5	11.4	0.8	6.4	18.0	5.0	0.7	1.50	8	--	--	--	--	--

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L)

Table 6-5. Water Quality Baseflow Conditions for Howard Creek H/2, 1993

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
1	15 JAN	7.0	8.5	14.0	11.3	0.7	6.2	15.0	6.0	4.9	2.55	3	--	--	--	--	--
2	08 FEB	13.5	11.0	15.3	10.4	1.1	6.2	14.5	6.5	5.5	3.55	2	0.12	<0.01	0.046	0.003	0.008
3	01 MAR	8.0	7.5	16.1	10.8	0.7	6.1	12.0	4.0	2.7	2.95	<2	--	--	--	--	--
4	07 APR	14.5	12.0	15.8	12.8	1.3	6.0	14.5	4.0	5.8	3.65	<2	--	--	--	--	--
5	06 MAY	17.0	14.5	16.2	9.4	0.4	6.0	11.5	3.5	11.8	4.35	11	0.12	<0.01	0.055	0.007	0.018
6	01 JUN	19.0	16.5	17.7	9.6	0.9	6.0	17.0	5.0	6.7	5.30	12	--	--	--	--	--
7	07 JUL	27.0	20.5	26.0	9.2	1.0	5.9	17.0	9.5	5.3	5.00	14	--	--	--	--	--
8	05 AUG	21.0	19.0	28.0	9.0	0.8	5.7	21.5	8.0	5.0	4.00	12	0.28	<0.01	0.079	0.004	0.011

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
9	08 SEP	22.5	19.0	26.5	9.2	0.9	6.0	23.4	8.0	5.2	4.65	20	--	--	--	--	--
10	06 OCT	15.0	14.0	28.0	9.5	0.5	5.9	20.0	11.0	4.1	2.35	11	--	--	--	--	--
11	03 NOV	9.5	8.0	26.0	12.0	0.2	6.3	27.3	13.0	3.4	2.45	<2	0.32	<0.01	0.077	0.002	0.024
12	16 DEC	7.0	7.0	25.5	12.4	0.2	6.3	25.0	8.0	0.7	2.55	**	--	--	--	--	--

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L); **Sample not taken due to lack of proper sampling bottles

Table 6-6. Water Quality Baseflow Conditions for Howard Creek H/6, 1993

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
1	15 JAN	6.0	9.0	19.5	10.7	1.0	6.4	21.0	9.0	3.8	2.20	2	--	--	--	--	--
2	08 FEB	12.5	11.5	21.5	9.8	1.4	6.1	17.5	9.3	5.4	2.75	20	0.30	<0.01	0.095	0.002	0.010
3	01 MAR	10.0	8.0	22.0	12.0	0.5	6.1	16.0	7.5	2.9	2.05	4	--	--	--	--	--
4	07 APR	15.5	12.0	21.5	9.4	0.9	6.1	17.0	5.0	4.3	3.00	6	--	--	--	--	--
5	06 MAY	23.0	15.0	21.8	10.3	0.5	6.2	16.0	6.0	7.5	3.35	8	0.23	<0.01	0.089	0.006	0.022
6	01 JUN	22.5	17.0	26.0	8.6	0.8	6.0	21.0	8.1	6.0	4.00	12	--	--	--	--	--
7	07 JUL	31.0	19.0	38.0	8.4	0.9	6.0	24.0	14.0	6.0	4.85	20	--	--	--	--	--
8	05 AUG	25.0	18.0	39.5	8.5	0.8	5.8	26.7	13.5	5.3	3.85	8	0.57	<0.01	0.062	0.002	0.005
9	08 SEP	23.0	19.0	37.0	8.9	1.0	6.0	27.7	12.0	6.3	4.65	18	--	--	--	--	--
10	06 OCT	17.5	15.0	40.0	8.4	0.5	6.1	26.4	14.0	7.1	3.25	5	--	--	--	--	--
11	03 NOV	9.0	10.0	37.5	11.0	0.2	6.4	27.3	13.0	3.4	2.45	<2	0.63	<0.01	0.077	0.005	0.010
12	16 DEC	8.5	10.0	36.0	12.1	0.3	6.4	25.0	14.0	3.3	2.55	**	--	--	--	--	--

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L); **Sample not taken due to lack of proper sampling bottles

Table 6-7. Water Quality Baseflow Conditions for Howard Creek H/7, 1993

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
1	15 JAN	6.0	10.0	25.0	11.4	0.6	6.4	19.5	13.5	4.6	2.00	<2	--	--	--	--	--
2	08 FEB	10.5	12.0	28.0	11.4	0.8	6.2	23.0	12.0	5.2	2.20	<2	0.52	<0.01	0.046	0.002	0.013
3	01 MAR	6.5	9.5	28.3	11.8	0.5	6.4	21.0	10.0	2.8	1.70	4	--	--	--	--	--
4	07 APR	13.5	12.5	27.5	9.8	0.9	6.2	22.5	10.0	6.7	2.95	<2	--	--	--	--	--
5	06 MAY	18.0	14.0	24.0	9.2	0.4	6.3	18.5	8.5	9.0	3.30	8	0.38	<0.01	0.072	0.009	0.020
6	01 JUN	18.5	15.5	31.5	9.7	0.9	6.1	22.5	9.5	5.7	3.75	8	--	--	--	--	--
7	07 JUL	25.0	18.0	42.5	8.6	0.8	6.1	26.2	15.5	16.7	5.60	4	--	--	--	--	--
8	05 AUG	22.5	17.5	44.5	9.0	0.9	6.0	28.4	13.0	7.1	4.0	10	0.80	<0.01	0.062	0	0.033
9	08 SEP	21.0	18.0	40.5	8.8	0.7	5.9	32.4	14.0	7.3	3.35	<2	--	--	--	--	--
10	06 OCT	17.0	15.5	44.5	8.9	0.4	6.1	30.1	17.0	3.4	2.35	4	--	--	--	--	--
11	03 NOV	9.0	11.0	39.0	9.9	0.0	6.5	30.0	12.0	2.9	1.35	3	0.71	<0.01	0.094	0.004	0.041
12	16 DEC	7.5	11.5	42.5	10.8	0.3	6.4	28.0	16.0	1.4	2.55	6	--	--	--	--	--

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L)

Table 6-8. Water Quality Baseflow Conditions for Howard Creek H/9, 1993

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
1	15 JAN	6.5	9.0	8.5	12.8	1.3	6.0	9.0	5.0	2.8	1.95	<2	--	--	--	--	--
2	08 FEB	13.0	9.5	8.3	12.5	0.9	6.0	10.5	3.8	9.6	1.80	2	<0.01	<0.01	0.054	0.006	0.003
3	01 MAR	7.5	7.0	9.1	12.6	0.6	6.0	7.5	3.0	1.9	1.20	2	--	--	--	--	--
4	07 APR	12.0	10.5	8.2	11.0	0.6	6.1	6.0	2.2	3.5	2.20	3	--	--	--	--	--
5	06 MAY	15.0	12.5	9.4	10.0	0.3	6.0	7.0	1.5	8.8	2.65	6	<0.01	<0.01	0.080	0.009	0.018
6	01 JUN	17.5	15.0	10.0	9.4	0.9	6.0	9.0	5.0	3.2	4.30	13	--	--	--	--	--
7	07 JUL	22.0	18.0	12.5	8.4	0.9	5.8	9.1	1.0	5.0	4.25	12	--	--	--	--	--
8	05 AUG	20.0	17.5	12.0	9.1	0.7	5.8	8.0	3.0	4.0	3.50	10	0.02	<0.01	0.045	0.001	0.024

OBS	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
9	08 SEP	20.0	18.0	12.0	9.3	1.2	5.9	10.7	1.5	8.5	3.4	7	--	--	--	--	--
10	06 OCT	17.5	14.5	12.5	8.8	0.3	5.9	9.0	5.5	2.3	1.85	7	--	--	--	--	--
11	03 NOV	9.5	8.0	13.0	10.4	0.2	6.4	8.1	2.0	3.7	1.35	3	<0.01	<0.01	0.094	0.007	0.038
12	16 DEC	9.0	7.0	11.0	11.5	0.6	6.1	6.0	3.0	1.2	1.60	4	--	--	--	--	--

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L)

*Instrumental problems with BOD measurement

Table 6-9. Range of Annual Water Quality Baseflow Data for Howard Creek, 1993

Station	Date	ATEMP	WTEMP	SC	DO	BOD_5	pH	TA	TH	TSS	TUR	FC	NO_3N	NO_2N	NH_3N	OP	TP
H/1	MAX	23.0	20.0	27.0	12.8	1.1	6.4	21.4	10.0	9.5	5.85	19	0.20	<0.01	0.072	0.006	0.021
	MIN	4.0	7.0	13.3	8.3	0.3	5.8	13.0	3.0	0.7	1.50	<2	0.08	<0.01	0.045	0.002	0.001
H/2	MAX	27.0	20.5	28.0	12.8	1.1	6.3	27.3	3.0	10.8	5.30	20	0.32	<0.01	0.079	0.007	0.024
	MIN	7.0	7.0	14.0	9.0	0.2	5.7	11.5	3.5	0.7	2.55	<2	0.12	<0.01	0.046	0.002	0.008
H/6	MAX	31.0	19.0	40.0	12.1	1.4	6.4	27.1	14.0	7.5	4.85	20	0.63	<0.01	0.095	0.006	0.022
	MIN	6.0	8.0	19.5	8.4	0.2	5.8	16.0	5.0	2.9	2.05	<21	0.23	<0.01	0.062	0.002	0.005
H/7	MAX	25.0	18.0	4.5	11.8	0.9	6.5	32.4	17.0	16.7	5.6	10	0.80	<0.01	0.094	0.009	0.041
	MIN	6.0	9.5	24.0	8.6	0.0	5.9	18.5	8.5	1.4	1.35	<2	0.38	<0.01	0.046	0.000	0.013
H/9	MAX	22.0	18.0	13.0	12.8	1.3	6.4	10.7	5.5	9.6	4.3	13	0.02	<0.01	0.094	0.009	0.038
	MIN	6.5	7.0	8.2	8.4	0.2	5.8	6.0	1.0	1.2	1.20	<2	<0.01	<0.01	0.045	0.001	0.003

NOTE: ATEMP = Air Temperature (°C), WTEMP = Water Temperature (°C), SC = Specific Conductance (µmho/cm), DO = Dissolved Oxygen (mg/L), BOD_5 = Biochemical Oxygen Demand (mg/L), TA = Total Alkalinity (mg $CaCO_3$/L), TH = Total Hardness (mg $CaCO_3$/L), TSS = total Suspended Solids (mg/L), TUR = Turbidity (NTU), FC = Fecal Coliforms (# / 100 mL), NO_3N = Nitrate (mg/L), NO_2N = Nitrite (mg/L), NH_3N = Ammonia (mg/L), OP = Orthophosphate (mg/L), TP = Total Phosphorus (mg/L)

6.4 Compliance with SCDHEC State Standards

Present day (1993) water quality parameters assessed for Howard Creek and compared against state standards for temperature, DO, pH, and turbidity were all within SCDHEC criteria limits for freshwater (trout) streams.

Since the maximum range of turbidity measured at all three stations in 1993 was consistent with (and even below) those observed during pre construction, baseflow turbidity values under current conditions are considered to be within the trout water turbidity standards set forth by SCDHEC. Post construction DO measurements were greater than the SC trout water standard, therefore DO is also considered to be within state standards for trout waters. Stream standards for trout waters must have a pH of 6.0 to 8.0; mountain streams such as Howard Creek are typically poorly buffered and tend to have low pH values (Abernathy et al. 1994). Low values were recorded in Howard Creek during all phases of sampling and there is a link between pH decreases and prolonged lack of rainfall; however, mean values of pH in 1993 were within the state criteria except for station H/9, which is upstream of the Project and therefore not impacted by the Project. In post construction data, the warmest temperature recorded above and below the Project on Howard Creek was 20.5°C at Station H/2. In pre construction data, water temperatures as high as 21°C were noted, therefore temperatures are consistent and within the range of pre-Project temperatures.[14]

The state standard for fecal coliform in waters call for a maximum of 200/100 milliliter (over five consecutive samples during any 30-day period with <10 percent of total samples any 30-day period exceeding 400/100 milliliter. While fecal coliform is not a state standard that would be affected by Project operations, based on these criteria, post construction values for fecal coliform satisfy the trout water standard.

[14] Note that temperature was monitored on a monthly basis in the seepage at the toe of the main dam. The seepage waters appear to have a somewhat constant temperature, but do experience some ponding before they enter Howard Creek. The result tends to be a slight warming of Howard Creek (l-2°C) at Station H/7 during cooler (winter) months and a slight cooling at the same station in warmer (summer) months. In looking at these data along with the pre construction water temperature data tor Howard Creek, there appear to be no negative trends that would be detrimental to the biological community resulting from the construction of the Bad Creek reservoir.

6.5 Summary Pre construction vs. Post Construction Comparison

Table 6-10 provides water quality parameters for postconstruction (i.e., existing conditions) as well as pre construction (1980-1981) as a comparison, indicating that total suspended solids, turbidity, temperature, DO, pH, BOD_5 and fecal coliform under operational conditions are generally similar and fall well within the range of variation observed during pre construction conditions. Station H/1 is the furthest downstream, Station H/7 is just downstream of the Project, and Station H/9 is the control station (Abernathy et al. 1994). Comparisons between pre construction and post construction water quality data for each monitoring station are included in Figure 6-2 through Figure 6-7.

Table 6-10. Comparison of Water Quality Data: Pre construction vs. Post construction

		H/1		H/7		H/9	
Parameter		**1980-81**	**1993**	**1980-81**	**1993**	**1980-81**	**1993**
TSS	MAX	14.0	9.5	40.0	16.7	17.0	9.6
	MIN	0.05	0.7	0.6	1.4	0.05	1.2
	MEAN	4.9	5.3	8.5	6.1	3.9	4.5
TUR	MAX	19.0	5.8	34.0	5.6	18	4.3
	MIN	0.6	1.5	0.67	1.35	0.53	1.2
	MEAN	4.26	3.48	5.1	2.9	3.9	2.5
DO	MAX	15.2	12.8	15	11.8	13.7	12.8
	MIN	8.2	8.3	8.6	8.6	7.6	8.4
	MEAN	10.8	10.6	10.9	9.9	10.2	10.5
pH	MAX	7.3	6.4	7.2	6.5	7.4	6.4
	MIN	6.0	5.8	5.8	5.9	5.4	5.8
	MEAN	6.36	6.08	6.2	6.18	6.07	5.98
TA	MAX	16.4	21.4	15.4	32.4	10.7	10.7
	MIN	2.6	13	1.4	18.5	0.3	6.0
	MEAN	8.8	17.2	7.2	25.2	5.7	8.3
TH	MAX	24.2	10	36.9	17	38.2	5.5
	MIN	5.9	3.0	5.3	8.5	5.1	1.0
	MEAN	10.7	6.2	10.8	12.6	10.2	3.0
SC	MAX	35.0	27.0	19.0	44.5	19.0	13.0
	MIN	7.5	13.3	7.5	24.0	5.0	8.2
	MEAN	17.8	20.1	13.2	34.8	12.1	10.5
BOD_5	MAX	2.5	1.1	3.3	0.9	3.8	1.3
	MIN	0.2	0.3	0.2	0.0	0.2	0.2
	MEAN	0.8	0.8	0.8	0.6	0.8	0.7
FC	MAX	52.0	19.0	52.0	10.0	28.0	13.0
	MIN	1.0	<2.0	1.0	<2.0	1.0	<2.0
	MEAN	11.0	9.0	9.0	6.0	8.0	6.0

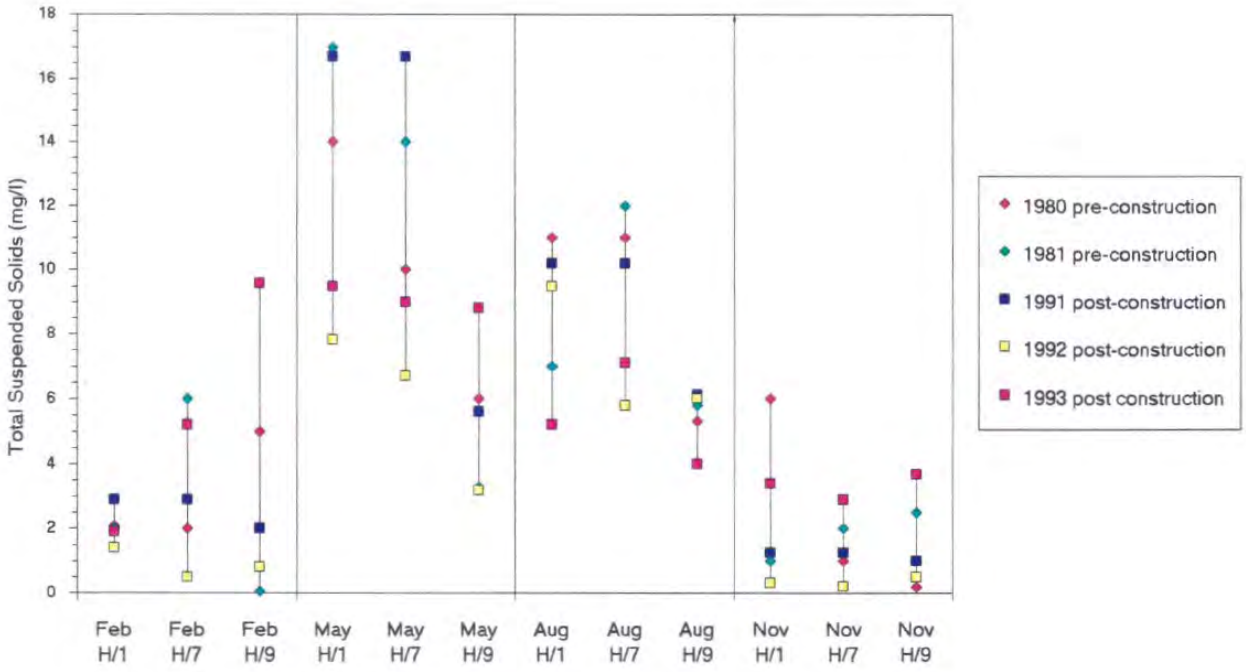


Figure 6-2. Comparison of Pre and Post Construction TSS Values

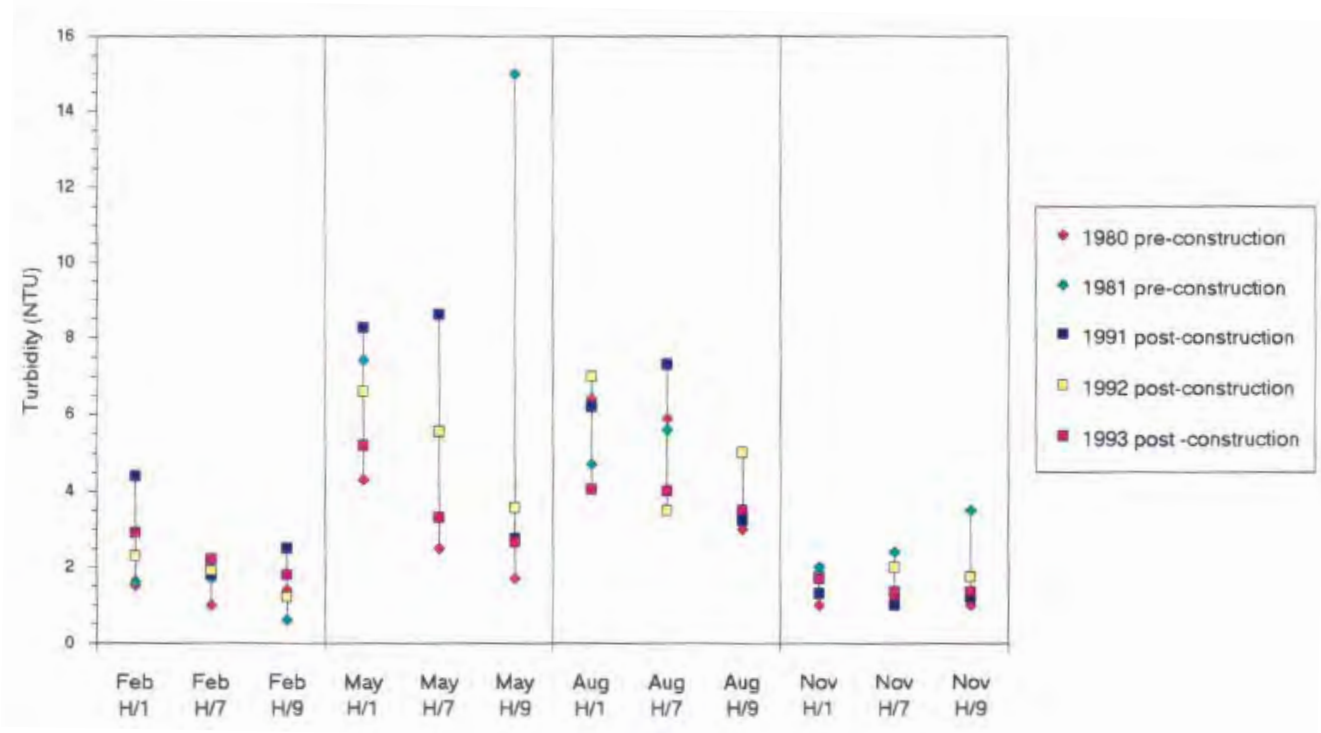


Figure 6-3. Comparison of Pre and Post Construction Turbidity Values

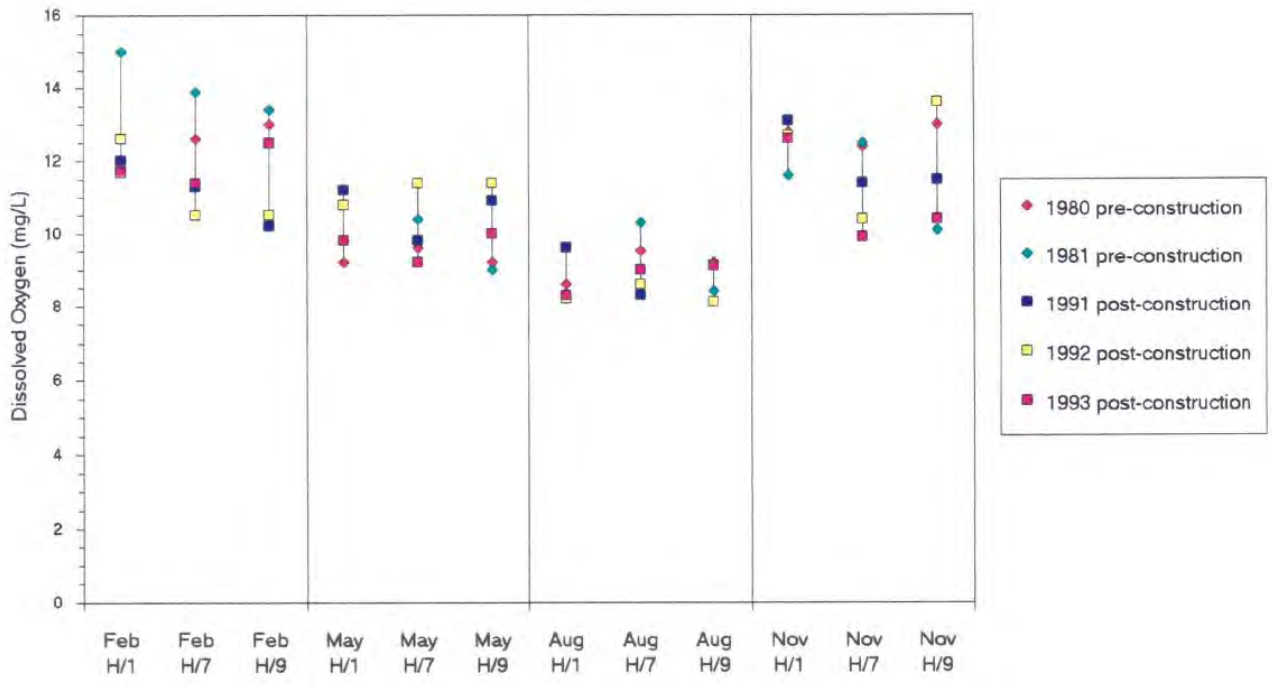


Figure 6-4. Comparison of Pre and Post Construction DO Concentration

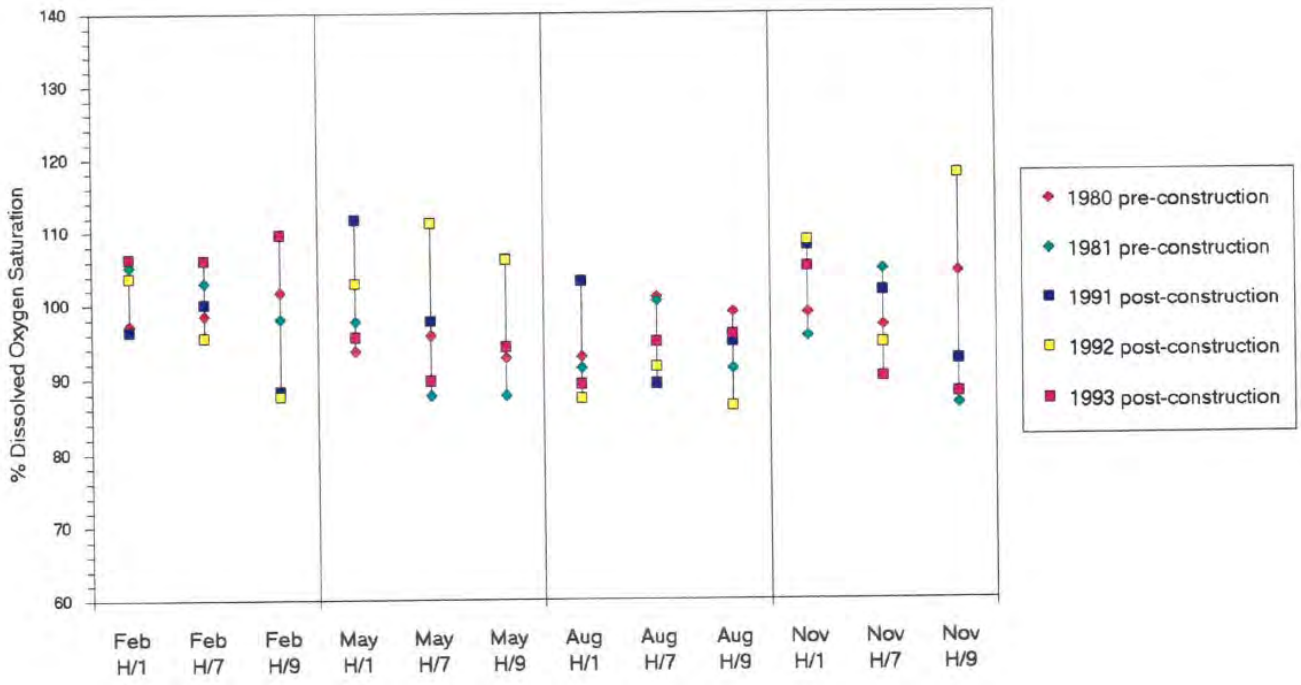


Figure 6-5. Comparison of Pre and Post Construction DO Saturation

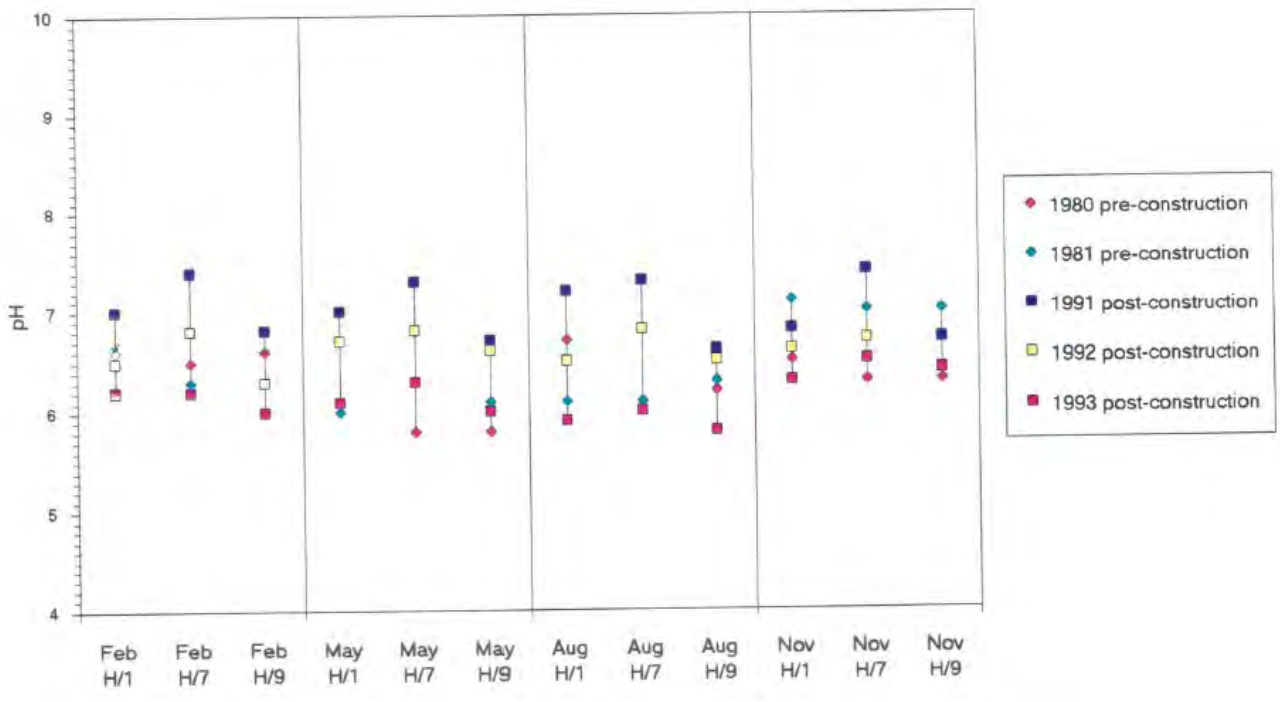


Figure 6-6. Comparison of Pre and Post Construction pH Values

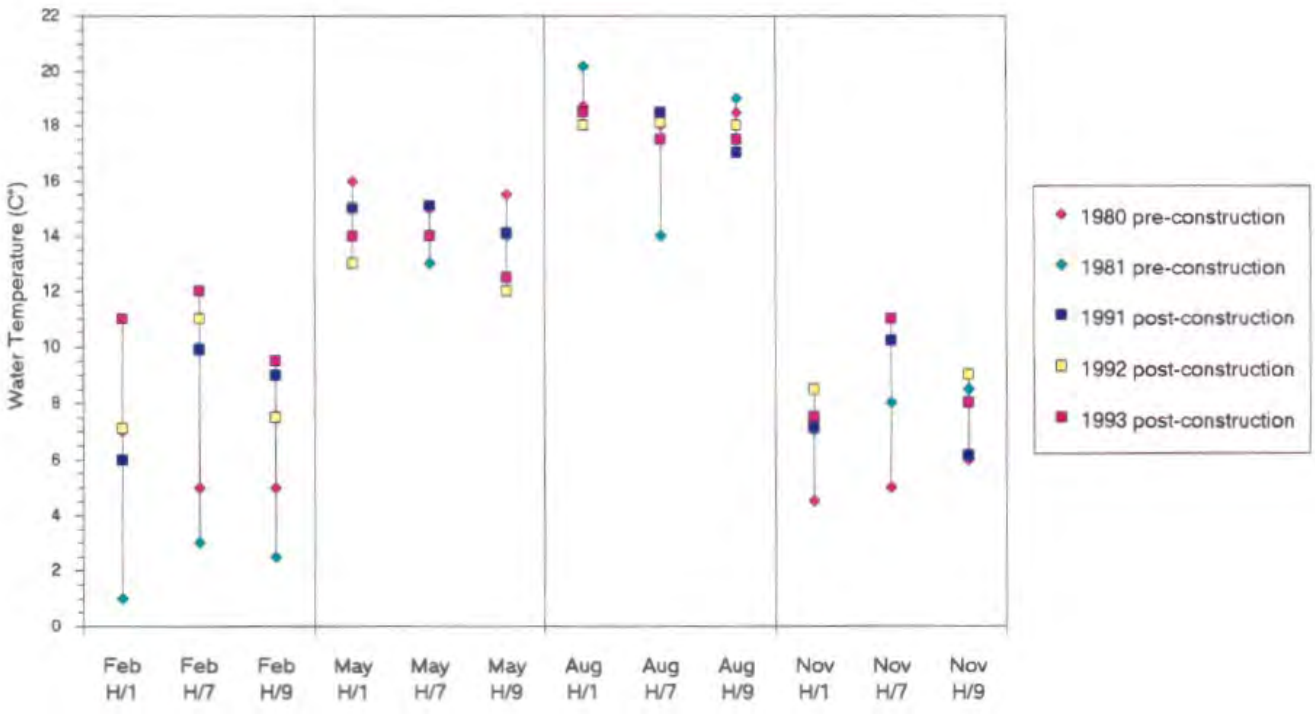


Figure 6-7. Comparison of Pre and Post Construction pH Values

Overall, Howard Creek, while showing typical annual variations, has remained a high-quality mountain stream with no major changes in the upper portion of the watershed upstream of the Project. Abernathy et al. (1994) notes that even with the major construction of the Project, most baseflow water quality conditions were relatively unchanged during and after construction and post construction water quality conditions are generally similar to pre construction, indicating little or no impact for the parameters studied. Notable changes in water quality that were observed between pre and postconstruction conditions included pH, total alkalinity, total hardness, and specific conductance.

Specific conclusions of the Abernathy et al. (1994) study include the following:

- Howards Creek's baseflow water quality in the postconstruction period is similar to that of pre construction. Differences are within the range of normal seasonal/annual variations with the following exceptions:
    - During 1991 pH readings were elevated above pre construction and postconstruction, by 1992 the values had returned to near normal, and in 1993 values dropped near or below pre construction, most likely due to lack of rainfall.
    - Total alkalinity values were elevated above pre construction levels at Station H/7 during 1991 and 1992 and remained elevated through 1993.
    - Total hardness values were elevated above pre construction levels at Station H/7 during 1991 and remained slightly elevated through 1992 and 1993. The control Station H/9, however, experienced a drop in mean total hardness during 1993 as compared to the pre construction mean.
    - Specific conductance values were elevated above pre construction levels at Station H/7 during 1991 and 1992 and-although decreasing-remained elevated through 1993.
- The elevated values of total alkalinity, total hardness, and specific conductance, and to some extent pH, following construction were likely due to seepage waters through the main and west dams coming into contact with grout materials. It is expected that these parameters (with the exception of pH) will continue to decline and stabilize over time.

6.6 Recent Howard Creek Aquatics Sampling Summary

Results from the initial recovery program suggested Howard Creek had returned to pre construction conditions by 1995. Commencing in 1997 and continuing through 2015, additional

fishery sampling of Howard Creek was implemented to assess whether the recovered state would persist. Sampling was performed at three monitoring stations (H/1, H/6, H/9).

All three survey locations maintained a consistent level of species diversity over the 18-year monitoring study. Generally, species diversity was higher at the downstream location (N=11 species) as compared to the upstream location (N=2 species); this is likely due to species immigration from the reservoir as well as a natural barrier (bedrock slide) found between H/1 and H/6 that hinders fish migration. All three species of trout known to the region (Rainbow Trout, Brown Trout, and Brook Trout) were collected in Howard Creek, but only Rainbow Trout were collected in significant numbers. The condition of Rainbow Trout was similar between the locations over time and was considered healthy. Other common species present in Howard Creek included Bluehead Chub (*Nocomis leptocephalus*), Yellowfin Shiner (*Notropis lutipinnis*), Blackbanded Darter (*Percina nigrofasciata*), Blacknose Dace, and Northern Hog Sucker (*Hypentelium nigricans*).

While water quality wasn't specifically monitored during this 18-year study, the results of the study suggest that Howard Creek has maintained a recovered condition from 1995 to at least 2015 (the last survey period); in the absence of any other known impacts, it is likely Howard Creek currently supports fish populations similar to those found in other southern Appalachian streams, indicating suitable water quality and habitat. Full results of the Howard Creek aquatics study are included in Duke Energy (2016) "Long-term Recovery Monitoring of the Howard Creek Fishery (1997-2015)".

7 Need for Protection, Mitigation, and Enhancement Measures to Protect Water Quality

Based on the results of this water quality study, and in consideration of results of other data collection efforts in support of the KT relicensing (Duke Energy 2014), there is no need for additional PM&E measures to protect water quality at the Project.

As a condition of the Original License for the Project, and as described in Section 1.6 of the Pre-application Document (Duke Energy 2022), Duke Energy entered into a Memorandum of

Understanding (MOU) with the SCDNR for the long-term management and maintenance of high-quality fishery resources in Lake Keowee, Lake Jocassee, and their tributary streams. The MOU and first 10-Year Work Plan were approved pursuant to Article #32(b)(1) of the Original License for the Project on May 1, 1997. License Article #32(b)(2) covers Lake Jocassee pelagic trout habitat and License Article #34 covers Lake Jocassee water quality. Through this MOU, SCDNR and Duke Energy personnel work cooperatively, and include third parties as necessary, to design and implement data collection and other activities to develop and enhance management strategies for fish in these areas. Activities included in the 10-Year Work Plans are focused on fisheries surveys and inventories, water quality and aquatic habitat evaluations, fish stocking, recreation, and shoreline impacts.

During the New License term, Duke Energy will continue to implement activities established by the MOU, as may be modified in consultation with stakeholders through the relicensing process and will continue to implement PM&E activities established under the KT Project Relicensing Agreement. Duke Energy plans to further consult with SCDHEC and relicensing stakeholders through the Integrated Licensing Process regarding final proposed mitigation and enhancement measures directed at operation of the existing Project and the proposed Bad Creek II Complex to be included in the Final License Application.

It should be noted that in the Environmental Assessment report developed as part of the KT Project relicensing effort in 2014, FERC specifically indicated that (1) existing water quality in the reservoirs and tailwaters (i.e., Lake Jocassee and Lake Keowee) is meeting or exceeding levels consistent with state water quality standards, and is consistent with levels supporting designated uses, and no issues have been raised concerning pH and total dissolved gas; (2) water quality modeling results indicate under the proposed [KT] Project operation, suitable DO levels and water temperatures would exist for the propagation of aquatic life in the Keowee Development water releases; (3) there are no proposed changes in KT Project operation that would alter water quality from existing conditions in the Jocassee Development tailwaters; and (4) the fishery at the KT Project is considered high quality.

This desktop review carried out to support Task 1 of the Water Resources Study is complete and results summarized in this document meet the goals and objectives stated in the RSP to describe

and analyze existing baseline conditions in waters impacted by the Project; data reported herein may serve as a reference for future water quality comparison and assessment.

8 Future Work

Under a separate task of the Water Resources Study (i.e., Task 2), Duke Energy will undertake water quality monitoring (continuous temperature and biweekly DO) at three historic monitoring stations in the Whitewater River arm (stations 564.1, 564.0, 560.0) of Lake Jocassee in June through September 2023 (two-unit powerhouse operation) and 2024 (four-unit powerhouse operation, with all ongoing upgrades complete). Water quality sampling in the Upper Reservoir is infeasible and because the Upper Reservoir directly discharges to Whitewater River cove (with very little other water contribution to the Upper Reservoir), water quality in Whitewater River cove and in particular at Station 564.1, is considered representative of conditions in the Bad Creek Reservoir.

These three locations have been routinely monitored by Duke Energy since the impoundment of Lake Jocassee and historic datasets represent data ranging from 1973 to 2015, depending on the location (provided in Appendix B). The continuous water temperature data will be used to better understand the effectiveness of the existing submerged weir and the effects of existing unit discharge in the Whitewater River arm. Additionally, newly collected water quality data will be compared against historical data and a summary comparison will be provided in the license application.

While Project operations are not expected to impose additional adverse effects on water quality, these baseline water quality data, such as what was compiled and assessed as part of this study, can be used to compare future impacts from construction and operation of the Bad Creek II Complex.

Note that pursuant to the existing MOU between Duke Energy and the SCDNR and subsequent 10-Year Work Plans, Duke Energy continues to collect water quality data in Lake Jocassee to support annual aquatic habitat evaluations. As part of the New License, Duke Energy plans to continue this long-term water quality monitoring program and will develop a Water Quality Monitoring Plan (WQMP) in consultation with agencies focused on the proposed Bad Creek II Complex. The WQMP will include three phases: pre construction, construction, and post

construction of Bad Creek II, including identification of applicable and appropriate threshold values for water quality parameters and monitoring means and methods. The future WQMP will be developed from January – December 2024 for submittal with the Draft License Application (March 2025) pending approval of Bad Creek II Complex construction.

9 Variances from FERC-approved Study Plan

There were no variances from the FERC-approved RSP for this task of the Water Resources Study.

10 Germane Correspondence and Consultation

Germane correspondence will be included with the Water Resources Study Report to be filed with the Initial Study Report in January 2024.

11 References

Abernathy, A.R., Augspurger, P.A. and Dysart, Benjamin C. III. 1994. Howard Creek Postconstruction Water Quality Monitoring: 1993. Prepared for Duke Power Company, Huntersville, NC.

Dobson, M., and C. Frid. 2009. Ecology of Aquatic Systems, Second Edition. Oxford University Press, New York, NY.

Duke Power Company. 1995. Order Approving Additional Monitoring. Project No. 2740-032.

Duke Energy Carolinas, LLC (Duke Energy). 2016. Long-term Recovery Monitoring of the Howard Creek Fishery (199702015). Final Report September 2016.

_____. 2014. Keowee-Toxaway Hydroelectric Project FERC Relicensing Final License Application (FERC Project No. 2503). August 2014.

_____. 2022. Pre-Application Document for the Bad Creek Pumped Storage Station. FERC No. 2740. February 2022.

Miller, S.D., Van Lear, D.H., Abernathy, A.R., Barwick, D.H., Dysart III, B.C., and Wood, T.H. 1997. Sedimentation Impacts on Resident Rainbow Trout in a High-gradient Southern

Appalachian Stream. Proc. Annual Conf. Southeast. Assoc. Fish and Wildlife Agencies.

North Carolina Department of Environmental Quality (NCDEQ). 2021. NC Surface Water Classifications. Accessed 03/02/2021. [URL]: https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=6e125ad7628f494694e259c80dd64265.

U.S. Geological Survey (USGS) 2018a. Temperature and Water. Water Science School; June 6, 2018. Accessed 04/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/temperature-and-water.

_____. 2018b. Dissolved oxygen and water. Water Science School; June 5, 2018. Accessed 04/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/dissolved-oxygen-and-water

_____. 2018c. Phosphorus and Water. Water Science School; June 5, 2015. Accessed 04/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/phosphorus-and-water

_____. 2018d. Turbidity and Water. Water Science School; June 6, 2018. Accessed 03/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/turbidity-and-water#:~:text=Turbidity%20is%20the%20measure%20of,light%2C%20the%20higher%20the%20turbidity

_____. 2018d. Nitrogen and Water. Water Science School; May 21, 2018. Accessed 05/23/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/nitrogen-and-water.

_____. 2019. pH and Water. Water Science School; October 22, 2019. Accessed 04/2023. [URL] https://www.usgs.gov/special-topics/water-science-school/science/ph-and-water.

South Carolina Department of Health and Environmental Control (SCDHEC). 2020. Regulations 61 - 68 Water Classifications and Standards. Columbia, SC. [URL] https://scdhec.gov/sites/default/files/Library/Regulations/R.61-68.pdf. (Accessed July 2022).

_____. 2021. SC Watershed Atlas. Accessed 03/02/2021. [URL]: https://gis.dhec.sc.gov/watersheds/

_____. n.d.. SCDHEC Surface Water Quality and Assessment Methodology. https://scdhec.gov/sites/default/files/media/document/Surface%20Water%20Quality.pdf

U.S. Army Corps of Engineers (USACE). 2014. New Operating Agreement between U.S. Army Corps of Engineers, Southeastern Power Administrations, and Duke Energy

Carolinas, LLC Final Environmental Assessment for Hydropower License. October 2014.

U.S. Environmental Protection Agency (USEPA). 2020. National Rivers and Streams Assessment 2013-2014: A Collaborative Survey. December 2020. EPA 841-R-19-001. Washington, DC. Accessed January 2021. [URL]: https://www.epa.gov/national-aquatic-resource-surveys/nrsa.

_____. 2022a. National Aquatic Resources Surveys. Indicators: Chlorophyll a. Accessed May 2023. [URL] https://www.epa.gov/national-aquatic-resource-surveys/indicators-chlorophyll.

_____. 2022b. National Aquatic Resources Surveys. Indicators: Conductivity. Accessed 03/2023. [URL] https://www.epa.gov/national-aquatic-resource-surveys/indicators-conductivity.

Appendix A

Appendix A – Duke Energy Water Quality Field and Sample Collection Procedures

This page intentionally left blank.

Procedure Number:	ESFP-SW-0503
Procedure Title:	Water Quality Field Procedure
Applicability:	Applies to Duke Energy, Environmental Science Field Programs
Originator:	Environmental Science Group
Approval:	Zachary Hall – Director Environmental Science
Signature:	
Approval Date:	01/06/2021
Effective Date:	01/06/2021

CONTROLLED

Summary of Changes

Revision Number	Date Revised/Reviewed	Summary of Changes (Include Page Number)	Revision By
0	01/01/2020	New Procedure	J. C. Green
1	01/06/2021	Section 8.1.1-Note added to identify NPDES requirements (pg.4)	J. C. Green
1	01/06/2021	Section 8.1.1.1- D.O. calibration and check updated to incorporate SC specific NDPES monitoring (pg. 4).	J. C. Green
1	01/06/2021	Section 8.1.1.2.1- Instrument manufacturers added (pg.5).	J. C. Green
1	01/06/2021	Section 8.1.1.2.3-Reference to manufacturer guidance for pH calibrations added (pg.5).	J. C. Green
1	01/06/2021	Section 8.1.1.2.5- Section language deleted. Sections 8.1.1.2.5-10 were updated to 8.1.1.2.5-9 after deletion (pg. 6).	J. C. Green
1	01/06/2021	Section 8.1.1.3.1- Instrument manufacturers added (pg. 6).	J. C. Green

1	01/06/2021	Section 8.1.1.3.6- Requirement for NPDES monitoring added (pg. 7).	J. C. Green
1	01/06/2021	Section 8.1.1.4-clarified digital non-NIST devices will be checked annually against an NIST device (pg.7).	J. R. Quinn
1	01/06/2021	Section 12.11-14-References for instrument user manuals added (pg. 10).	J. C. Green
1	01/06/2021	Section 13.4-Criteria for duplicate pH sample recovery added (pg.11).	J. C. Green
1	01/06/2021	Section 13.6-Table added to identify NC/SC specific field certified laboratory methodology and acceptance criteria (pg.11).	J. C. Green
1	01/06/2021	Section 13-Footnote added to clarify acceptance criteria from table in section 13.6 (pg. 11).	J. C. Green
1	01/06/2021	Section 13.7- Added to describe requirement of LCS during SC NPDES specific monitoring for specific conductivity (pg. 11).	J. C. Green
1	01/06/2021	Section 13.8- Added to describe automatic temperature compensation verifications for instruments used to measure specific conductivity (pg. 11).	J. C. Green
1	01/06/2021	Section 13.9-Added to describe annual instrument thermistor checks and criteria (pg. 11).	J. C. Green

CONTROLLED

Document title

Water Quality Field Procedure

Document number

ESFP-SW-0503

Applies to: Duke Energy – Environmental Science

CONTROLLED

1.0 Purpose

To obtain representative field data, including but not limited to: water temperature, dissolved oxygen (DO), hydrogen ion activity (pH), specific conductivity, Secchi disk transparency, salinity, turbidity, and photosynthetically active radiation (PAR) as needed to characterize and detect changes in water quality field conditions.

2.0 Forms Referenced in This Procedure

FRM-SW-0502 - Photosynthetically Active Radiation Field Form

3.0 Scope and Frequency

This procedure applies at all times to all field sampling programs in the Environmental Sciences Department that generate water quality data. Water quality monitoring conducted by third parties should be consistent with this procedure. Refer to Site specific study plans or special studies for current year activities.

4.0 Summary of Methods

Water Quality measurement description are detailed in this procedure to ensure collection of accurate, consistent and reliable information. Methods included detail the verification/operation of instrumentation used to quantitatively evaluate physical water conditions and recording of field information to support program objectives.

5.0 Equipment or Apparatus

5.1 Meter(s) probe(s), or sensor(s) measuring field parameters including the following but not limited to: temperature, dissolved oxygen (D.O.), pH, conductivity, and turbidity. This also includes any ancillary equipment or hardware required for use of instruments.

5.2 Data entry form or datalogger, labels, and pencil or pen.

5.3 Secchi disk with graduated line marked at meter and sub-meter increments.

5.4 LI-COR® or equivalent underwater spherical quantum sensor, lowering frame, and quantum/radiometer/photometer.

5.5 National Institute of Standards and Technology (NIST) traceable thermometer.

5.6 Refractometer.

5.7 Meter stick.

5.8 Depth finder/GPS unit.

5.9 First aid kit and AED.

5.10 Nitrile or latex gloves.

5.11 SPOT unit and cell phone.

5.12 Polarized safety sunglasses and safety glasses.

5.13 Coast Guard approved Personal Flotation Device (PFD) and throwable type IV PFD.

5.14 Closed toe non-slip shoes.

5.15 Spare batteries or battery charger.

5.16 Sunscreen and insect repellant.

6.0 Reagent List

6.1 Specific Conductance Standards (0 – 50,000 µS/cm)

6.2 pH Buffer (4.0, 7.0, and 10.0)

6.3 Reagent grade de-ionized water.

6.4 Turbidity Standards (Formazin secondary, gel based).

6.5 Sodium chloride, reagent grade.

6.6 Sodium chloride solution, 10 ppt

Transfer 1.0 $\pm$ 0.10 g of sodium chloride to a 100-ml volumetric flask. Add approximately 50 ml of deionized water and dissolve salt. Dilute to volume (100-ml) with de-ionized water.

6.7 Sodium chloride solution, 20 ppt

Transfer 2.0 $\pm$ 0.10 g of sodium chloride to a 100-ml volumetric flask. Add approximately 50 ml of deionized water and dissolve salt. Dilute to volume with de-ionized water.

6.8 Sodium chloride solution, 30 ppt

Transfer 3.0 $\pm$ 0.10 g of sodium chloride to a 100-ml volumetric flask. Add approximately 50 ml of deionized water and dissolve salt. Dilute to volume with de-ionized water.

7.0 Safety, Limitations, Precautions, and Interferences

7.1 No element of this procedure may supersede the Company's safety standards and policies. Appropriate safety precautions and personal protective equipment (PPE) should be used when handling chemicals. Refer to Safety Data Sheets for specific descriptions of the physical and chemical properties, physical and health hazards, and

CONTROLLED

precautions for safe handling and use. Formalin is listed as an irritant and potential human carcinogen by the NC Occupational Safety and Health Standards for General Industry. Refer to the Duke Energy Environmental Health and Safety Handbook for guidelines to the proper use of Extremely Hazardous Chemicals.

7.2 Field staff are to ensure all pre and post operational instrument checks or calibrations have been performed for the parameters to be measured. These activities should occur prior to (pre) the collection of the first water quality sample and after collection of the final water quality sample (post).

7.3 Ensure that equipment found to be out of calibration or functioning improperly is promptly evaluated and the validity of data collected with the instrument since the last calibration is determined in coordination with the Site Lead. Management of this corrective action process will be carried out by instrument managers and field personnel.

7.3.1 Laboratory Supervisor or designee

7.3.1.1 Provide water quality instrumentation and equipment that is available to unit personnel for field monitoring or investigative purposes based on calibrations performed according to the frequency given in the instrument calibration procedures section

7.3.1.2 Provide a centralized location for field monitoring equipment and ensure “physical” control over equipment.

7.3.1.4 For instruments that do not electronically store calibrations internally, attach calibration stickers to instruments and include information as follows: calibration due or expiration date, date calibrated, calibration performed by.

7.3.1.5 Ensure that maintenance and repair work are performed as needed and that non-serviceable, uncalibrated, and/or non-functioning equipment is returned to service only after verified repair. Functional instruments are to be stored in centralized equipment storage area.

7.3.1.7 Maintain documentation of calibration records (including signature or initials of the persons performing the calibrations), repair, and instrument usage.

7.3.2 ES Personnel

7.3.2.1 Use of multiparameter instruments by various manufacturers requires user familiarity. Field staff will review operational manuals prior to usage of water quality instruments. Knowledge of recommended factory or user calibration intervals, specific probe tolerance values, and various maintenance operations are critical in collection of accurate data from this type of instrumentation.

7.3.2.2 Perform an operational check or necessary calibration prior to collection of field data.

CONTROLLED

7.3.2.3 Ensure proper usage, storage and handling of field equipment including transportation to and from laboratory in truck or boat.

7.3.2.4 Perform a post operational check after collection of field data.

7.3.2.5 Ensure that non-serviceable, uncalibrated, and/or non-functioning equipment is removed from service and flagged and/or tagged with a note indicating that the instrument is not to be used. This will include date, initials, and instrument issue/repair needed.

7.3.2.6 Report any damage, malfunction, and/or failure of equipment directly to laboratory supervisor or designee and coordinate to provide prompt evaluation of data collected during field sampling. Do not return malfunctioning instruments to the centralized location.

7.4 All standards will be obtained following the approved chemical control procedure. Standards for all water quality parameters will be within vendor stated expiration date. Expired or used standards will be disposed of properly.

7.5 Calibration or calibration check standards expiration date, and lot numbers will be documented based on specific parameters.

8.0 Procedure

8.1 Calibration Checks and Calibrations of field equipment (pre and post trip)

8.1.1 Multiparameter Instrument Calibration Check/Calibration

NOTE: Pre-sampling calibrations and post calibration checks must be performed each day prior to making field measurements for NPDES compliance monitoring. For South Carolina compliance monitoring calibrations must be conducted at the certified laboratory.

8.1.1.1 Check and Calibration of Dissolved Oxygen (D.O.)

8.1.1.1.1 Refer to instrument manufacturer calibration instructions (In-situ, YSI, or Hydrolab) for dissolved oxygen. At a minimum, either 100 % saturated air or water calibrations will be performed based on manufacturer instructions for specific instrumentation.

8.1.1.1.2 Determination of accuracy and or need for calibration will be conducted by placing the DO probe in 100% saturated air or 100% saturated water.

8.1.1.1.3 Document the barometric pressure and instrument temperature. If check or calibration occurs at altitude, barometric pressure-corrected values should be used to correct for elevation above sea level.

8.1.1.1.4 Document instrument conductivity for calibration/checks if calculating known dissolved oxygen concentration for saturated water.

CONTROLLED

NOTE: An excel spreadsheet is utilized to calculate predicted dissolved oxygen concentrations (mg/l) in water based on USGS DO solubility reference tables . The spreadsheet will be checked annually for accuracy against USGS values.

8.1.1.1.5

AIR CALIBRATION – Ensure the dissolved oxygen probe is dry by carefully blotting the measuring surface with a lint free wipe. Place the probe in the calibration cup with sufficient moisture to enable air saturation.

WATER CALIBRATION – Ensure the dissolved oxygen and temperature sensors are fully immersed in air-saturated water.

8.1.1.1.6 Allow the instrument to equilibrate until the dissolved oxygen % saturation is stable based on manufacturer specifications.

8.1.1.1.7 For non-NPDES compliance related monitoring: if the % saturation is between 98.0% and 102.0%, no calibration is needed. Document the % saturation reading from the instrument and move to the next parameter to be checked.

8.1.1.1.8 For NPDES compliance related monitoring OR If the % saturation is outside of 98.0% - 102.0% for non-NPDES compliance related monitoring: follow the calibration procedure in the instrumentation manual and document the new % saturation and calibration values accordingly (8.2.4).

8.1.1.1.9 For South Carolina NPDES compliance related monitoring, a laboratory control standard (LCS) and an LCS duplicate (LCSD) must be analyzed to verify calibration prior to field analysis. The LCS and LCSD must be within 98.0% - 102.0% of the calibrated value

8.1.1.2 Check and Calibration of pH

8.1.1.2.1 Refer to instrument manufacturer calibration procedures (In-situ, YSI, or Hydrolab) for pH. Initial daily calibrations are required for all NPDES permit required monitoring.

8.1.1.2.2 Inspect the status of the pH probe. If the glass bulb at the end of the probe is cloudy or damaged, or if the probe body is cracked or broken, replace the probe.

8.1.1.2.3 Three-point checks or calibrations are to be performed using traceable pH standards (values 4.0, 7.0, 10.0) according to manufacturer instructions.

CONTROLLED

8.1.1.2.4 Prior to recording instrument values for individual check or calibration reference standards, probes should be rinsed with deionized water, then triple rinsed with fresh respective pH standard 4.0, 7.0, or 10.0.

8.1.1.2.5 Fresh standards should be used to obtain values for calibration. Record values after pH readings have stabilized.

8.1.1.2.6 Calibration is required if NPDES permit required monitoring is to be performed or if measured pH readings deviate from the standard by more than 0.2 pH units for other monitoring. Follow calibration instructions in the instrumentation manual and document post-calibration pH values accordingly (8.2.4).

8.1.1.2.7 Calibration must be verified with a known traceable 7.0 pH reference standard prior to collection of field data. Standard verification results must be with 0.1 pH units of the known standard value to be accepted. If standard values are outside this range corrective action should be taken to identify instrument or calibration process deficiencies.

8.1.1.2.8 A calibration check must be conducted after every ten samples using a traceable pH standard when NPDES sampling is being performed.

8.1.1.2.9 Post check verification values are recorded after daily sampling activities are conducted. Values for 4.0, 7.0, and 10.0 standards are to be within 0.1 pH units for NPDES permit required monitoring, or 0.2 pH units for other monitoring.

8.1.1.3 Check and Calibration of Specific Conductivity

8.1.1.3.1 Refer to instrument manufacturer calibration procedures for conductivity (In-situ, YSI, or Hydrolab).

8.1.1.3.2 Inspect the operational condition of the conductivity probe (i.e cracks, film, fouling etc.).

8.1.1.3.3 Perform a zero check in air. Rinse the conductivity probe with de-Ionized water and blot the probe dry with lint free paper. Value should read 0.0 µS/cm. Record the specific conductance value in the appropriate format.

8.1.1.3.4 Triple rinse the conductivity probe with fresh traceable reference standard (typically 150 µS/cm for inland waters).

8.1.1.3.5 Place the probe in the calibration cup containing fresh standard. Record the specific conductance value in the

CONTROLLED

appropriate format.

8.1.1.3.6 Calibration is required for NPDES permit required monitoring and if the at check, the measured specific conductance (µS/cm) deviates from the standard by more than 10%. Follow the calibration procedure in the instrument manual and document post-calibration values in the appropriate format (8.2.4).

8.1.1.4 Check of Non-NIST Digital Thermistors for Temperature (annually, at a minimum)

8.1.1.4.1 Inspect the operational condition of the temperature probe.

8.1.1.4.2 Immerse the temperature probe into a bucket of water alongside a NIST certified temperature probe and allow for equilibration. Record the temperature readings from both instruments in the appropriate format (8.2.4).

8.1.1.4.3 If the temperature value deviates from the NIST certified probe by more than 0.2°C, condition of the probe should be checked prior to collection of field data. Differences of 0.5 °C or greater require replacement of the temperature probe.

8.1.2 Calibration Check/Calibration of Turbidity

8.1.2.1 Follow procedure ESFP-SW-0500.

8.1.3 Calibration Check of Refractometers (Salinity)

8.1.3.1 Ensure the refractometer is clean and no scratches are present on the lenses.

8.1.3.2 Triple rinse the refractometer with De-Ionized water and zero the instrument if necessary.

8.1.3.3 Triple rinse the refractometer with salinity standard solution (10ppt) and place a small amount of solution on the sensor and record the salinity values in the appropriate format.

8.1.3.4 Triple rinse the refractometer with salinity standard solution (20ppt) and place a small amount of solution on the sensor and record the salinity values in the appropriate format.

8.1.3.5 Triple rinse the refractometer with salinity standard solution (30ppt) and place a small amount of solution on the sensor and record the salinity values in the appropriate format.

8.1.3.6 Discard the refractometer if the salinity values deviate from the standards by more than 10%.

CONTROLLED

8.1.4 Calibration Check of Photosynthetically Active Radiation (PAR)

8.1.4.1 Inspect the functionality and integrity of the sampling device.

8.1.4.2 An annual calibration is conducted by the manufacturer. Calibration verification information is stored electronically for reference.

8.1.5 Calibration Check of Secchi depth cable

8.1.5.1 Validate the distance markings on the depth cable annually and record. Verify markings are clear and discernable prior to each field usage. Validation information is stored electronically for reference.

8.1.6 Calibration Check of NIST thermometer

8.1.6.1 Inspect the temperature probe for damage and sufficient battery life for field usage.

8.1.6.2 Calibration of NIST thermometers performed annually by a third party. Calibration verification information is stored electronically for reference.

8.2 Collection of water quality data

8.2.1 Record information specific to various programs or studies including but not limited to: site location code, date, sampler identification, station, weather conditions, instrument number, time of sample collection (military format). All information is recorded in an appropriate format enabling consistent and accurate tracking and verification of samples during and after collection (electronic format preferred).

8.2.2 To record water quality parameter values such as D.O., pH, specific conductivity, or temperature, lower the multiparameter meter to surface depth to collect data. Allow time for the instrument to equilibrate and record measurements. Single point surface measurements collected in flowing water should be collected at this depth. Vertical profile water quality data should be collected at intervals described in specific study plans.

8.2.3 To record PAR data the spherical quantum sensor and lowering frame are held just above the surface of the water on the sun-lit side of the boat or stream for a measurement of the amount of incident (I_o) light that is reaching the water surface. Photosynthetically active radiation is measured based on site specific study plan or site depth. Data are recorded on the Photosynthetically Active Radiation Field Form (FRM-SW-0502).

8.2.4 Equilibration time is allowed at each depth. Values recorded are as follows:

Temperature	to the nearest 0.1 (°C)
D.O.	to the nearest 0.1 (mg/L)
pH	to the nearest 0.1 (standard unit)
Conductivity	to the nearest 1.0 (μmho/cm)
Salinity	to the nearest 0.1 (ppt)
PAR	to the nearest 0.01 (μE/sec/m^2)

CONTROLLED

Turbidity	to the nearest 0.05	@ 0-1 (NTU)
	to the nearest 0.1	@ 1-10 (NTU)
	to the nearest 1.0	@ 10-40 (NTU)
	to the nearest 5.0	@ 40-100 (NTU)
	to the nearest 10	@ 100-400 (NTU)
	to the nearest 50	@ 400-1000 (NTU)
	to the nearest 100	@ >1000 (NTU)

8.2.5 The bottom sample depth is recorded by rounding to the nearest meter.

8.2.6 Secchi disk depth is read at each reservoir station or as required by the current monitoring program. Record Secchi disk depth to the nearest 0.1 m. Measurements should be an average of two readings – first when the disk disappears and the second when the disk reappears as it is being raised. In addition, measurements should be recorded on the shaded (and if possible, leeward) side of the boat without the use of sunglasses.

8.2.7 Procedure discrepancies occurring in the field should be noted on the data sheet or in the comments section of data logging device.

9.0 Calculations

N/A

10.0 Results

Collected field data may be recorded electronically (preferred) or in field notebooks. Hard copy data will be transferred to a digital format following the appropriate QA protocol (see section 13.4). Electronic field data will be loaded to an electronic data storage system for end user analysis.

11.0 Definitions

Calibration Check – Comparison of measured values to known traceable standard.

Calibration – An adjustment made to the instrumentation to bring measured values of known traceable standards within approved/acceptable tolerances.

Operation Check – Ensuring an instrument has power and that measured values are stable without comparing it to known standards.

Multiparameter Instrument – An instrument capable of measuring multiple water quality parameters simultaneously by way of multiple specific probes.

Water Quality – A measured quantitative value generated by an instrument or device that is representative of a physical water condition (water temperature, DO, pH, conductivity, Secchi disk transparency depth, salinity, and PAR)

Surface – An area of the water column beginning at the air water interface and extending down to 0.30 meters in depth.

12.0 References

CONTROLLED

12.1 LI-COR® instruction manual LI-250 quantum/radiometer/photometer. LI-COR Incorporated, 4421 Superior St., P. O. Box 4425, Lincoln, NE 68504.

12.2 Lind, O. T. 1974. Handbook of common methods in limnology. C. V. Mosby Co., St. Louis, MO.

12.3 American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 22th Edition 2012, 1015 Fifteenth St., NW, Washington, DC 20005.

12.7 Hach 2100Q and 2100Q*is* User Manual, DOC022.53.80041, 12/2017, Edition 4, HACH COMPANY World Headquarters P.O. Box 389, Loveland, CO 80539-0389 U.S.A.

12.8 North Carolina Wastewater/Groundwater Laboratory Certification Approved Procedure for the Analysis of pH, 15A NCAC 2H .0805 (a) (6) (F) and (g) (3).

12.9 North Carolina Wastewater/Groundwater Laboratory Certification Approved Procedure for the Analysis of Temperature, 15A NCAC 2H .0805 (a) (6) (F) and (g) (3).

12.10 North Carolina Wastewater/Groundwater Laboratory Certification Approved Procedure for the Analysis of Specific Conductance (Conductivity), 15A NCAC 2H .0805 (a) (6) (F) and (g) (3).

12.11 Aqua TROLL®600 Multiparameter Sonde Operator's Manual. 0096402 / 2019-09-04, In-Situ, 221 East Licoln Avenue, Fort Collins, Co 80524, U.S.A.

12.12 Hydrolab HL Series Sonde User Manual. 04/2017, Edition 2, OTT Hydromet, 5600 Lindbergh Dr., Loveland, CO 80538, U.S.A.

12.13 6-Series Multiparameter Water Quality Sondes User Manual. Item# 069300 Revision J, March 2012, YSI Incorporated, 1700/1725 Brannum Lane, Yellow Springs, Ohio, 45387 U.S.A

12.14 Professional Plus User Manual. Item# 605596 Rev D, March 2009, YSI Incorporated, 1700/1725 Brannum Lane, Yellow Springs, Ohio, 45387 U.S.A

13.0 Quality Control

13.1 Qualified personnel are responsible for briefing personnel on sample collection, study objectives, and sampling locations.

13.2 All project area stations will be sampled on the same day if possible.

13.3 If data are collected in field notebooks and transferred to a digital format, the newly created digital file must be verified by a second party to ensure the data has been transcribed accurately.

13.4 South Carolina NPDES specific: for samples not analyzed *in-situ*, a sample duplicate must be analyzed with each batch of 20 or fewer samples and must recover within the laboratory's acceptance criteria (± 0.2 SU of the first sample aliquot for pH, 10% of known standard value for specific conductivity) when conducting NPDES sampling in South Carolina.13.5 South Carolina NPDES specific: personnel conducting water quality

CONTROLLED

field collection in South Carolina waters for NPDES related monitoring will participate in initial demonstration of capability (IDOC), and continuing demonstration of capability (CDOC) for variables included as certified field laboratory parameters.

13.6 NPDES Specific Conditions

Parameter	North Carolina Specific Methods	South Carolina Specific Methods	Standard	Acceptance Criteria[1]
Temperature	SM 2550 B-2010 USGS Method 1975	SM 2550 B-2010	NIST-traceable device	*Annual temperature accuracy verification*: ±0.2 °C of NIST device temperature
Dissolved Oxygen	ASTM 0888-09 (C) ASTM 0888-05 HACH 10360 SM 4500-O C-2011 SM 4500-O G-2011	ASTM 0888-09 (C)	Water-saturated air, or air-saturated water	LCS/LCSD within 98 - 102 % of theoretical saturation concentration
Specific Conductance	SM 2510 B-2011 SW-846 9050A	SM 2510 B-2011	NIST-traceable KCl standard	±10% of standard LFB or CCV value
pH	SM 4500-H B-2011 SW-846 9040 C SW-846 9045 D	SM 4500-H B-2011	NIST-traceable buffers	±0.1 pH units of buffer value for calibration or check, ±0.2 pH units for duplicate

13.7 South Carolina NPDES specific: for specific conductivity samples not analyzed *in-situ*, a laboratory control sample (LCS) must be analyzed after every 10 samples and at the end of each analysis batch.

13.8 Specific conductivity instrument automatic temperature compensation will be verified before initial use and annually for equipment used to perform NPDES monitoring. Verification will be performed by analyzing standards which bracket observed temperature conditions where samples are to be collected, and a third temperature of 25° C. All standards measured at, above, or below 25° C must be within 10% of the true value of the standard. Equipment not meeting these criteria will be taken out of service for corrective action.

13.9 Initial and annual temperature verification will be performed on non-NIST thermometers. Comparison of a minimum of two temperature conditions which bracket field sample conditions will be performed for any instrument involved in water quality data collection. All temperatures measured must be within ± 0.2 °C of a certified NIST device. Equipment not meeting criteria will be taken out of service for corrective action

1 The calibration acceptance criteria shown are based on NC and SC lab certification requirements and may in certain cases be modified by study plan-specific criteria, but only for studies that **are not** NPDES compliance-related. All compliance data must meet the criteria in this table. Consult applicable study plans for further details.

CONTROLLED

Procedure Number:	ESFP-SW-0504
Procedure Title:	Water Chemistry Field Sample Collection
Applicability:	Applies to Duke Energy, Environmental Science Field Programs
Originator:	Environmental Science Group
Approval:	Zachary Hall – Director Environmental Science
Signature:	Z. Hall
Approval Date:	01/01/2020
Effective Date:	01/01/2020

Summary of Changes

Revision Number	Date Revised/Reviewed	Summary of Changes (Include Page Number)	Revision By
0	01/01/2020	New Procedure	J.C. Green

CONTROLLED

Document title

Water Chemistry Sampling Procedure

Document number

ESFP-SW-0504

Applies to: Duke Energy – Environmental Science

CONTROLLED

1.0 Purpose

To provide representative, viable water chemistry samples as needed to allow for various characterizations of waterbodies associated.

2.0 Forms Referenced in This Procedure

Sample chain of custody forms for various programs.

3.0 Scope and Frequency

This procedure applies to field sampling programs in the Environmental Sciences Department that generate water chemistry data. Water chemistry sampling conducted by third parties should be consistent with this procedure. Refer to location specific study plans for current year.

4.0 Summary of Methods

Water samples are collected in an appropriate manner depending on analyte requirements. Samples are placed in labeled containers, preserved according to current analytical methodology, and sent to a laboratory within holding times for various analysis. A sample chain of custody is generated and maintained as required.

5.0 Equipment or Apparatus

5.1 Cooler, and ice.

5.2 Sample bottles containing appropriate preservatives as required for analysis.

5.3 Nonmetallic, subsurface water bottle sampler.

5.4 Data entry form or labels, and pencil or pen.

5.5 Depth finder/GPS unit.

5.6 Peristaltic pump with power supply.

5.7 Individually bagged pump tubing (Tygon® or equivalent for pump, HDPE for collection segment).

5.8 High capacity, 0.45 µm cartridge filters (meets analytical requirements).

5.9 Powder-free Nitrile, polyethylene, vinyl or latex disposable gloves.

5.10 First aid kit and AED.

5.11 SPOT unit and cell phone.

5.12 Polarized safety sunglasses and safety glasses.

5.13 Coast Guard approved Personal Flotation Device (PFD) and throwable type IV PFD.

5.14 Closed toe non-slip shoes.

5.15 Spare batteries or battery charger.

5.16 Wide range (0-14) pH test strips.

5.17 Nonmetallic bridge sampling basket.

5.18 Spare sample bottle kit.

5.19 Field Computer and portable media storage.

6.0 Reagent List

6.1 De-ionized reagent grade water.

6.2 Laboratory grade detergent (Liquinox® or equivalent).

6.3 Preservatives as defined in Figure 1.

7.0 Safety, Limitations, Precautions, and Interferences

7.1 No element of this procedure may supersede the Company's safety standards and policies. Appropriate safety precautions and personal protective equipment (PPE) should be used when handling chemicals. Refer to Safety Data Sheets for specific descriptions of the physical and chemical properties, physical and health hazards, and precautions for safe handling and use. Formalin is listed as an irritant and potential human carcinogen by the NC Occupational Safety and Health Standards for General Industry. Refer to the Duke Energy Environmental Health and Safety Handbook for guidelines to the proper use of Extremely Hazardous Chemicals.

7.2 Surface samples are collected just below the surface to avoid collecting surface film.

7.3 If a preserved sample is spilled or the bottle is overfilled, the sample must be tested for appropriate pH level and discarded/ recollected if samples are not adequately preserved. pH testing is done by pouring a small amount of sample over the strip, not by inserting the strip into the sample container.

7.4 Samples should be collected, handled, and transferred to the minimum extent possible to reduce contamination. **Direct dip method** is preferred when possible to minimize the contact of sample from multiple containers.

7.5 Samples collection time should be recorded as identical to water quality condition collection time unless times are outside of 15 minutes.

7.6 Sample chain of custody sheets are maintained, and all pertinent information will be filled out accurately and completely. Store all water chemistry samples using

CONTROLLED

appropriate preservation techniques, and in a manner that maintains secure custody and relinquish to the laboratory as soon as possible to avoid exceeding sample holding times.

7.7 Location characteristics should be evaluated prior to any sample collection in order to prevent sample contamination due to various factors. Special consideration should be given to Low Level Mercury and other low-level metals sample collection. See procedure ESFP-SW-0502 for details on this specific process prior to sampling.

Examples of unfavorable conditions include but are not limited to: material spills nearby, leaking fuel/oil from boat motors, or pesticide/herbicide spraying near the sampling location. If samples are collected during atypical conditions. details should be included on field records and chain of custody to provide clarification on analytical results if needed.

7.8 Prior to sampling trip ensure that the appropriate number and type of sample containers are included in field gear. This includes appropriate labels for location/analyte identification and preservatives.

8.0 Procedure

8.1 Navigate to the sampling location. Using GPS or other landmark, to verify location.

8.2 Sampling personnel will put on new gloves prior to sample collection or handling of sampling equipment. If gloves are contaminated during use they will be replaced with a new pair. New gloves will be used at each individual sampling location.

8.3 Sampling locations should be visited in a manner that initiates the sampling day at the least contaminated location and progresses towards the most potentially contaminated location when possible. Sampling of spatial composite locations is to be performed in the same manner from least to most known contaminated areas.

8.4 Label sample container with the sample number, location code, station code, date, and depth using waterproof marking pen. If sample bottles are pre-labeled, verify location information prior to collection.

8.5 Non-preserved sample containers and sampling devices will be rinsed a minimum of two times with site water prior to filling the sample container. Bottles containing preservatives must not be rinsed prior to filling. Care must be taken not to overfill the bottle as preservative may be lost or diluted.

8.2.1 If direct dip method is used to collect grab samples, always collect the sample with the container opening facing upstream to avoid contamination from gloves. If no current is present, use a forward sweeping motion to avoid backflow of water from around the sample bottle. Sample containers should be immersed under the air water interface during collection of surface samples to avoid surface films or scum.

8.2.2 If a sampling device is used to collect grab samples, the water sample is transferred from the sampler into the sample containers and capped securely. The samples should be sealed as soon as possible with the minimal amount of entrained air to prevent oxidative changes.

CONTROLLED

8.3 Various parameters require specific sample bottles, volume of sample, or sampling technique such as no airspace in the sampling container, or other special considerations to ensure proper preservation. See Figure 1. or refer to analyte methodology for information on specific requirements.

8.4 Sampling equipment will be inspected for integrity and potential contaminants prior to field usage. If cleaning is needed a non-phosphorous detergent must be used followed by a thorough rinse using de-ionized reagent grade water. Samplers are to be suspended with accurately marked nylon rope to ensure proper sampling depth. When collecting samples from bridges or roadways, ensure that rope used to suspend the sampler does not contact railings or other structures which could result in contamination.

8.4.1 Van Dorn style samplers are typically used to collect discrete depth grab samples from a specific depth in the water column. Refer to user manual for proper use and sample collection techniques. Bottom samples are collected ~ 0.5 m from bottom. If silt or sediment appears in sample or if sampling gear does not properly seal, sample must be discarded and recollected.

8.4.2 Integrated Depth Sampler (IDS) may be used to collect both discrete grab and spatial composite samples of the water. When used for collection of spatial photic zone composite sampling, the IDS is lowered through the water column at a consistent rate to a depth equal to twice the secchi depth, and returned to the surface at the same rate. If the sampler fills prior to being returned to the surface, the sampler must be emptied and the photic zone resampled to ensure proper collection.

8.5 Samples requiring In-Field sample filtration will be filtered immediately on location as conditions allow. Secondary collection devices may be used to obtain designated depth samples when filtration is required.

8.5.1 Battery powered peristaltic pumps are preferred for field filtered samples. If location conditions do not allow for immediate on-site field filtration, filtration may occur at a more appropriate location within 15 minutes of sample collection.

8.5.2 A length of new, unused pump tubing should be placed in the pump head and secured to a longer length of HDPE sample tubing to be placed at the designated sampling depth.

8.5.3 Prior to filling sample bottles, pump tubing and filter (if needed) will be flushed for a minimum 20 seconds.

8.5.4 When filtered samples are being collected, attach a new unused 0.45 µm cartridge filter to the outlet end of the pump tubing. Turn the pump on and orient the outlet end of the filter (directional) up to allow air to be purged. After flushing as described in step 8.5.3, fill sample bottles according to steps 8.2.1 and 8.2.2.

8.5.5 After all samples have been collected at a location, discard the tubing and filter. New tubing and filters are to be used at each location, and should remain bagged until use.

8.6 Samples require appropriate temperature and chemical preservation, and tracking.

CONTROLLED

8.6.1 Samples are placed into location specific sealed bags and immediately stored on ice for transport to the analytical laboratory. If samples are not sent immediately to an analytical lab, they may be stored at a consistent temperature of <6°C.

8.6.2 Samples submitted to a laboratory must be accompanied by a chain of custody. A chain of custody will be maintained during sample transfer. Pertinent information will be filled out accurately and completely according to ESFP-AD-0102.

9.0 Calculations

N/A

10.0 Results

Samples collected are sent to an analytical chemistry laboratory for analysis. Results are placed on computer master file to be utilized in annual reports and/or as requested.

11.0 Definitions

Grab sample – Sample collected at a discrete depth and time.

Composite Sample – Sample collected at 2 or more specified locations or times used to represent a spatial or temporal average.

12.0 References

12.1 American Public Health Association, Standard Methods for the Examination of Water and Waste water, 19th Edition 1995, 1015 Fifteenth St., NW, Washington, DC 20005.

12.2 US Government Printing Office. 201. Code of Federal Regulations. Part 136 Guidelines Establishing Test Procedures For the Analysis of Pollutants. CFR §136 Identification of Test Procedures. April 16, 2019, National Archives and Records Administration, Washington, D.C.

12.3 Intensive Survey Branch Standard Operating Procedures Manual: Physical and Chemical Monitoring, Version 2.1, December 2013, NC Department of Environment and Natural Resources, Division of Water Resources, Environmental Sciences Section.

12.4 Region 4, U.S. Environmental Protection Agency (USEPA) Science and Ecosystem Support Division, Athens, G.A., Operating Procedure, Surface Water Sampling, No. SESDPROC-201-R3, February 28, 2013.

13.0 Quality Control

13.1 Split Samples

Samples representing the same aliquot of the waterbody sampled which are typically used for evaluating sample handling and analytical processes of the recipients of splits samples. When collecting these samples, complete homogenization of samples should occur before samples are dispensed into separate containers.

CONTROLLED

13.2 Duplicate Samples

Duplicate samples are collected as required by study design to evaluate

sample collection and preservation procedures. Duplicate samples are collected in a manner that minimizes changing site conditions while representing all aspects of sample collection.

13.3 Trip Blank

Trip blanks are used to evaluate storage and transport conditions of field samples. These should be treated as normal samples and not be opened in the field. Sample containers are pre-filled with reagent grade water that is transported into the field during sample collection activities, and is stored alongside samples in appropriate storage containers.

13.4 Equipment Blank

Equipment blanks are to be used in evaluation of sampling gear and equipment. Samples are exposed to reagent grade water which is then collected into sample bottles, preserved accordingly and delivered to an analytical lab for analysis.

13.5 Filter Blank

Filter blanks are used to assess the potential for contamination during the sample filtration process. Reagent grade water is processed through a filter in the same manner as a sample and then preserved according to analyte requirements.

13.6 Field Blank

Field Blanks are used to assess site or field conditions experienced during sampling. Samples are exposed to the same conditions as the sample, opened in the field.

13.7 Temperature Blank

Temperature Blanks are vials of water that accompany the samples that will be opened and tested upon arrival at the laboratory to ensure that the temperature of the contents of the sampling shipping container was within the required 6°C ± 2°.

13.8 Site or Trip lead should instruct personnel taking samples in the proper methods, QA sample frequency, and station locations.

13.9 Sample holding times vary among analytical procedures. Refer to Figure 1. Or contact analytical laboratory for specific hold time and preservative requirements.

FIGURE 1. CFR §136, 136.3

TABLE II—REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

CONTROLLED

Parameter number/name	Container[1]	Preservation[2 3]	Maximum holding time[4]
Table IA—Bacterial Tests			
1-5. Coliform, total, fecal, and *E. coli*	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22 23]
6. Fecal streptococci	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22]
7. Enterococci	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22]
8. *Salmonella*	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22]
Table IA—Aquatic Toxicity Tests			
9-12. Toxicity, acute and chronic	P, FP, G	Cool, ≤6 °C[16]	36 hours.
Table IB—Inorganic Tests			
1. Acidity	P, FP, G	Cool, ≤6 °C[18]	14 days.
2. Alkalinity	P, FP, G	Cool, ≤6 °C[18]	14 days.
4. Ammonia	P, FP, G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
9. Biochemical oxygen demand	P, FP, G	Cool, ≤6 °C[18]	48 hours.
10. Boron	P, FP, or Quartz	HNO_3 to pH <2	6 months.
11. Bromide	P, FP, G	None required	28 days.
14. Biochemical oxygen demand, carbonaceous	P, FP G	Cool, ≤6 °C[18]	48 hours.
15. Chemical oxygen demand	P, FP, G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
16. Chloride	P, FP, G	None required	28 days.
17. Chlorine, total residual	P, G	None required	Analyze within 15 minutes.
21. Color	P, FP, G	Cool, ≤6 °C[18]	48 hours.
23-24. Cyanide, total or available (or CATC) and free	P, FP, G	Cool, ≤6 °C,[18] NaOH to pH >10,[5 6] reducing agent if oxidizer present	14 days.
25. Fluoride	P	None required	28 days.
27. Hardness	P, FP, G	HNO_3 or H_2SO_4 to pH <2	6 months.
28. Hydrogen ion (pH)	P, FP, G	None required	Analyze within 15 minutes.
31, 43. Kjeldahl and organic N	P, FP, G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
Table IB—Metals[7]			
18. Chromium VI	P, FP, G	Cool, ≤6 °C,[18] pH = 9.3-9.7[20]	28 days.

CONTROLLED

35. Mercury (CVAA)	P, FP, G	HNO_3 to pH <2	28 days.
35. Mercury (CVAFS)	FP, G; and FP-lined cap[17]	5 mL/L 12N HCl or 5 mL/L BrCl[17]	90 days.[17]
3, 5-8, 12, 13, 19, 20, 22, 26, 29, 30, 32-34, 36, 37, 45, 47, 51, 52, 58-60, 62, 63, 70-72, 74, 75. Metals, except boron, chromium VI, and mercury	P, FP, G	HNO_3 to pH <2, or at least 24 hours prior to analysis[19]	6 months.
38. Nitrate	P, FP, G	Cool, ≤6 °C[18]	48 hours.
39. Nitrate-nitrite	P, FP, G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
40. Nitrite	P, FP, G	Cool, ≤6 °C[18]	48 hours.
41. Oil and grease	G	Cool to ≤6 °C,[18] HCl or H_2SO_4 to pH <2	28 days.
42. Organic Carbon	P, FP, G	Cool to ≤6 °C,[18] HCl, H_2SO_4, or H_3PO_4 to pH <2	28 days.
44. Orthophosphate	P, FP, G	Cool, to ≤6 °C[18 24]	Filter within 15 minutes; Analyze within 48 hours.
46. Oxygen, Dissolved Probe	G, Bottle and top	None required	Analyze within 15 minutes.
47. Winkler	G, Bottle and top	Fix on site and store in dark	8 hours.
48. Phenols	G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
49. Phosphorous (elemental)	G	Cool, ≤6 °C[18]	48 hours.
50. Phosphorous, total	P, FP, G	Cool, ≤6 °C,[18] H_2SO_4 to pH <2	28 days.
53. Residue, total	P, FP, G	Cool, ≤6 °C[18]	7 days.
54. Residue, Filterable	P, FP, G	Cool, ≤6 °C[18]	7 days.
55. Residue, Nonfilterable (TSS)	P, FP, G	Cool, ≤6 °C[18]	7 days.
56. Residue, Settleable	P, FP, G	Cool, ≤6 °C[18]	48 hours.
57. Residue, Volatile	P, FP, G	Cool, ≤6 °C[18]	7 days.
61. Silica	P or Quartz	Cool, ≤6 °C[18]	28 days.
64. Specific conductance	P, FP, G	Cool, ≤6 °C[18]	28 days.
65. Sulfate	P, FP, G	Cool, ≤6 °C[18]	28 days.
66. Sulfide	P, FP, G	Cool, ≤6 °C,[18] add zinc acetate plus sodium hydroxide to pH >9	7 days.
67. Sulfite	P, FP, G	None required	Analyze within 15 minutes.
68. Surfactants	P, FP, G	Cool, ≤6 °C[18]	48 hours.
69. Temperature	P, FP, G	None required	Analyze within 15 minutes.

CONTROLLED

73. Turbidity	P, FP, G	Cool, ≤6 °C[18]	48 hours.
Table IC—Organic Tests[8]			
13, 18-20, 22, 24, 25, 27,28, 34-37, 39-43, 45-47, 56, 76, 104, 105, 108-111, 113. Purgeable Halocarbons	G, FP-lined septum	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$,[5] HCl to pH 2	14 days.
26. 2-Chloroethylvinyl ether	G, FP-lined septum	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$[5]	14 days.
6, 57, 106. Purgeable aromatic hydrocarbons	G, FP-lined septum	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$,[5] HCl to pH 2[9]	14 days.[9]
3, 4. Acrolein and acrylonitrile	G, FP-lined septum	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$, pH to 4-5[10]	14 days.[10]
23, 30, 44, 49, 53, 77, 80, 81, 98, 100, 112. Phenols[11]	G, FP-lined cap	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$	7 days until extraction, 40 days after extraction.
7, 38. Benzidines[11 12]	G, FP-lined cap	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$[5]	7 days until extraction.[13]
14, 17, 48, 50-52. Phthalate esters[11]	G, FP-lined cap	Cool, ≤6 °C[18]	7 days until extraction, 40 days after extraction.
82-84. Nitrosamines[11 14]	G, FP-lined cap	Cool, ≤6 °C,[18] store in dark, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction.
88-94. PCBs[11]	G, FP-lined cap	Cool, ≤6 °C[18]	1 year until extraction, 1 year after extraction.
54, 55, 75, 79. Nitroaromatics and isophorone[11]	G, FP-lined cap	Cool, ≤6 °C,[18] store in dark, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction.
1, 2, 5, 8-12, 32, 33, 58, 59, 74, 78, 99, 101. Polynuclear aromatic hydrocarbons[11]	G, FP-lined cap	Cool, ≤6 °C,[18] store in dark, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction.
15, 16, 21, 31, 87. Haloethers[11]	G, FP-lined cap	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction.
29, 35-37, 63-65, 107. Chlorinated hydrocarbons[11]	G, FP-lined cap	Cool, ≤6 °C[18]	7 days until extraction, 40 days after extraction.
60-62, 66-72, 85, 86, 95-97, 102, 103. CDDs/CDFs[11]	G	See footnote 11	See footnote 11.
Aqueous Samples: Field and Lab Preservation	G	Cool, ≤6 °C,[18] 0.008% $Na_2S_2O_3$,[5] pH <9	1 year.
Solids and Mixed-Phase Samples: Field Preservation	G	Cool, ≤6 °C[18]	7 days.
Tissue Samples: Field Preservation	G	Cool, ≤6 °C[18]	24 hours.
Solids, Mixed-Phase, and Tissue Samples: Lab Preservation	G	Freeze, ≤−10 °C	1 year.

CONTROLLED

114-118. Alkylated phenols	G	Cool, <6 °C, H_2SO_4 to pH <2	28 days until extraction, 40 days after extraction.
119. Adsorbable Organic Halides (AOX)	G	Cool, <6 °C, 0.008% $Na_2S_2O_3$, HNO_3 to pH <2	Hold *at least* 3 days, but not more than 6 months.
120. Chlorinated Phenolics	G, FP-lined cap	Cool, <6 °C, 0.008% $Na_2S_2O_3$, H_2SO_4 to pH <2	30 days until acetylation, 30 days after acetylation.
Table ID—Pesticides Tests			
1-70. Pesticides[11]	G, FP-lined cap	Cool, ≤6 °C,[18] pH 5-9[15]	7 days until extraction, 40 days after extraction.
Table IE—Radiological Tests			
1-5. Alpha, beta, and radium	P, FP, G	HNO_3 to pH <2	6 months.
Table IH—Bacterial Tests			
1-4. Coliform, total, fecal	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22 23]
5. *E. coli*	PA, G	Cool, <10 °C, 0. 008% $Na_2S_2O_3$[5]	8 hours.[22]
6. Fecal streptococci	PA, G	Cool, <10 °C, 0.008% $Na_2S_2O_3$[5]	8 hours.[22]
7. Enterococci	PA, G	Cool, <10 °C, 0. 008% $Na_2S_2O_3$[5]	8 hours.[22]
Table IH—Protozoan Tests			
8. *Cryptosporidium*	LDPE; field filtration	1-10 °C	96 hours.[21]
9. *Giardia*	LDPE; field filtration	1-10 °C	96 hours.[21]

[1]"P" is for polyethylene; "FP" is fluoropolymer (polytetrafluoroethylene (PTFE); Teflon®), or other fluoropolymer, unless stated otherwise in this Table II; "G" is glass; "PA" is any plastic that is made of a sterilizable material (polypropylene or other autoclavable plastic); "LDPE" is low density polyethylene.

[2]Except where noted in this Table II and the method for the parameter, preserve each grab sample within 15 minutes of collection. For a composite sample collected with an automated sample (e.g., using a 24-hour composite sample; see 40 CFR 122.21(g)(7)(i) or 40 CFR part 403, appendix E), refrigerate the sample at ≤6 °C during collection unless specified otherwise in this Table II or in the method(s). For a composite sample to be split into separate aliquots for preservation and/or analysis, maintain the sample at ≤6 °C, unless specified otherwise in this Table II or in the method(s), until collection, splitting, and preservation is completed. Add the preservative to the sample container prior to sample collection when the preservative will not compromise the integrity of a grab sample, a composite sample, or aliquot split from a composite sample within 15 minutes of collection. If a composite measurement is required but a composite sample would compromise sample integrity, individual grab samples must be collected at prescribed time intervals (e.g., 4 samples over the course of a day, at 6-hour intervals). Grab samples must be analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory if the compositing procedure produces results equivalent to results produced by arithmetic averaging of results of analysis of individual grab samples. For examples of laboratory compositing procedures, see EPA Method 1664 Rev. A (oil and grease) and the procedures at 40 CFR 141.24(f)(14)(iv) and (v) (volatile organics).

CONTROLLED

[3]When any sample is to be shipped by common carrier or sent via the U.S. Postal Service, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirement of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater; Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

[4]Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before the start of analysis and still be considered valid. Samples may be held for longer periods only if the permittee or monitoring laboratory have data on file to show that, for the specific types of samples under study, the analytes are stable for the longer time, and has received a variance from the Regional ATP Coordinator under §136.3(e). For a grab sample, the holding time begins at the time of collection. For a composite sample collected with an automated sampler (e.g., using a 24-hour composite sampler; see 40 CFR 122.21(g)(7)(i) or 40 CFR part 403, appendix E), the holding time begins at the time of the end of collection of the composite sample. For a set of grab samples composited in the field or laboratory, the holding time begins at the time of collection of the last grab sample in the set. Some samples may not be stable for the maximum time period given in the table. A permittee or monitoring laboratory is obligated to hold the sample for a shorter time if it knows that a shorter time is necessary to maintain sample stability. See §136.3(e) for details. The date and time of collection of an individual grab sample is the date and time at which the sample is collected. For a set of grab samples to be composited, and that are all collected on the same calendar date, the date of collection is the date on which the samples are collected. For a set of grab samples to be composited, and that are collected across two calendar dates, the date of collection is the dates of the two days; e.g., November 14-15. For a composite sample collected automatically on a given date, the date of collection is the date on which the sample is collected. For a composite sample collected automatically, and that is collected across two calendar dates, the date of collection is the dates of the two days; e.g., November 14-15. For static-renewal toxicity tests, each grab or composite sample may also be used to prepare test solutions for renewal at 24 h, 48 h, and/or 72 h after first use, if stored at 0-6 °C, with minimum head space.

[5]ASTM D7365-09a specifies treatment options for samples containing oxidants (e.g., chlorine) for cyanide analyses. Also, Section 9060A of Standard Methods for the Examination of Water and Wastewater (20th and 21st editions) addresses dechlorination procedures for microbiological analyses.

[6]Sampling, preservation and mitigating interferences in water samples for analysis of cyanide are described in ASTM D7365-09a. There may be interferences that are not mitigated by the analytical test methods or D7365-09a. Any technique for removal or suppression of interference may be employed, provided the laboratory demonstrates that it more accurately measures cyanide through quality control measures described in the analytical test method. Any removal or suppression technique not described in D7365-09a or the analytical test method must be documented along with supporting data.

[7]For dissolved metals, filter grab samples within 15 minutes of collection and before adding preservatives. For a composite sample collected with an automated sampler (e.g., using a 24-hour composite sampler; see 40 CFR 122.21(g)(7)(i) or 40 CFR part 403, appendix E), filter the sample within 15 minutes after completion of collection and before adding preservatives. If it is known or suspected that dissolved sample integrity will be compromised during collection of a composite sample collected automatically over time (e.g., by interchange of a metal between dissolved and suspended forms), collect and filter grab samples to be composited (footnote 2) in place of a composite sample collected automatically.

[8]Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9]If the sample is not adjusted to pH 2, then the sample must be analyzed within seven days of sampling.

[10]The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

[11]When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity (*i.e.,* use all necessary preservatives and hold for the shortest time listed). When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to ≤6 °C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (regarding the requirement for thiosulfate reduction), and footnotes 12, 13 (regarding the analysis of benzidine).

[12]If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

CONTROLLED

[13]Extracts may be stored up to 30 days at <0 °C.

[14]For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15]The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

[16]Place sufficient ice with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present when the samples arrive, immediately measure the temperature of the samples and confirm that the preservation temperature maximum has not been exceeded. In the isolated cases where it can be documented that this holding temperature cannot be met, the permittee can be given the option of on-site testing or can request a variance. The request for a variance should include supportive data which show that the toxicity of the effluent samples is not reduced because of the increased holding temperature. Aqueous samples must not be frozen. Hand-delivered samples used on the day of collection do not need to be cooled to 0 to 6 °C prior to test initiation.

[17]Samples collected for the determination of trace level mercury (<100 ng/L) using EPA Method 1631 must be collected in tightly-capped fluoropolymer or glass bottles and preserved with BrCl or HCl solution within 48 hours of sample collection. The time to preservation may be extended to 28 days if a sample is oxidized in the sample bottle. A sample collected for dissolved trace level mercury should be filtered in the laboratory within 24 hours of the time of collection. However, if circumstances preclude overnight shipment, the sample should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. If sample integrity will not be maintained by shipment to and filtration in the laboratory, the sample must be filtered in a designated clean area in the field within the time period necessary to maintain sample integrity. A sample that has been collected for determination of total or dissolved trace level mercury must be analyzed within 90 days of sample collection.

[18]Aqueous samples must be preserved at ≤6 °C, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of "≤ °C" is used in place of the "4 °C" and "<4 °C" sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).

[19]An aqueous sample may be collected and shipped without acid preservation. However, acid must be added at least 24 hours before analysis to dissolve any metals that adsorb to the container walls. If the sample must be analyzed within 24 hours of collection, add the acid immediately (see footnote 2). Soil and sediment samples do not need to be preserved with acid. The allowances in this footnote supersede the preservation and holding time requirements in the approved metals methods.

[20]To achieve the 28-day holding time, use the ammonium sulfate buffer solution specified in EPA Method 218.6. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case requirements in the method must be followed.

[21]Holding time is calculated from time of sample collection to elution for samples shipped to the laboratory in bulk and calculated from the time of sample filtration to elution for samples filtered in the field.

[22]Sample analysis should begin as soon as possible after receipt; sample incubation must be started no later than 8 hours from time of collection.

[23]For fecal coliform samples for sewage sludge (biosolids) only, the holding time is extended to 24 hours for the following sample types using either EPA Method 1680 (LTB-EC) or 1681 (A-1): Class A composted, Class B aerobically digested, and Class B anaerobically digested.

[24]The immediate filtration requirement in orthophosphate measurement is to assess the dissolved or bio-available form of orthophosphorus (*i.e.,* that which passes through a 0.45-micron filter), hence the requirement to filter the sample immediately upon collection (*i.e.,* within 15 minutes of collection).

[38 FR 28758, Oct. 16, 1973]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §136.3, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at *www.govinfo.gov*.

CONTROLLED

Appendix B

Appendix B – Existing Water Quality Data Tables

This page intentionally left blank.

Lake Jocassee

Water Quality Data by Station

This page intentionally left blank.

Lake Jocassee

Temperature Data

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Average Water Temperatures (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.5	10.3	12.1	14.9	21.0	24.7	25.4	26.0	24.8	21.4	18.4	13.5
1095 to 1080	10.3	9.5	11.1	13.7	18.3	21.9	24.7	25.9	24.7	21.5	17.6	13.2
1080 to 1065	10.3	9.3	10.4	12.9	16.4	20.5	23.5	25.3	24.7	21.4	17.4	13.4
1065 to 1050	10.2	9.5	10.3	12.2	15.5	19.5	22.5	24.9	24.7	21.4	17.5	13.4
1050 to 1035	10.3	9.5	10.2	11.4	14.5	18.8	21.7	24.3	24.7	21.3	17.6	13.6
1035 to 1020	10.3	9.5	9.8	11.2	13.6	17.2	20.6	23.5	24.0	21.2	17.4	13.3
1020 to 1005	10.2	9.4	9.7	10.7	12.2	14.7	17.1	19.9	20.7	20.8	17.5	13.4
1005 to 990	10.3	9.4	9.6	10.3	11.3	12.0	12.9	13.8	14.1	15.4	16.3	13.5
990 to 975	10.3	9.5	9.6	9.9	10.3	10.5	11.0	11.0	11.4	11.2	12.0	12.5
975 to 960	10.1	9.2	9.3	9.6	9.7	9.9	10.2	10.4	10.3	10.2	10.0	10.8
960 to 945	9.7	9.3	9.3	9.4	9.6	9.7	9.9	10.0	9.8	9.8	9.7	9.9
945 to 930	9.5	9.3	9.3	9.3	9.4	9.3	9.8	9.8	9.6	9.5	9.6	9.6
930 to 915	9.4	9.2	9.1	9.1	9.3	9.4	9.4	9.6	9.5	9.5	9.3	9.4
915 to 900	9.2	9.0	9.0	9.1	9.2	9.2	9.5	9.6	9.3	9.3	9.3	9.2
900 to 885	9.1	8.9	8.9	9.0	9.1	9.1	9.4	9.4	9.3	9.3	9.2	9.3
885 to 870	9.1	8.9	8.9	8.9	9.0	9.1	9.4	9.3	9.3	9.1	9.2	9.2
870 to 855	9.0	8.7	8.7	8.8	8.9	9.0	9.2	9.3	9.3	9.2	9.1	9.1
< 855	9.0	8.7	8.4	8.6	9.0	9.0	9.2	9.2	9.2	9.1	9.1	9.1

Jocassee B_2_558.7: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.7	9.8	11.2	15.1	19.7	24.0	25.9	26.1	24.9	21.4	17.6	13.9
1095 to 1080	10.5	9.8	11.0	14.4	17.7	21.7	24.6	26.0	25.0	21.5	17.4	13.8
1080 to 1065	10.6	9.7	10.6	13.4	16.5	20.4	23.6	25.5	24.9	21.5	17.4	14.0
1065 to 1050	10.6	9.7	10.2	12.5	15.1	19.0	22.6	24.6	24.8	21.5	17.4	13.9
1050 to 1035	10.5	9.5	10.0	11.5	13.4	17.1	20.7	23.4	23.7	21.3	17.3	13.8
1035 to 1020	10.5	9.6	9.8	11.0	12.4	14.9	18.0	21.0	22.3	20.8	17.2	13.9
1020 to 1005	10.6	9.5	9.6	10.3	11.1	12.4	14.0	15.8	17.9	18.6	16.8	13.9
1005 to 990	10.6	9.5	9.5	9.9	10.1	10.7	11.2	11.7	12.5	12.7	14.1	13.2
990 to 975	10.1	9.5	9.4	9.6	9.7	9.8	9.9	10.2	10.3	10.4	10.6	11.2
975 to 960	9.9	9.4	9.3	9.4	9.4	9.5	9.6	9.7	9.8	9.7	9.8	9.9
960 to 945	9.5	9.2	9.1	9.3	9.2	9.3	9.4	9.5	9.5	9.5	9.5	9.4
945 to 930	9.2	9.0	9.1	9.0	9.0	9.1	9.2	9.3	9.3	9.2	9.3	9.2
930 to 915	9.1	9.0	8.9	9.0	9.0	9.0	9.2	9.2	9.3	9.2	9.2	9.1
915 to 900	9.0	8.9	8.9	8.9	8.9	9.0	9.0	9.1	9.2	9.2	9.2	9.1
900 to 885	9.0	8.8	8.8	8.9	8.8	8.9	9.0	9.0	9.1	9.0	9.1	9.0
885 to 870	8.8	8.8	8.8	8.8	8.8	8.8	8.9	9.1	9.1	9.0	9.0	9.1
870 to 855	8.9	8.7	8.7	8.7	8.8	8.8	8.9	9.0	9.1	9.0	9.0	9.0
< 855	8.8	8.5	8.5	8.6	8.7	8.7	8.9	9.0	9.1	9.0	9.0	8.9

Jocassee B_3_558.0: Monthly Average Water Temperatures (deg C) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.3	9.1	10.1	13.7	18.8	23.3	25.9	25.8	25.0	21.6	18.3	13.3
1095 to 1080	10.3	8.7	9.3	13.4	19.2	23.2	25.3	25.4	25.1	21.6	17.7	13.4
1080 to 1065	10.3	8.8	9.8	13.1	17.8	21.3	24.2	25.1	24.7	21.4	17.5	13.4
1065 to 1050	10.3	8.8	9.5	12.6	15.8	19.6	22.8	24.0	24.7	21.4	17.5	13.3
1050 to 1035	10.2	8.7	9.3	11.9	14.8	18.8	21.7	23.7	24.3	21.3	17.5	13.6
1035 to 1020	10.2	8.7	9.2	11.5	13.6	16.7	20.5	22.6	24.1	21.3	17.5	13.4
1020 to 1005	10.3	8.6	8.7	10.6	12.3	16.4	19.2	22.1	22.6	20.9	17.4	13.5
1005 to 990	10.2	8.6	8.9	10.2	11.6	13.4	17.1	19.3	22.3	20.5	17.5	13.1
990 to 975	10.3	8.6	8.8	9.9	11.2	13.9	15.7	18.4	19.0	18.9	16.3	13.2
975 to 960	10.2	8.6	8.3	9.6	10.4	11.6	13.4	14.5	16.6	17.7	15.8	12.7
960 to 945	10.3	8.5	8.5	9.1	9.9	10.8	11.5	12.3	12.8	13.2	12.8	11.3
945 to 930	10.1	8.5	8.3	9.0	9.3	9.7	9.9	9.7	10.0	10.0	10.9	10.9
930 to 915	10.0	8.8	9.3	9.1	9.6	9.2	9.5	9.5	9.7	9.6	9.5	9.8
915 to 900	9.5	9.0	9.1	8.9	9.4	9.3	9.5	9.5	9.2	9.1	9.5	9.5
900 to 885	9.1	8.5	8.4	8.7	8.9	8.9	9.0	8.9	9.0	8.8	8.9	9.0
885 to 870	9.0	8.7	8.8	8.7	9.0	9.1	9.3	9.1	9.3	9.1	9.2	9.2
870 to 855	8.9	8.7	8.8	8.7	9.0	9.1	9.2	9.1	9.1	8.8	9.2	9.2
< 855	8.9	8.4	8.4	8.5	8.8	8.8	8.9	8.9	8.9	8.8	9.0	9.0

Jocassee B_3_558.0: Monthly Average Water Temperatures (deg C) 1991 to 2020 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.7	9.8	11.1	14.7	20.1	24.1	25.9	26.2	25.1	21.5	17.5	13.9
1095 to 1080	10.7	9.9	11.5	14.4	19.1	23.1	25.4	26.3	25.3	21.5	17.9	13.9
1080 to 1065	10.6	9.8	11.2	14.1	17.8	21.5	24.6	26.0	25.1	21.6	17.5	13.9
1065 to 1050	10.5	9.8	11.1	13.7	17.0	20.9	24.1	25.8	25.2	21.7	17.6	14.1
1050 to 1035	10.6	9.7	10.6	12.9	15.6	19.5	23.1	25.3	24.9	21.5	17.4	13.8
1035 to 1020	10.6	9.8	10.4	12.5	14.9	18.8	22.2	24.5	24.8	21.7	17.6	14.0
1020 to 1005	10.5	9.6	10.3	11.7	13.8	17.6	21.0	23.8	23.9	21.2	17.3	13.7
1005 to 990	10.6	9.7	10.1	11.2	13.2	16.1	19.9	22.4	23.5	21.3	17.5	14.1
990 to 975	10.5	9.6	10.0	10.8	12.1	14.3	17.5	20.7	21.9	20.6	17.1	13.7
975 to 960	10.7	9.7	9.8	10.3	11.2	12.7	14.3	16.6	18.9	18.7	17.2	13.8
960 to 945	10.4	9.6	9.8	10.0	10.6	11.2	12.4	13.6	15.1	15.6	15.9	13.4
945 to 930	10.4	9.6	9.6	9.7	9.8	10.0	10.3	10.6	11.0	11.0	11.6	11.9
930 to 915	9.7	9.3	9.4	9.4	9.4	9.4	9.5	9.6	9.8	9.6	9.7	9.7
915 to 900	9.3	9.1	9.2	9.2	9.2	9.2	9.3	9.3	9.5	9.3	9.3	9.3
900 to 885	9.0	9.0	9.1	9.0	9.0	9.0	9.1	9.2	9.3	9.2	9.2	9.1
885 to 870	9.0	8.8	8.9	8.9	8.9	8.9	9.0	9.1	9.2	9.1	9.1	9.0
870 to 855	8.9	8.8	8.8	8.8	8.8	8.8	8.9	9.0	9.1	9.0	9.0	9.0
< 855	8.8	8.6	8.7	8.7	8.7	8.8	8.9	8.9	9.1	9.0	9.0	9.0

Legend	8										25

Jocassee C_2_559.0: Monthly Average Water Temperatures (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.5	10.3	11.2	16.7	21.3	25.5	25.8	26.1	24.8	21.4	18.6	13.7
1095 to 1080	10.4	9.7	11.1	14.4	18.1	22.9	24.9	26.5	24.9	21.6	17.7	13.6
1080 to 1065	10.5	9.5	10.5	13.1	16.7	21.0	23.6	25.5	24.8	21.5	17.7	13.7
1065 to 1050	10.4	9.6	10.3	12.3	15.6	19.6	22.4	24.8	24.8	21.5	17.7	13.6
1050 to 1035	10.4	9.7	10.0	11.6	14.7	18.7	21.7	24.3	24.6	21.3	17.7	13.7
1035 to 1020	10.4	9.5	9.8	11.3	13.8	17.4	20.5	23.3	24.0	21.3	17.7	13.5
1020 to 1005	10.3	9.4	9.6	10.8	12.6	15.0	17.1	20.1	20.9	20.8	17.6	13.5
1005 to 990	10.4	9.5	9.5	10.5	11.4	12.3	12.9	14.2	13.9	15.2	15.9	13.5
990 to 975	10.4	9.5	9.5	9.9	10.5	10.8	11.1	11.1	11.2	11.2	12.0	12.4
975 to 960	10.3	9.3	9.3	9.6	9.9	10.1	10.2	10.4	10.3	10.2	10.1	10.4
960 to 945	9.7	9.3	9.3	9.5	9.6	9.7	9.9	9.9	9.8	9.8	9.8	9.8
945 to 930	9.4	9.4	9.2	9.3	9.4	9.6	9.8	9.7	9.7	9.5	9.6	9.6
930 to 915	9.3	9.1	9.1	9.2	9.4	9.4	9.4	9.6	9.5	9.5	9.4	9.4
915 to 900	9.1	9.0	9.0	9.1	9.2	9.3	9.4	9.6	9.3	9.3	9.3	9.2
900 to 885	9.1	9.0	8.9	9.0	9.0	9.2	9.3	9.4	9.3	9.3	9.2	9.3
885 to 870	9.0	9.0	8.9	8.9	9.1	9.2	9.3	9.3	9.2	9.2	9.2	9.2
870 to 855	8.9	8.8	8.7	8.9	9.0	9.1	9.1	9.3	9.2	9.2	9.2	9.1
< 855	8.9	8.7	8.7	8.7	8.9	9.0	9.2	9.2	9.1	9.1	9.1	9.1

Jocassee C_2_559.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.8	9.8	11.4	15.2	20.1	24.5	26.4	26.4	25.0	21.4	17.7	14.0
1095 to 1080	10.6	9.8	11.1	14.6	18.0	22.0	24.9	26.2	25.1	21.6	17.5	13.8
1080 to 1065	10.6	9.7	10.7	13.5	16.6	20.3	23.7	25.6	25.0	21.6	17.4	13.9
1065 to 1050	10.6	9.7	10.2	12.4	15.2	18.9	22.5	24.5	24.8	21.5	17.5	13.9
1050 to 1035	10.6	9.5	10.0	11.4	13.5	17.1	20.7	23.2	23.7	21.3	17.3	13.8
1035 to 1020	10.5	9.6	9.7	10.9	12.4	15.0	18.2	20.8	22.1	20.8	17.3	13.9
1020 to 1005	10.6	9.5	9.6	10.3	11.2	12.7	14.3	16.0	17.8	18.6	16.8	13.8
1005 to 990	10.6	9.5	9.4	9.9	10.1	10.8	11.4	11.8	12.4	12.9	14.2	13.1
990 to 975	10.1	9.5	9.4	9.6	9.7	9.9	10.1	10.1	10.3	10.4	10.7	11.2
975 to 960	9.8	9.4	9.3	9.4	9.4	9.6	9.7	9.6	9.8	9.7	9.8	9.9
960 to 945	9.5	9.2	9.1	9.3	9.2	9.3	9.4	9.4	9.5	9.5	9.5	9.4
945 to 930	9.1	9.0	9.1	9.1	9.0	9.1	9.2	9.2	9.3	9.2	9.3	9.2
930 to 915	9.0	9.0	8.9	9.1	9.0	9.1	9.2	9.2	9.3	9.2	9.2	9.1
915 to 900	8.9	8.9	8.9	8.9	8.9	9.0	9.1	9.1	9.2	9.2	9.2	9.1
900 to 885	9.0	8.8	8.7	8.9	8.8	8.9	9.0	9.0	9.1	9.1	9.2	9.0
885 to 870	8.8	8.8	8.8	8.8	8.8	8.8	9.0	9.0	9.1	9.0	9.0	9.1
870 to 855	8.9	8.8	8.7	8.8	8.8	8.9	9.0	9.0	9.1	9.1	9.1	9.0
< 855	8.7	8.6	8.6	8.7	8.8	8.8	8.9	8.9	9.0	9.0	9.0	9.0

Legend	8										25

Jocassee C_2_560.0: Monthly Average Water Temperatures (deg C) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.4	9.2	10.1	14.3	19.5	24.5	26.4	26.3	25.1	21.6	18.2	13.3
1095 to 1080	10.4	9.0	10.1	13.3	17.6	21.9	24.4	25.4	25.1	21.6	17.7	13.4
1080 to 1065	10.3	8.7	9.5	12.0	15.2	19.2	22.1	24.0	24.6	21.4	17.6	13.5
1065 to 1050	10.3	8.8	9.3	11.3	13.9	17.5	20.6	22.9	24.0	21.4	17.7	13.4
1050 to 1035	10.3	8.7	8.7	10.4	12.5	15.7	18.8	21.3	22.6	20.8	17.6	13.5
1035 to 1020	10.3	8.6	8.8	10.0	11.6	13.5	16.1	18.8	19.9	18.9	16.7	13.2
1020 to 1005	10.3	8.6	8.4	9.4	10.4	11.5	13.6	14.3	15.1	15.7	14.7	12.4
1005 to 990	10.2	8.4	8.3	9.2	10.1	10.4	10.3	10.8	11.1	11.9	12.5	11.2
990 to 975	10.1	8.5	8.2	8.9	9.4	9.7	9.6	9.7	9.5	9.4	10.0	10.4
975 to 960	10.0	8.7	9.3	9.0	9.8	8.9	9.4	9.4	9.6	9.7	9.4	9.6
960 to 945	9.8	9.2	9.2	9.2	9.7	9.7	9.7	9.6	9.8	9.6	9.8	9.7
945 to 930	9.4	9.0	9.3	8.9	9.3	9.4	9.7	9.5	8.8	8.8	9.4	9.5
930 to 915	9.3	9.0	9.2	9.0	9.4	9.4	9.4	9.5	9.5	9.3	9.5	9.4
915 to 900	8.9	8.3	8.2	8.5	8.7	8.7	8.8	8.8	8.7	8.8	8.8	8.8
900 to 885	9.0	8.8	8.9	8.9	9.1	9.1	9.4	9.3	9.2	9.1	9.1	9.2
885 to 870	9.0	8.8	8.9	8.8	9.2	9.1	9.4	9.2	9.2	9.0	9.3	9.1
870 to 855	8.9	8.6	8.7	8.7	9.0	9.1	9.2	9.2	9.3	9.0	9.2	9.1
< 855	8.9	8.5	8.6	8.7	8.7	9.0	9.1	9.1	8.9	9.0	9.2	9.0

Jocassee C_2_560.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	9.9	11.5	15.2	20.3	24.6	26.3	26.4	25.1	21.4	17.9	14.2
1095 to 1080	10.8	9.9	11.3	14.5	18.2	22.3	24.9	26.4	25.2	21.6	17.6	13.9
1080 to 1065	10.8	9.7	10.7	13.4	16.7	20.6	23.7	25.7	25.0	21.6	17.6	14.1
1065 to 1050	10.8	9.7	10.4	12.4	15.5	19.1	22.4	24.5	24.8	21.6	17.7	14.0
1050 to 1035	10.8	9.6	10.1	11.4	13.8	17.5	20.8	23.3	23.7	21.5	17.5	13.9
1035 to 1020	10.7	9.6	9.9	11.0	12.9	15.7	18.7	21.2	22.3	20.8	17.4	14.0
1020 to 1005	10.8	9.6	9.7	10.4	11.6	13.3	15.1	16.6	18.0	18.9	16.9	13.9
1005 to 990	10.7	9.5	9.5	10.0	10.5	11.1	11.9	12.2	12.5	13.1	14.1	13.0
990 to 975	10.3	9.5	9.5	9.7	9.9	10.1	10.2	10.3	10.3	10.4	10.8	11.3
975 to 960	10.0	9.4	9.3	9.5	9.6	9.6	9.7	9.7	9.8	9.8	9.9	10.1
960 to 945	9.6	9.3	9.2	9.3	9.3	9.4	9.5	9.5	9.5	9.6	9.6	9.5
945 to 930	9.3	9.1	9.2	9.1	9.1	9.2	9.3	9.3	9.3	9.3	9.4	9.3
930 to 915	9.2	9.1	9.1	9.1	9.1	9.2	9.3	9.3	9.3	9.3	9.3	9.2
915 to 900	9.1	9.1	9.0	9.0	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.2
900 to 885	9.1	8.9	8.9	9.0	8.9	9.0	9.1	9.1	9.1	9.1	9.2	9.1
885 to 870	8.9	8.9	8.9	8.8	8.8	9.0	9.0	9.1	9.1	9.1	9.1	9.1
870 to 855	9.1	8.9	8.7	8.9	9.0	9.0	9.0	9.1	9.1	9.1	9.2	9.1
< 855	8.6	8.4	8.6	8.6	8.6	8.8	8.7	8.7	8.9	8.7	9.2	9.1

Legend	8										25

Jocassee C_2_562.0: Monthly Average Water Temperatures (deg C) 1980 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.3	10.1	11.0	14.6	20.4	26.6	26.4	26.6	25.0	21.7	18.3	13.5
1095 to 1080	10.4	9.5	10.9	13.4	18.4	23.4	24.9	25.9	25.4	21.8	17.8	13.3
1080 to 1065	10.3	9.3	10.4	12.2	16.3	21.0	23.1	25.0	24.9	21.5	17.6	13.4
1065 to 1050	10.2	9.2	10.2	11.7	15.2	19.7	21.9	24.0	24.6	21.6	17.6	13.3
1050 to 1035	10.2	9.2	9.9	11.1	14.3	18.9	21.1	23.1	24.1	21.3	17.6	13.5
1035 to 1020	10.2	9.1	9.6	10.6	12.9	17.7	19.8	20.9	23.4	20.8	17.5	13.2
1020 to 1005	10.1	9.1	9.5	10.1	12.1	15.5	15.7	17.2	19.8	19.1	17.4	13.2
1005 to 990	9.8	8.7	9.5	9.7	11.3	12.7	12.3	12.9	13.9	14.4	14.9	12.9
990 to 975	8.9	8.1	8.6	9.1	8.6		9.3	8.6	9.3	9.7	9.2	
975 to 960									9.3			
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 964.5 ft

Jocassee C_2_562.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	10.0	11.9	15.4	20.6	24.8	26.5	26.6	25.2	21.5	17.9	14.1
1095 to 1080	10.6	10.0	11.5	14.2	18.3	22.4	24.9	26.4	25.2	21.6	17.5	13.7
1080 to 1065	10.7	9.7	10.8	13.3	16.9	20.7	23.8	25.6	25.0	21.6	17.5	13.9
1065 to 1050	10.6	9.7	10.4	12.3	15.5	19.1	22.5	24.4	24.8	21.6	17.5	13.9
1050 to 1035	10.6	9.5	10.1	11.3	13.6	17.2	20.8	23.2	23.7	21.3	17.4	13.7
1035 to 1020	10.6	9.6	9.9	10.9	12.5	15.2	18.4	20.9	22.3	20.6	17.3	13.9
1020 to 1005	10.5	9.5	9.7	10.3	11.2	13.0	14.9	16.5	18.2	19.0	17.0	13.7
1005 to 990	10.1	9.3	9.5	10.0	10.3	11.1	12.1	12.9	13.1	14.0	15.2	13.0
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 992.2 ft

Legend	8								25

Jocassee C_2_565.4: Monthly Average Water Temperatures (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.7	11.0	11.3	16.9	21.6	26.4	26.1	26.8	25.1	21.6	18.2	14.7
1095 to 1080	10.5	9.8	11.1	14.1	18.6	22.2	25.2	26.6	25.1	21.7	17.7	13.7
1080 to 1065	10.3	9.5	10.4	12.6	16.5	20.5	23.9	26.0	24.9	21.5	17.6	13.8
1065 to 1050	10.3	9.5	9.9	11.9	15.6	19.4	22.7	25.0	24.7	21.7	17.6	13.7
1050 to 1035	10.3	9.6	9.7	11.2	14.6	18.7	21.9	24.4	24.5	21.4	17.5	13.9
1035 to 1020	10.3	9.3	9.7	10.9	13.4	17.2	20.9	23.5	23.9	21.4	17.5	13.8
1020 to 1005	10.2	9.3	9.5	10.7	12.5	15.3	17.6	20.0	20.8	20.8	17.4	13.6
1005 to 990	10.2	9.3	9.4	10.4	11.4	12.5	13.3	14.3	14.2	14.5	16.0	13.5
990 to 975	10.2	9.4	9.5	9.9	10.4	10.6	11.1	11.0	11.3	10.8	11.3	12.0
975 to 960	9.9	9.2	9.2	9.5	9.8	10.0	10.0	10.1	10.4	10.0	9.9	10.4
960 to 945	9.8	9.2	9.2	9.4	9.6	9.6	9.7	9.8	9.9	9.9	9.9	9.7
945 to 930	9.4	9.1	9.3	9.5	9.5	9.7	10.2	9.7	9.7	9.6	10.2	9.5
930 to 915			9.9		9.4	10.3		10.3	9.6			
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.1 ft

Jocassee C_2_565.4: Monthly Average Water Temperatures (deg C) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.8	10.5	11.2	15.9	21.0	24.5	26.8	26.1	25.1	20.2	17.1	14.2
1095 to 1080	10.5	10.2	10.6	13.8	18.6	21.8	24.8	25.5	25.1	20.5	17.0	13.1
1080 to 1065	10.7	10.0	10.2	12.4	16.1	19.5	22.6	24.8	24.7	20.3	16.7	13.4
1065 to 1050	10.6	9.9	10.1	11.3	14.8	17.3	20.5	22.4	23.8	20.2	16.7	13.6
1050 to 1035	10.7	9.8	9.9	10.8	13.0	15.6	18.5	19.8	20.1	19.7	16.6	13.2
1035 to 1020	10.4	9.9	9.8	10.6	11.8	12.9	14.8	16.7	17.9	16.6	15.8	13.3
1020 to 1005	10.5	9.8	9.7	10.2	11.0	11.7	13.1	12.5	13.9	14.7	14.4	13.1
1005 to 990	10.6	9.7	9.6	10.0	10.3	10.7	11.2	10.9	11.1	11.5	12.4	11.4
990 to 975	10.3	9.8	9.5	9.7	10.2	10.0	10.2	10.3	10.2	10.1	10.1	10.7
975 to 960	10.4	9.7	9.5	9.6	9.9	9.8	9.9	10.0	9.9	9.9	9.9	9.8
960 to 945	10.1	9.7	9.4	9.5	9.7	9.7	9.8	9.8	9.8	9.9	9.8	9.5
945 to 930	9.9	9.4	9.4	9.4	9.8	9.9	9.6	9.9	9.6	9.5	9.5	10.1
930 to 915	8.0				9.9		10.5	10.4	9.9		8.0	
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 926.6 ft

Legend	8									25

Jocassee D_2_551.0: Monthly Average Water Temperatures (deg C) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	5.3	5.7	8.9	11.9	14.4	19.4	21.1	21.3	17.8	13.6	10.1	6.8
1095 to 1080	5.3	7.7	10.0	13.4	15.5	20.0	24.2	21.2	20.0	13.4	10.6	7.4
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1082.8 ft

Jocassee D_2_551.0: Monthly Average Water Temperatures (deg C) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	3.3	6.2	8.9	15.0	20.6	20.2	20.8	22.7	20.1	12.3	16.1	4.0
1095 to 1080		6.2						27.2			18.4	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1083.7 ft

Legend	8											25

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.4	9.3	10.4	14.8	19.5	24.8	26.5	26.5	25.3	21.6	17.7	13.3
1095 to 1080	10.4	9.1	10.1	13.5	17.7	22.1	24.5	25.3	25.2	21.6	17.5	13.2
1080 to 1065	10.3	8.7	9.6	11.9	15.6	19.5	22.4	24.0	24.8	21.5	17.5	13.3
1065 to 1050	10.2	8.8	9.3	11.2	14.2	18.0	21.1	22.9	24.1	21.4	17.4	13.2
1050 to 1035	10.3	8.7	8.7	10.4	12.6	16.1	19.3	21.6	22.9	21.0	17.5	13.4
1035 to 1020	10.3	8.6	8.8	10.1	11.6	14.2	17.0	19.4	20.7	19.4	16.5	13.0
1020 to 1005	10.2	8.6	8.5	9.6	10.5	12.1	14.3	14.9	15.9	16.1	15.0	12.3
1005 to 990	10.2	8.4	8.4	9.3	10.2	10.9	10.9	11.1	11.9	12.1	13.0	11.4
990 to 975	10.2	8.5	8.6	9.0	9.5	10.1	10.6	9.9	9.9	9.5	10.1	10.6
975 to 960	10.0	8.7	9.3	9.2	9.8	9.4	9.8	9.8	9.9	9.9	9.4	9.8
960 to 945	9.7	9.1	9.2	9.3	9.6	9.9	10.0	10.0	10.0	9.6	9.8	9.8
945 to 930	9.4	9.1	9.2	9.2	9.4	9.8	10.0	9.7	9.9	9.3	9.6	9.6
930 to 915	9.3	9.0	9.1	9.2	9.3	9.6	9.7	9.7	9.8	9.5	9.5	9.4
915 to 900	9.1	8.9	9.0	9.1	9.2	9.5	9.7	9.6	9.6	9.4	9.4	9.2
900 to 885	9.1	8.8	8.9	9.0	9.1	9.4	9.6	9.6	9.5	9.3	9.2	9.3
885 to 870	9.1	8.8	8.9	8.8	9.1	9.1	9.5	9.6	9.6	9.2	9.3	9.1
870 to 855	9.4		8.6	8.5	9.0	9.2	9.7	9.2	9.9	9.4	9.8	8.9
< 855	Minimum Reading 864.7 ft											

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.4	11.7	15.6	20.4	24.6	26.3	26.2	25.1	21.4	18.2	14.3
1095 to 1080	10.8	10.1	11.4	14.4	18.2	22.6	25.1	26.5	25.2	21.7	17.8	14.0
1080 to 1065	10.9	10.0	10.8	13.5	16.9	20.9	24.0	26.0	25.0	21.7	17.8	14.1
1065 to 1050	10.8	10.0	10.6	12.7	16.0	19.7	22.9	24.9	24.9	21.6	17.8	14.1
1050 to 1035	10.8	9.9	10.3	12.0	14.3	17.9	21.3	23.7	23.8	21.5	17.7	14.0
1035 to 1020	10.7	9.9	10.1	11.4	13.2	15.9	18.9	21.7	22.5	20.8	17.5	14.0
1020 to 1005	10.8	9.8	9.9	10.6	12.0	13.6	15.5	17.1	18.6	19.3	17.0	13.8
1005 to 990	10.8	9.7	9.7	10.2	10.6	11.5	12.4	12.7	13.3	13.6	14.6	13.1
990 to 975	10.5	9.7	9.7	10.0	10.1	10.5	10.5	10.6	10.6	10.8	11.1	11.7
975 to 960	10.2	9.6	9.5	9.7	9.7	9.9	9.9	10.0	10.0	10.0	10.0	10.3
960 to 945	9.9	9.5	9.4	9.6	9.5	9.7	9.7	9.7	9.7	9.8	9.8	9.7
945 to 930	9.6	9.4	9.3	9.5	9.3	9.5	9.5	9.6	9.5	9.6	9.6	9.6
930 to 915	9.4	9.3	9.3	9.4	9.2	9.4	9.4	9.5	9.5	9.5	9.5	9.4
915 to 900	9.4	9.2	9.2	9.3	9.0	9.3	9.3	9.4	9.4	9.5	9.4	9.4
900 to 885	9.3	9.1	9.0	9.1	9.2	9.2	9.1	9.3	9.3	9.3	9.4	9.2
885 to 870	9.1	8.9	9.1	9.0	9.2	9.4	9.2	9.4	9.5	9.2	9.5	9.3
870 to 855	9.2	8.2	9.5	8.9		10.0	9.1	9.3		9.0	10.3	
< 855	Minimum Reading 864.4 ft											

Legend	8									25

Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	11.6	12.6	16.0	20.8	24.2	26.1	26.8	25.8	21.6	18.2	13.5
1095 to 1080	10.6	10.2	11.2	14.2	18.3	21.8	24.6	26.0	25.4	21.8	17.9	13.4
1080 to 1065	9.8	9.2	10.8	13.3	16.9	20.3	23.1	25.2	25.1	21.3	17.6	13.1
1065 to 1050	8.8	8.2	9.4	11.9	15.3	18.0	21.5	24.0	23.9	20.3	16.1	11.4
1050 to 1035	8.4	8.2	8.4	10.1	12.6	14.5	18.2	21.5	23.1	19.9	15.6	11.3
1035 to 1020	8.4	8.0	8.1	9.0	10.4	11.1	13.5	16.8	20.6	19.5	15.5	10.8
1020 to 1005	8.3	7.9	7.6	8.1	8.8	10.0	12.6	15.2	17.5	19.2	15.3	11.0
1005 to 990	8.3	8.0	7.5	7.8	8.3	8.9	9.9	12.2	14.8	16.9	15.3	11.1
990 to 975	8.3	8.2	7.5	7.9	8.6	8.9	9.5	11.3	13.7	14.7	14.7	11.0
975 to 960	8.2	7.8	6.7	7.2	8.6	8.9	9.6	11.0	13.2	13.0	13.1	9.9
960 to 945					8.6							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1991 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.3	11.3	14.8	20.1	23.5	25.4	26.1	24.9	21.3	18.2	14.3
1095 to 1080	10.7	10.1	11.0	14.0	18.4	22.4	24.7	26.2	25.2	21.5	17.8	13.9
1080 to 1065	10.7	10.0	10.9	13.7	17.2	21.3	24.3	25.7	25.1	21.7	17.8	13.9
1065 to 1050	10.5	9.8	10.7	13.3	16.4	20.8	23.8	24.9	25.0	21.5	17.7	13.8
1050 to 1035	10.6	9.7	10.8	13.2	15.9	20.3	23.5	25.0	24.9	21.6	17.6	13.7
1035 to 1020	10.4	9.6	10.8	13.1	16.0	19.9	23.3	24.8	24.8	21.5	17.4	13.7
1020 to 1005	10.3	9.7	10.8	13.0	15.9	19.8	23.1	24.7	24.8	21.5	17.6	13.6
1005 to 990	10.4	9.5	10.4	12.7	15.2	19.0	22.4	24.3	24.5	21.3	17.3	13.6
990 to 975	10.0	9.5	10.5	12.3	15.4	19.0	22.2	24.0	24.3	20.9	17.0	13.4
975 to 960	10.2	9.4	9.9	12.1	14.5	17.8	21.5	22.4	23.7	20.0	16.8	13.2
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend	8										25

Jocassee E_2_557.0: Monthly Average Water Temperatures (deg C) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.3	8.9	10.4	14.2	19.2	24.0	26.3	25.9	24.8	21.4	18.0	13.3
1095 to 1080	10.3	8.9	10.1	13.5	17.6	21.6	24.0	25.1	24.9	21.4	17.5	13.3
1080 to 1065	10.3	8.6	9.4	12.2	15.1	18.9	22.1	23.7	24.6	21.4	17.4	13.4
1065 to 1050	10.1	8.6	9.2	11.4	13.6	17.2	20.6	22.7	23.9	21.2	17.4	13.3
1050 to 1035	10.1	8.5	8.7	10.4	12.3	15.4	18.8	21.2	22.3	20.9	17.4	13.4
1035 to 1020	10.2	8.5	8.6	9.8	11.2	13.5	16.1	18.7	19.8	19.2	16.5	13.2
1020 to 1005	10.1	8.5	8.4	9.3	10.1	11.3	13.6	14.2	15.2	15.7	14.5	12.4
1005 to 990	10.1	8.3	8.3	9.1	9.9	10.3	10.3	10.6	11.4	12.0	12.2	11.4
990 to 975	10.1	8.4	8.1	8.9	9.4	9.6	9.6	9.7	9.6	9.3	10.0	10.7
975 to 960	9.9	8.7	9.3	8.9	9.7	8.9	9.4	9.4	9.7	9.7	9.5	9.8
960 to 945	9.7	9.1	9.2	9.2	9.6	9.8	9.7	9.6	9.9	9.5	9.7	9.9
945 to 930	9.5	8.8	9.4	8.8	9.3	9.2	9.5	9.5	9.0	8.8	9.4	9.6
930 to 915	9.4	8.9	9.1	9.0	9.3	9.4	9.3	9.5	9.6	9.3	9.4	9.4
915 to 900	9.0	8.1	8.3	8.4	8.7	8.7	8.9	8.7	8.8	8.8	9.0	8.9
900 to 885	9.1	8.5	8.9	8.9	9.1	9.1	9.4	9.4	9.2	9.2	9.1	9.3
885 to 870	9.1	8.4	8.9	8.7	9.0	9.1	9.4	9.2	9.3	9.1	9.2	9.2
870 to 855	9.0	8.4	8.6	8.7	8.9	9.0	8.9	9.2	9.1	9.2	9.2	9.2
< 855	8.9	8.5	8.5	8.6	8.7	8.9	8.7	9.1	9.0	9.0	9.0	9.1

Jocassee E_2_557.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	9.9	11.6	15.7	20.5	24.7	26.3	26.5	25.0	21.3	17.7	14.2
1095 to 1080	10.7	9.9	11.3	14.7	17.7	22.0	24.8	26.3	25.1	21.4	17.4	13.7
1080 to 1065	10.7	9.8	10.7	13.5	16.4	20.5	23.6	25.5	24.9	21.5	17.4	14.0
1065 to 1050	10.7	9.7	10.4	12.6	15.1	19.2	22.5	24.5	24.7	21.4	17.5	13.9
1050 to 1035	10.7	9.6	10.0	11.6	13.7	17.2	20.8	23.3	23.5	21.2	17.3	13.8
1035 to 1020	10.6	9.6	9.9	11.1	12.6	15.2	18.5	21.0	22.1	20.7	17.2	13.9
1020 to 1005	10.7	9.6	9.7	10.4	11.5	13.0	14.7	16.3	18.0	18.9	16.7	13.8
1005 to 990	10.6	9.5	9.5	9.9	10.3	11.1	11.6	12.0	12.5	13.1	14.4	13.0
990 to 975	10.3	9.4	9.5	9.7	9.8	10.1	10.3	10.3	10.4	10.5	10.8	11.4
975 to 960	9.9	9.3	9.3	9.5	9.5	9.7	9.8	9.7	9.8	9.8	9.8	10.2
960 to 945	9.6	9.2	9.2	9.3	9.3	9.5	9.5	9.5	9.6	9.5	9.6	9.6
945 to 930	9.4	9.0	9.1	9.1	9.2	9.3	9.3	9.4	9.3	9.3	9.4	9.3
930 to 915	9.2	9.0	9.0	9.1	9.1	9.2	9.3	9.3	9.3	9.3	9.3	9.3
915 to 900	9.1	8.8	9.0	9.0	9.0	9.1	9.2	9.2	9.3	9.2	9.3	9.2
900 to 885	9.0	8.7	8.8	8.9	8.9	9.0	9.1	9.1	9.2	9.1	9.2	9.1
885 to 870	8.9	8.6	8.9	8.9	8.9	9.0	9.1	9.1	9.2	9.1	9.1	9.1
870 to 855	8.9	8.6	8.7	8.8	8.9	9.0	9.1	9.1	9.2	9.1	9.2	9.1
< 855	8.9	8.6	8.7	8.6	8.7	8.8	9.1	8.9	9.1	9.0	9.1	9.0
	Legend	**8**										**25**

Jocassee F_2_554.8: Monthly Average Water Temperatures (deg C) 1986 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.5	10.7	14.0	16.3	22.7	26.2	26.8	26.7	25.0	21.4	18.1	14.3
1095 to 1080	10.1	9.5	11.4	14.5	19.5	22.0	25.2	26.5	25.0	21.5	17.2	13.5
1080 to 1065	10.1	9.1	10.6	13.0	16.2	20.2	23.9	25.4	24.8	21.5	17.2	13.4
1065 to 1050	9.9	9.2	10.1	12.5	15.3	19.5	22.7	25.0	24.6	21.3	17.0	13.3
1050 to 1035	10.0	9.1	10.2	11.5	14.3	18.7	21.9	24.4	24.4	21.2	17.1	13.5
1035 to 1020	10.0	9.2	9.9	11.0	13.2	17.1	20.8	23.6	23.9	21.1	17.0	13.4
1020 to 1005	9.9	9.0	9.6	10.7	12.1	15.0	17.3	20.2	21.2	20.0	16.8	13.2
1005 to 990	9.9	9.0	9.7	10.2	11.1	12.1	13.2	14.2	14.4	14.5	15.7	13.2
990 to 975	9.6	9.1	9.8	9.8	10.2	10.5	11.0	10.9	11.3	10.8	13.4	12.7
975 to 960	9.0	8.5	9.5	9.7	9.6	9.8	10.0	10.2	10.3	10.2	10.1	11.7
960 to 945	8.8	9.1	9.1		10.4	9.9	10.2	9.6	10.2	9.9	9.7	10.4
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 946.5 ft

Jocassee F_2_554.8: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.7	9.7	11.8	16.1	20.7	24.9	26.8	26.7	25.1	21.3	17.5	14.0
1095 to 1080	10.5	9.8	11.5	14.8	17.7	22.2	24.8	26.4	25.1	21.4	17.2	13.5
1080 to 1065	10.4	9.6	10.6	13.3	16.4	20.4	23.6	25.5	24.9	21.4	17.2	13.7
1065 to 1050	10.5	9.6	10.2	12.3	15.2	19.2	22.5	24.5	24.6	21.4	17.3	13.6
1050 to 1035	10.4	9.4	10.0	11.4	13.8	17.2	20.9	23.3	23.4	21.1	17.1	13.5
1035 to 1020	10.3	9.5	9.8	11.0	12.6	15.2	18.4	21.1	22.1	20.3	16.8	13.6
1020 to 1005	10.4	9.4	9.6	10.3	11.3	12.9	14.6	16.3	18.0	18.5	16.4	13.4
1005 to 990	10.2	9.3	9.4	9.9	10.3	10.9	11.5	12.1	12.4	13.0	14.7	12.8
990 to 975	9.8	9.1	9.4	9.7	9.8	10.0	10.2	10.3	10.3	10.4	11.6	11.6
975 to 960	9.4	8.9	9.2	9.5	9.5	9.7	9.7	9.8	9.8	9.9	10.1	10.7
960 to 945	9.4	8.7	9.0	9.4	9.2	9.5	9.6	9.6	9.7	9.6	9.8	10.0
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 945.3 ft

Legend	8									25

Jocassee F_2_556.0: Monthly Average Water Temperatures (deg C) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.4	8.6	11.1	15.5	20.0	24.6	26.5	26.0	24.9	21.5	18.0	13.0
1095 to 1080	10.2	8.7	10.5	14.3	17.6	21.8	24.1	24.8	24.9	21.4	17.5	12.9
1080 to 1065	10.2	8.3	9.6	12.5	15.0	19.1	22.2	23.4	24.5	21.4	17.3	13.0
1065 to 1050	10.0	8.5	9.3	11.6	13.8	17.1	20.4	22.5	23.8	21.2	17.3	12.9
1050 to 1035	10.0	8.2	8.6	10.5	12.5	15.4	18.7	20.7	22.4	20.7	17.3	13.1
1035 to 1020	10.1	8.3	8.5	10.2	11.6	13.4	15.7	18.6	19.7	18.5	16.3	12.8
1020 to 1005	9.9	8.2	8.3	9.6	10.5	11.2	13.6	14.1	15.2	15.3	14.4	12.1
1005 to 990	9.9	8.0	8.2	9.5	10.1	10.2	10.3	10.8	11.7	12.4	12.8	11.4
990 to 975	9.7	7.9	8.1	9.2	9.5	9.6	9.7	9.8	9.7	9.5	11.0	10.7
975 to 960	9.4	8.4	9.2	9.6	9.9	8.9	9.5	9.5	9.8	10.2	9.7	10.4
960 to 945	9.1	8.8	9.2	9.5	9.7	9.8	9.9	10.0	9.9	9.8	9.8	10.1
945 to 930	9.0	8.5	9.2	9.4	9.5	9.5	9.9	9.8	9.7	9.6	9.8	9.8
930 to 915	8.6	8.8	9.4	9.3	9.3	10.3	9.7	9.9	9.8	9.4	9.2	10.3
915 to 900					8.9							
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 914.1 ft

Jocassee F_2_556.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.8	9.8	11.7	16.0	20.8	24.7	26.6	26.6	25.0	21.4	17.5	14.0
1095 to 1080	10.6	9.8	11.4	14.8	17.7	22.1	24.8	26.3	25.0	21.4	17.2	13.5
1080 to 1065	10.5	9.7	10.6	13.4	16.4	20.5	23.6	25.5	24.9	21.4	17.2	13.8
1065 to 1050	10.6	9.6	10.3	12.3	15.1	19.2	22.5	24.5	24.6	21.4	17.3	13.7
1050 to 1035	10.5	9.5	10.0	11.4	13.8	17.1	20.8	23.3	23.5	21.2	17.2	13.6
1035 to 1020	10.4	9.5	9.8	11.1	12.6	15.1	18.5	21.0	22.1	20.4	16.9	13.7
1020 to 1005	10.5	9.4	9.6	10.4	11.3	12.9	14.7	16.4	18.0	18.7	16.3	13.4
1005 to 990	10.3	9.3	9.4	9.9	10.2	11.0	11.6	12.1	12.4	13.2	14.7	12.7
990 to 975	9.9	9.1	9.4	9.7	9.8	10.0	10.2	10.3	10.3	10.5	11.3	11.6
975 to 960	9.5	9.0	9.3	9.5	9.5	9.7	9.7	9.8	9.8	9.8	10.0	10.7
960 to 945	9.5	8.9	9.1	9.4	9.3	9.5	9.5	9.5	9.6	9.6	9.6	10.0
945 to 930	9.2	8.7	9.1	9.2	9.2	9.3	9.3	9.4	9.3	9.4	9.5	9.5
930 to 915	9.3	8.4	8.9	9.0	9.1	9.1	9.4	9.3	9.3	9.3	9.3	9.4
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.4 ft

Lake Jocassee

Dissolved Oxygen

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.6	9.2	10.1	10.1	9.0	8.3	8.5	8.3	7.6	8.2	8.6	9.2
1095 to 1080	9.5	8.8	10.1	10.2	9.5	9.1	8.4	8.1	7.6	8.2	8.7	9.1
1080 to 1065	9.5	8.7	9.8	10.1	9.5	9.1	8.2	8.0	7.6	8.1	8.8	9.0
1065 to 1050	9.4	8.8	9.7	9.9	9.4	9.1	8.1	7.7	7.6	8.1	8.7	9.0
1050 to 1035	9.4	8.8	9.4	9.7	9.4	9.2	8.3	7.6	7.3	8.0	8.6	9.0
1035 to 1020	9.4	8.8	9.3	9.6	9.2	9.1	8.1	7.3	6.5	7.9	8.7	9.0
1020 to 1005	9.3	8.7	9.2	9.6	9.1	8.8	7.7	6.7	5.5	7.2	8.6	8.9
1005 to 990	9.4	8.6	9.1	9.5	9.0	8.4	7.6	6.9	6.2	5.5	7.4	8.8
990 to 975	9.4	8.6	9.0	9.2	8.8	8.2	7.6	7.0	6.4	6.3	5.2	7.6
975 to 960	8.9	8.4	8.7	8.9	8.3	7.8	7.2	6.8	6.1	6.1	5.4	5.1
960 to 945	6.2	8.6	8.6	8.7	8.0	7.4	6.8	6.3	5.7	5.4	4.9	3.5
945 to 930	3.5	8.1	8.5	8.6	7.6	7.1	6.4	5.9	5.2	5.1	4.7	3.3
930 to 915	4.0	7.7	8.3	7.9	6.9	6.4	6.0	5.5	4.8	4.7	4.2	3.0
915 to 900	2.8	6.2	7.9	7.4	6.4	5.7	5.2	4.9	4.5	4.2	3.7	2.9
900 to 885	1.4	6.1	7.1	6.8	5.9	5.5	4.8	4.4	3.9	3.5	3.3	2.3
885 to 870	0.5	6.7	6.3	6.4	5.3	4.9	4.1	4.0	3.2	2.9	2.7	1.7
870 to 855	0.3	7.0	6.7	5.9	4.9	4.5	4.0	3.1	2.4	2.3	2.6	1.3
< 855	0.3	4.6	7.5	5.6	4.0	3.8	3.1	2.5	1.6	1.4	1.7	0.9

Jocassee B_2_558.7: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.3	9.3	10.0	9.9	9.0	8.4	8.2	7.9	7.7	7.8	8.3	8.8
1095 to 1080	9.2	9.2	9.9	9.9	9.3	8.8	8.3	7.8	7.6	7.9	8.4	8.7
1080 to 1065	9.1	9.1	9.9	9.7	9.2	8.8	8.2	7.7	7.5	7.8	8.3	8.7
1065 to 1050	9.1	9.0	9.8	9.6	9.2	8.7	8.2	7.6	7.4	7.8	8.3	8.7
1050 to 1035	9.1	8.9	9.5	9.5	9.1	8.7	8.1	7.2	6.8	7.7	8.2	8.7
1035 to 1020	9.0	8.9	9.3	9.5	9.0	8.6	7.9	6.9	6.3	7.4	8.2	8.6
1020 to 1005	9.0	8.8	9.2	9.3	9.0	8.6	8.0	7.0	6.0	6.3	7.8	8.6
1005 to 990	9.0	8.7	9.2	9.1	8.8	8.4	8.0	7.3	6.7	6.2	6.6	8.1
990 to 975	8.3	8.6	8.9	8.8	8.4	8.0	7.6	7.1	6.8	6.3	5.9	6.0
975 to 960	6.8	8.4	8.5	8.4	7.9	7.5	7.1	6.8	6.5	6.0	5.7	4.9
960 to 945	5.7	7.6	7.8	7.9	7.3	7.0	6.7	6.4	6.1	5.6	5.3	4.7
945 to 930	4.6	7.3	7.3	7.2	6.9	6.5	6.2	5.9	5.7	5.1	4.9	4.3
930 to 915	4.0	6.7	6.9	6.5	6.4	6.0	5.6	5.3	5.2	4.8	4.7	3.9
915 to 900	3.3	6.1	6.6	6.3	6.1	5.6	5.4	5.1	5.1	4.4	4.2	3.6
900 to 885	3.0	5.7	6.3	5.9	6.1	5.2	5.0	4.9	4.6	3.9	3.8	3.6
885 to 870	3.0	5.7	6.2	5.6	5.5	5.3	4.9	4.2	4.2	3.7	3.7	2.9
870 to 855	2.5	6.0	6.1	5.6	5.6	4.9	4.4	4.1	4.0	3.4	3.2	2.7
< 855	2.6	6.0	6.1	5.2	5.2	4.7	4.2	3.8	3.4	3.0	2.7	2.5

Jocassee B_3_558.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.9	9.4	10.1	9.9	9.2	8.3	8.6	8.0	7.3	8.1	8.6	9.1
1095 to 1080	9.8	9.4	9.8	10.2	9.3	8.5	8.4	7.8	7.4	8.1	8.4	9.1
1080 to 1065	9.8	9.3	9.6	10.4	9.2	8.8	8.1	7.8	7.4	8.1	8.3	9.1
1065 to 1050	9.8	9.2	9.5	10.1	9.1	8.8	8.3	7.7	7.3	8.2	8.4	9.1
1050 to 1035	9.8	9.0	9.5	9.5	9.1	8.8	8.3	7.7	7.2	8.1	8.4	9.1
1035 to 1020	9.8	9.0	9.6	9.5	9.1	8.7	8.1	7.3	6.6	8.1	8.3	9.0
1020 to 1005	9.8	9.0	9.5	9.5	9.0	8.6	8.0	7.1	5.6	7.3	8.2	9.0
1005 to 990	9.7	8.9	9.3	9.5	8.9	8.4	7.9	7.2	6.3	6.4	7.7	8.9
990 to 975	9.7	9.0	9.1	9.3	8.8	8.1	7.9	7.2	6.6	6.8	6.1	8.0
975 to 960	9.5	9.1	8.9	9.0	8.6	7.8	7.4	7.2	6.5	6.8	5.8	6.7
960 to 945	9.2	8.9	8.6	8.4	8.0	7.3	6.9	6.6	6.2	6.2	5.5	5.4
945 to 930	8.7	8.5	8.2	8.0	7.1	6.5	6.2	5.8	5.5	5.5	4.7	4.0
930 to 915	7.4	7.6	7.1	6.5	6.1	5.7	5.2	4.8	4.6	4.6	3.9	3.1
915 to 900	4.5	6.4	6.0	5.6	4.9	4.5	4.2	4.0	3.6	3.7	3.2	2.4
900 to 885	2.2	5.7	5.0	4.7	4.0	3.7	3.5	3.2	2.9	2.9	2.6	1.9
885 to 870	0.6	4.3	4.0	3.3	3.3	2.8	2.9	2.4	2.2	2.3	1.8	1.5
870 to 855	0.0	2.6	2.5	2.7	2.6	2.3	2.3	2.1	1.6	1.8	1.2	1.0
< 855	0.0	0.4	1.3	1.8	1.9	1.6	1.5	0.8	0.5	0.4	0.2	0.1

Jocassee B_3_558.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2020 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.5	9.3	9.9	9.9	9.0	8.4	8.0	7.8	7.7	7.7	8.3	8.8
1095 to 1080	9.3	9.2	9.8	9.8	9.1	8.5	8.0	7.7	7.6	7.9	8.4	8.8
1080 to 1065	9.1	9.1	9.7	9.6	9.1	8.6	8.1	7.7	7.5	7.8	8.3	8.8
1065 to 1050	9.1	9.1	9.7	9.5	9.1	8.6	8.1	7.5	7.4	7.8	8.3	8.8
1050 to 1035	9.2	9.1	9.5	9.4	9.1	8.6	8.0	7.3	7.1	7.7	8.3	8.7
1035 to 1020	9.1	9.0	9.3	9.3	9.1	8.6	7.9	7.0	6.6	7.5	8.2	8.7
1020 to 1005	9.1	8.9	9.2	9.2	9.0	8.6	8.0	7.1	6.3	6.8	7.9	8.6
1005 to 990	8.9	8.8	9.1	9.0	8.8	8.5	8.0	7.5	6.9	6.5	7.0	8.1
990 to 975	8.6	8.6	8.8	8.7	8.4	8.1	7.8	7.4	7.1	6.6	6.2	6.7
975 to 960	7.0	8.2	8.5	8.3	8.0	7.7	7.2	7.0	6.7	6.3	6.0	5.6
960 to 945	6.2	7.2	7.8	7.8	7.5	7.1	6.8	6.5	6.3	5.8	5.7	5.3
945 to 930	4.9	6.5	7.2	7.4	7.0	6.7	6.4	6.0	5.9	5.2	5.2	4.9
930 to 915	4.1	5.9	6.5	6.7	6.5	6.2	5.7	5.5	5.3	5.0	4.9	4.4
915 to 900	3.7	5.4	6.0	6.5	6.2	5.8	5.5	5.3	5.1	4.6	4.4	4.1
900 to 885	3.4	5.0	5.8	6.2	6.1	5.4	5.3	5.2	4.9	4.4	4.3	4.2
885 to 870	3.4	5.3	5.6	5.9	5.6	5.7	5.2	4.6	4.7	4.3	4.4	3.7
870 to 855	3.3	5.4	5.6	6.0	5.7	5.2	4.8	4.6	4.5	4.1	3.9	3.6
< 855	2.9	5.7	5.7	5.6	5.4	5.0	4.6	4.2	4.0	3.3	3.2	3.1

Jocassee C_2_559.0: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	9.8	9.7	10.0	9.0	8.4	8.5	8.1	7.7	8.2	8.4	9.1
1095 to 1080	9.7	9.2	10.0	10.2	9.5	9.1	8.5	8.1	7.8	8.1	8.5	9.0
1080 to 1065	9.6	9.0	9.9	10.1	9.5	9.0	8.3	7.9	7.7	8.0	8.5	9.0
1065 to 1050	9.5	9.1	9.8	9.8	9.4	9.0	8.3	7.6	7.6	8.0	8.4	8.9
1050 to 1035	9.5	9.1	9.6	9.7	9.3	9.1	8.4	7.4	7.3	8.0	8.5	9.0
1035 to 1020	9.4	8.8	9.3	9.6	9.3	9.1	8.0	7.2	6.6	7.9	8.4	9.0
1020 to 1005	9.4	8.8	9.2	9.6	9.1	8.7	7.8	6.6	5.6	7.2	8.4	8.9
1005 to 990	9.3	8.7	8.9	9.5	9.0	8.5	7.7	6.8	6.3	5.5	6.6	8.5
990 to 975	9.3	8.7	8.8	9.1	8.7	8.2	7.5	6.8	6.4	6.2	5.4	7.2
975 to 960	8.3	8.5	8.5	8.7	8.2	7.7	6.9	6.3	5.9	5.8	5.1	5.0
960 to 945	5.0	8.1	8.5	8.4	7.8	7.1	6.3	5.8	5.4	5.2	4.7	4.4
945 to 930	4.1	7.7	8.0	7.9	7.3	6.5	5.7	5.3	4.8	4.7	4.1	3.7
930 to 915	3.0	6.7	7.0	7.0	6.5	5.9	5.2	4.7	4.2	3.9	3.5	3.2
915 to 900	2.4	3.7	6.3	6.5	5.8	5.0	4.4	3.8	3.7	3.5	2.9	2.4
900 to 885	1.5	3.2	5.5	5.8	5.4	4.6	3.9	3.3	3.0	2.5	2.2	1.6
885 to 870	0.8	2.6	4.6	5.1	3.7	4.0	3.2	2.9	2.4	1.7	1.3	0.9
870 to 855	0.7	3.3	4.9	4.5	3.8	3.6	3.0	2.1	1.7	1.0	1.0	0.7
< 855	0.4	4.1	4.3	4.1	3.7	3.2	2.5	2.2	1.7	0.8	0.7	0.5

Jocassee C_2_559.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.3	9.3	10.0	9.9	9.0	8.3	8.1	7.9	7.9	7.7	8.2	8.7
1095 to 1080	9.2	9.2	10.0	10.0	9.2	8.8	8.3	7.8	7.7	7.8	8.3	8.7
1080 to 1065	9.1	9.1	9.9	9.8	9.3	8.8	8.3	7.7	7.6	7.8	8.3	8.7
1065 to 1050	9.1	9.1	9.8	9.7	9.2	8.8	8.2	7.6	7.4	7.7	8.3	8.7
1050 to 1035	9.1	9.0	9.6	9.5	9.1	8.8	8.1	7.2	6.9	7.7	8.2	8.6
1035 to 1020	9.0	9.0	9.4	9.4	9.0	8.7	7.9	6.9	6.3	7.4	8.2	8.6
1020 to 1005	9.0	8.9	9.2	9.3	9.0	8.6	8.0	7.1	6.1	6.2	7.7	8.5
1005 to 990	8.9	8.8	9.1	9.0	8.7	8.4	8.0	7.3	6.7	6.0	6.6	7.8
990 to 975	8.4	8.6	8.7	8.7	8.3	7.9	7.4	6.9	6.5	6.0	5.6	5.9
975 to 960	6.5	8.0	8.4	8.1	7.7	7.2	6.7	6.3	5.9	5.4	5.1	4.7
960 to 945	5.0	7.3	7.5	7.5	7.0	6.6	6.0	5.7	5.4	4.8	4.6	4.3
945 to 930	3.9	6.2	6.9	6.8	6.6	6.0	5.5	5.1	4.9	4.3	4.1	3.7
930 to 915	3.2	5.4	6.2	5.9	5.9	5.4	4.8	4.5	4.4	3.8	3.7	3.2
915 to 900	2.6	5.1	5.7	5.6	5.6	5.0	4.5	4.3	4.1	3.4	3.2	2.9
900 to 885	2.2	4.3	5.4	5.1	5.5	4.5	4.2	4.1	3.8	3.0	2.9	2.8
885 to 870	2.5	4.6	5.4	4.8	5.0	4.7	4.2	3.6	3.5	3.0	2.9	2.2
870 to 855	2.1	5.1	5.5	4.8	5.0	4.3	3.9	3.7	3.5	2.7	2.5	2.1
< 855	2.3	5.2	5.3	4.6	4.7	4.3	3.9	3.6	3.4	2.6	2.4	2.2

Jocassee C_2_560.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.5	9.7	10.3	10.6	9.7	8.8	8.7	8.4	8.3	8.3	8.6	9.0
1095 to 1080	9.5	9.5	10.1	10.6	10.1	9.3	9.6	8.6	8.3	8.2	8.5	9.0
1080 to 1065	9.4	9.3	10.0	10.5	9.9	9.9	9.8	8.6	8.2	8.1	8.6	9.0
1065 to 1050	9.3	9.2	9.8	10.2	9.7	9.6	9.6	8.3	7.6	8.0	8.5	9.0
1050 to 1035	9.3	9.0	9.5	9.8	9.6	9.4	9.2	8.1	7.2	7.7	8.7	9.0
1035 to 1020	9.3	8.9	9.4	9.4	9.1	9.0	8.7	7.6	7.0	7.1	8.5	9.0
1020 to 1005	9.2	8.8	9.1	9.2	8.6	8.3	8.1	7.2	6.5	6.5	7.2	8.6
1005 to 990	9.1	8.8	8.9	9.0	8.4	7.7	7.6	6.7	6.2	5.3	6.2	7.4
990 to 975	8.3	8.8	8.4	8.9	7.8	7.4	7.2	6.3	6.2	5.7	5.1	6.3
975 to 960	7.8	8.1	8.4	8.4	7.6	7.8	7.1	6.6	5.7	5.5	5.3	5.2
960 to 945	6.8	8.2	8.2	8.3	7.9	7.2	6.7	6.0	5.9	5.4	5.3	4.6
945 to 930	5.3	7.2	8.3	7.8	7.2	6.8	6.1	5.6	5.6	5.1	5.0	4.0
930 to 915	4.4	6.6	8.2	6.9	7.0	6.2	5.7	5.1	5.0	4.2	4.3	3.6
915 to 900	1.8	5.7	7.4	6.6	6.0	5.7	4.6	4.2	4.4	3.7	4.0	3.3
900 to 885	1.6	4.6	6.7	6.0	6.1	5.1	4.6	3.6	3.6	2.5	3.0	2.7
885 to 870	1.1	3.8	5.5	4.9	4.8	4.5	3.9	3.2	3.2	1.9	2.4	1.9
870 to 855	1.4	5.3	5.4	4.3	4.4	3.9	3.6	2.8	2.1	1.2	1.7	1.4
< 855	0.9	5.2	5.1	4.0	5.6	3.5	3.4	2.4	2.5	0.7	1.2	1.4

Jocassee C_2_560.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.3	10.0	9.9	9.0	8.3	8.1	7.9	7.7	7.6	8.1	8.7
1095 to 1080	9.0	9.2	9.9	9.9	9.1	8.5	8.1	7.7	7.5	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.9	9.8	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.7	9.7	9.2	8.7	8.2	7.6	7.2	7.6	8.1	8.6
1050 to 1035	8.9	9.0	9.6	9.5	9.1	8.7	8.1	7.2	6.8	7.5	8.1	8.5
1035 to 1020	8.8	8.9	9.4	9.4	9.0	8.5	7.9	6.9	6.3	7.2	8.0	8.5
1020 to 1005	8.8	8.7	9.3	9.3	8.9	8.5	7.9	7.0	6.1	6.1	7.6	8.4
1005 to 990	8.8	8.7	9.1	9.0	8.7	8.3	7.9	7.2	6.5	5.8	6.1	7.5
990 to 975	8.0	8.6	8.8	8.6	8.2	7.7	7.2	6.7	6.3	5.8	5.4	5.5
975 to 960	6.7	8.1	8.4	8.1	7.6	6.9	6.4	5.9	5.5	5.0	4.6	4.2
960 to 945	4.8	7.2	7.7	7.4	7.0	6.1	5.7	5.3	5.0	4.4	4.1	3.6
945 to 930	3.6	6.2	7.1	6.6	6.4	5.5	5.3	4.8	4.7	4.0	3.8	3.0
930 to 915	2.8	5.6	6.2	5.7	5.9	5.1	4.7	4.2	4.1	3.7	3.5	2.6
915 to 900	2.2	5.1	5.4	5.4	5.6	4.7	4.5	4.0	3.9	3.3	3.0	2.4
900 to 885	2.0	4.5	5.1	5.0	5.5	4.3	4.2	3.8	3.5	2.8	2.8	2.7
885 to 870	2.4	4.6	4.6	4.6	4.8	4.4	4.2	3.3	3.4	2.8	2.8	1.9
870 to 855	1.8	4.9	5.1	4.6	4.1	3.9	3.6	3.2	3.0	2.1	2.0	1.9
< 855	2.2	4.8	5.3	4.2	4.3	4.1	4.0	3.7	2.8	2.5	2.5	1.7

Jocassee C_2_562.0: Monthly Averaged Dissolved Oxygen (mg/l) 1980 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.9	10.4	10.1	10.6	9.7	8.3	8.8	8.5	7.9	8.3	8.2	9.2
1095 to 1080	9.7	9.9	10.0	10.4	9.5	8.6	8.9	8.8	8.1	8.1	8.5	9.1
1080 to 1065	9.6	9.7	9.9	10.4	9.5	8.7	8.4	8.2	7.9	8.0	8.5	9.1
1065 to 1050	9.7	9.7	9.9	10.3	9.5	8.5	8.1	7.9	7.6	7.9	8.3	9.0
1050 to 1035	9.6	9.7	9.9	10.1	9.3	8.2	7.8	7.3	7.4	7.9	8.4	9.0
1035 to 1020	9.7	9.6	9.7	9.7	9.0	7.7	7.0	5.7	6.7	7.5	8.4	9.0
1020 to 1005	9.7	9.6	9.5	9.3	8.1	6.5	5.6	3.1	2.6	5.9	8.3	9.0
1005 to 990	10.1	9.8	9.4	8.1	7.1	4.8	2.5	0.3	0.1	1.4	5.6	9.1
990 to 975	10.4	10.0	9.7	7.6	4.8		1.0	0.6	0.0	0.3	0.0	
975 to 960									0.0			
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 964.5 ft

Jocassee C_2_562.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.4	9.7	10.1	10.0	9.1	8.6	8.5	8.1	7.9	7.8	8.3	8.8
1095 to 1080	9.3	9.6	10.1	10.1	9.1	8.6	8.6	8.1	7.7	7.8	8.4	8.7
1080 to 1065	9.2	9.6	10.0	9.9	9.1	8.3	8.1	7.9	7.5	7.8	8.3	8.7
1065 to 1050	9.2	9.5	10.0	9.8	9.0	8.1	7.8	7.7	7.4	7.8	8.2	8.7
1050 to 1035	9.2	9.4	9.8	9.6	8.8	7.9	7.2	6.9	7.1	7.7	8.2	8.7
1035 to 1020	9.2	9.4	9.5	9.4	8.5	7.3	6.2	5.4	5.6	7.3	8.0	8.7
1020 to 1005	9.3	9.4	9.3	8.6	7.6	6.4	4.8	3.5	2.7	5.6	7.9	8.6
1005 to 990	9.2	9.4	8.7	7.5	6.2	4.2	2.5	0.9	0.3	0.9	5.9	7.7
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 992.2 ft

Legend	0.0										10.0

Jocassee C_2_565.4: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.8	10.1	10.0	10.1	9.4	8.2	8.5	8.2	7.9	8.0	7.9	9.5
1095 to 1080	9.8	9.3	10.0	10.3	9.8	9.3	8.9	8.4	7.8	7.9	8.4	9.1
1080 to 1065	9.6	9.1	9.8	10.3	9.9	9.6	9.0	8.2	7.6	7.9	8.5	9.1
1065 to 1050	9.6	9.1	9.6	10.1	9.9	9.2	9.0	7.9	7.4	7.8	8.3	9.1
1050 to 1035	9.5	9.0	9.3	9.9	9.7	8.9	8.6	7.7	7.2	7.9	8.4	9.0
1035 to 1020	9.6	8.8	9.1	9.8	9.2	8.1	7.7	6.9	6.4	7.8	8.3	9.0
1020 to 1005	9.7	8.8	9.0	9.7	8.7	7.7	6.7	5.4	4.5	6.9	8.3	9.0
1005 to 990	9.7	8.8	9.0	9.5	8.5	7.1	6.0	4.8	3.8	3.1	6.7	8.9
990 to 975	9.8	9.1	8.7	9.0	8.0	6.5	5.6	4.2	3.6	3.3	1.7	5.8
975 to 960	9.9	9.1	8.6	8.3	7.3	5.7	4.6	3.3	2.4	1.2	0.3	2.1
960 to 945	10.1	9.4	8.6	8.0	6.6	5.0	3.6	2.2	0.9	0.2	0.1	0.4
945 to 930	10.4	9.4	8.6	7.8	6.1	4.6	3.7	1.8	0.4	0.0	0.0	0.1
930 to 915			8.1		5.5	3.8		0.9	0.2			
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.1 ft

Jocassee C_2_565.4: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	8.9	9.4	9.7	10.2	9.1	8.3	8.9	7.9	8.0	7.8	8.2	8.9
1095 to 1080	8.8	9.3	9.8	10.3	9.7	8.7	9.3	7.9	7.7	7.9	8.5	8.8
1080 to 1065	8.8	9.2	9.6	9.9	9.6	8.7	9.4	7.7	7.5	7.9	8.4	8.8
1065 to 1050	8.8	9.0	9.5	9.6	9.3	8.5	9.0	7.6	7.1	7.8	8.3	8.7
1050 to 1035	8.7	9.1	9.4	9.6	9.0	8.2	8.6	7.0	6.4	7.6	8.4	8.8
1035 to 1020	8.7	9.0	9.2	9.5	8.8	7.7	7.8	6.6	5.8	6.8	7.7	8.8
1020 to 1005	8.7	8.9	9.1	9.2	8.7	7.6	7.8	6.2	5.5	5.8	7.1	8.6
1005 to 990	8.7	8.8	9.0	8.9	8.3	7.2	7.5	5.8	5.0	4.2	5.0	6.4
990 to 975	8.7	9.0	8.9	8.6	7.6	6.3	6.2	4.4	3.7	3.0	3.1	4.6
975 to 960	8.8	9.0	8.9	8.2	6.9	5.6	5.4	3.7	2.8	2.3	1.9	1.8
960 to 945	8.4	9.1	8.9	7.8	6.5	5.0	4.8	3.0	2.2	1.8	1.4	1.4
945 to 930	5.8	9.4	8.9	7.0	5.9	3.8	4.1	2.5	1.8	1.5	1.1	1.1
930 to 915	8.9				5.2		0.9	0.1	1.1		1.7	
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 926.6 ft

Legend	0.0										10.0

Jocassee D_2_551.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	12.1	12.1	11.0	10.4	8.9	8.6	8.4	8.5	8.8	9.4	10.2	11.3
1095 to 1080	11.5	11.2	10.9	9.8	9.8	8.7	8.1	8.1	8.6	10.1	10.6	11.4
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1082.8 ft

Jocassee D_2_551.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	13.3	11.4	10.5	8.9	8.9	8.2	8.3	8.7	8.9	10.7	8.4	10.8
1095 to 1080		11.7						7.7			7.8	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1083.7 ft

Legend	0.0										10.0

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	10.0	10.4	10.5	9.9	8.7	8.6	7.8	8.4	8.3	8.6	9.0
1095 to 1080	9.6	9.6	10.1	10.6	10.1	9.3	9.0	8.1	8.3	8.2	8.6	9.0
1080 to 1065	9.5	9.5	10.0	10.5	10.3	9.8	9.2	7.6	8.3	8.1	8.6	9.0
1065 to 1050	9.5	9.4	9.9	10.3	10.0	9.4	9.0	7.4	7.8	8.1	8.5	9.0
1050 to 1035	9.4	9.3	9.9	10.2	9.4	9.0	8.6	7.1	7.1	8.0	8.7	9.0
1035 to 1020	9.5	9.1	9.6	10.0	8.9	8.5	7.6	6.1	6.2	7.4	8.2	9.1
1020 to 1005	9.5	9.2	9.5	9.6	8.2	7.6	6.7	4.6	4.0	4.8	7.1	8.9
1005 to 990	9.5	9.3	9.4	9.2	7.9	7.3	6.1	3.1	3.3	2.6	4.8	7.5
990 to 975	9.5	9.4	9.2	8.9	7.7	7.3	6.8	3.1	3.5	2.3	2.7	5.6
975 to 960	9.6	9.3	8.6	8.6	7.9	6.6	6.0	3.8	4.1	3.9	3.0	4.3
960 to 945	8.8	9.2	8.7	8.3	7.8	7.0	6.3	4.1	4.9	3.7	3.5	3.4
945 to 930	6.7	9.4	8.5	8.0	7.2	6.2	5.7	3.7	4.2	3.0	2.4	2.2
930 to 915	5.5	8.0	8.3	7.0	6.4	4.9	4.6	2.9	2.9	2.1	1.8	1.5
915 to 900	4.7	5.7	7.4	6.6	5.6	3.8	3.3	2.1	2.1	1.6	1.5	1.1
900 to 885	4.0	4.9	7.4	5.9	5.2	3.2	2.5	1.2	1.5	0.9	1.1	0.6
885 to 870	3.3	4.3	6.1	4.0	3.8	3.1	2.3	0.8	0.7	0.4	0.6	0.7
870 to 855	0.0		7.9	7.2	4.6	1.5	1.7	2.2	0.0	0.0	0.0	0.7
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.1	9.3	9.9	9.8	9.0	8.2	8.2	7.9	7.7	7.6	8.1	8.8
1095 to 1080	8.9	9.2	9.8	9.8	9.1	8.5	8.1	7.7	7.4	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.7	9.6	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.6	9.5	9.1	8.7	8.2	7.6	7.1	7.5	8.1	8.6
1050 to 1035	8.8	9.0	9.5	9.4	9.0	8.6	8.1	7.3	6.9	7.5	8.1	8.6
1035 to 1020	8.8	8.9	9.3	9.3	9.0	8.5	7.8	7.0	6.4	7.3	8.0	8.6
1020 to 1005	8.8	8.8	9.1	9.1	8.9	8.4	7.8	6.9	5.9	6.4	7.6	8.4
1005 to 990	8.8	8.8	8.9	8.8	8.6	8.1	7.6	6.7	5.8	5.3	6.1	7.6
990 to 975	8.3	8.7	8.7	8.4	8.1	7.6	6.8	6.1	5.4	5.0	4.6	5.5
975 to 960	6.8	8.2	8.3	7.9	7.5	6.7	6.0	5.4	4.7	4.1	3.8	3.7
960 to 945	5.7	7.6	7.8	7.3	6.8	5.8	5.3	4.9	4.1	3.3	3.0	2.9
945 to 930	3.6	6.8	7.2	6.5	6.3	5.1	4.8	4.2	3.6	2.7	2.3	2.1
930 to 915	2.7	6.0	6.4	5.3	5.6	4.5	4.0	3.5	2.8	2.3	1.9	1.8
915 to 900	2.1	5.7	5.3	5.0	5.4	4.0	3.9	3.1	2.7	1.9	1.6	1.7
900 to 885	1.7	5.3	4.8	4.1	3.7	2.8	3.4	2.6	2.1	1.5	1.2	1.9
885 to 870	2.3	3.9	3.3	4.4	2.9	2.7	3.0	2.2	2.0	2.2	1.0	1.4
870 to 855	0.1	4.3	3.1	5.2		0.0	0.4	2.8		2.3	0.0	
< 855	*Minimum Reading 864.4 ft*											

Legend	0.0										10.0

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.0	10.6	9.8	10.2	9.3	8.7	8.6	5.4	7.9	8.2	8.3	9.2
1095 to 1080	9.8	9.5	10.0	10.2	9.5	8.9	8.7	6.3	7.7	8.0	8.5	9.2
1080 to 1065	10.0	9.7	10.0	10.1	9.5	9.0	8.6	5.9	7.6	8.1	8.6	9.2
1065 to 1050	10.6	10.6	10.2	10.3	9.4	8.5	8.2	5.5	7.5	8.0	8.7	9.7
1050 to 1035	10.7	10.4	10.1	10.3	9.2	7.7	6.8	4.7	7.0	7.8	8.6	9.8
1035 to 1020	10.7	10.2	10.0	9.8	8.7	6.2	5.3	2.7	4.6	7.7	8.5	9.9
1020 to 1005	10.6	10.4	9.8	9.1	7.7	5.1	3.8	2.2	1.0	6.2	8.4	9.8
1005 to 990	10.6	10.2	9.3	8.0	5.8	2.9	1.5	0.9	0.1	1.7	8.1	9.7
990 to 975	10.6	10.0	9.0	7.3	4.1	2.1	0.3	0.3	0.0	0.0	5.4	9.7
975 to 960	10.5	9.9	9.5	8.7	2.8	1.5	0.0	0.4	0.0	0.0	1.9	10.1
960 to 945					2.7							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870	*Minimum Reading 959.9 ft*											
870 to 855												
< 855												

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.5	9.7	9.7	8.9	8.3	8.2	7.8	7.3	7.5	8.1	8.8
1095 to 1080	9.0	9.4	9.7	9.7	9.0	8.4	8.1	7.6	7.2	7.5	8.1	8.6
1080 to 1065	9.1	9.3	9.6	9.6	9.0	8.5	8.2	7.6	7.2	7.5	8.1	8.6
1065 to 1050	9.1	9.4	9.6	9.6	9.0	8.5	8.3	7.6	7.1	7.5	8.1	8.7
1050 to 1035	9.1	9.4	9.6	9.5	9.0	8.6	8.2	7.5	7.1	7.4	8.1	8.6
1035 to 1020	9.2	9.4	9.6	9.5	9.0	8.6	8.1	7.6	7.1	7.4	8.1	8.7
1020 to 1005	9.1	9.3	9.6	9.4	8.9	8.6	8.1	7.6	7.1	7.4	8.0	8.7
1005 to 990	9.2	9.4	9.6	9.4	8.9	8.6	8.4	7.6	7.1	7.4	8.1	8.7
990 to 975	9.1	9.5	9.6	9.4	8.7	8.6	8.1	7.6	6.9	7.4	8.2	8.7
975 to 960	9.3	9.4	9.8	9.5	8.8	8.3	8.4	7.1	6.8	7.5	8.2	8.9
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870	*Minimum Reading 963 ft*											
870 to 855												
< 855												

Legend	0.0										10.0

Jocassee E_2_557.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.8	9.9	10.6	10.4	9.7	8.8	8.7	8.5	8.3	8.2	8.7	9.1
1095 to 1080	9.8	9.8	10.3	10.4	10.1	9.3	9.4	8.6	8.4	8.1	8.7	9.1
1080 to 1065	9.7	9.5	10.1	10.3	10.0	9.9	9.6	8.5	8.1	8.1	8.6	9.1
1065 to 1050	9.6	9.4	9.9	10.1	9.8	9.4	9.4	7.9	7.3	7.9	8.6	9.1
1050 to 1035	9.6	9.3	9.6	9.7	9.5	9.3	8.6	7.5	6.3	7.5	8.7	9.1
1035 to 1020	9.7	9.3	9.5	9.3	8.8	8.8	7.9	6.8	5.9	6.7	8.4	9.1
1020 to 1005	9.6	9.3	9.3	9.2	8.3	8.2	7.3	6.3	5.1	5.8	6.8	8.5
1005 to 990	9.6	9.3	9.2	9.0	8.2	7.7	6.8	5.9	4.9	3.9	5.3	6.8
990 to 975	9.2	9.4	8.9	9.0	7.8	7.3	6.4	5.1	4.7	3.8	3.2	6.4
975 to 960	9.2	9.3	9.2	8.6	7.5	7.5	6.2	5.0	4.2	3.4	3.0	3.8
960 to 945	9.0	9.5	9.1	8.9	7.9	7.0	5.7	4.4	3.6	2.8	2.4	2.6
945 to 930	7.9	8.8	9.5	8.7	7.7	6.6	5.4	4.0	3.7	2.8	2.2	1.2
930 to 915	6.0	9.5	9.5	8.6	7.6	6.5	5.1	3.7	2.9	2.1	1.7	0.8
915 to 900	3.9	8.3	9.2	8.2	7.2	6.0	4.7	3.7	3.4	2.7	1.8	1.4
900 to 885	4.5	8.3	9.5	8.1	7.3	6.1	4.9	3.4	2.9	1.8	1.4	0.7
885 to 870	2.7	8.3	9.4	7.9	7.0	5.9	4.6	3.2	2.7	1.4	1.1	0.5
870 to 855	0.1	8.1	9.3	7.4	6.7	5.5	4.9	2.9	2.4	0.9	0.8	0.5
< 855	0.1	8.1	9.0	7.3	6.6	5.3	4.8	2.6	2.1	0.8	0.7	0.3

Jocassee E_2_557.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.6	9.6	10.2	9.9	9.1	8.4	8.3	8.1	8.0	7.7	8.4	8.9
1095 to 1080	9.4	9.6	10.1	9.9	9.5	9.1	8.5	8.0	7.7	7.8	8.5	8.9
1080 to 1065	9.4	9.5	10.0	9.8	9.5	9.1	8.6	7.9	7.6	7.8	8.4	8.8
1065 to 1050	9.4	9.5	9.9	9.7	9.4	9.0	8.4	7.5	7.1	7.7	8.4	8.8
1050 to 1035	9.3	9.3	9.7	9.6	9.2	8.8	7.9	6.8	6.4	7.6	8.3	8.8
1035 to 1020	9.3	9.3	9.5	9.5	9.0	8.3	7.3	6.0	5.4	7.4	8.2	8.8
1020 to 1005	9.3	9.2	9.4	9.3	8.9	8.1	7.1	6.0	5.1	6.0	7.8	8.6
1005 to 990	9.3	9.3	9.3	9.1	8.7	8.1	7.3	6.4	5.6	4.8	6.4	7.9
990 to 975	9.1	9.3	9.2	8.9	8.4	7.7	7.0	6.2	5.6	4.9	4.5	6.2
975 to 960	8.3	9.1	9.1	8.7	8.1	7.4	6.7	6.0	5.5	4.8	4.2	4.3
960 to 945	6.6	8.7	9.1	8.4	7.8	7.0	6.3	5.5	5.2	4.5	3.7	3.1
945 to 930	5.4	8.8	8.7	8.0	7.4	6.5	5.9	5.0	4.7	3.9	3.3	2.4
930 to 915	4.6	8.4	8.5	7.5	7.1	6.1	5.5	4.6	4.3	3.7	3.1	2.0
915 to 900	3.7	8.2	8.2	7.4	6.8	5.9	5.4	4.6	4.2	3.5	3.0	2.1
900 to 885	3.8	7.3	7.9	7.2	6.7	5.6	5.2	4.5	3.9	3.3	2.9	2.3
885 to 870	3.3	7.0	8.0	6.8	6.2	5.5	5.0	4.0	3.5	3.1	2.8	1.8
870 to 855	3.2	6.8	7.6	6.6	5.9	4.9	4.4	3.6	3.3	2.7	2.2	1.6
< 855	2.4	6.6	6.8	6.1	5.6	4.6	4.5	3.4	2.8	2.3	2.1	1.5

Legend	0.0										10.0

Jocassee F_2_554.8: Monthly Averaged Dissolved Oxygen (mg/l) 1986 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.5	10.5	10.4	10.4	9.1	8.4	8.9	8.7	7.9	8.1	8.2	9.3
1095 to 1080	10.4	10.4	10.9	10.6	9.9	9.8	9.2	8.9	7.8	7.8	8.6	9.2
1080 to 1065	10.2	10.2	10.9	10.4	9.9	9.9	9.4	9.1	7.6	7.8	8.6	9.1
1065 to 1050	10.1	10.1	10.8	10.3	9.7	9.6	9.1	7.9	7.4	7.7	8.6	9.0
1050 to 1035	10.2	10.1	10.3	10.2	9.2	8.9	8.1	6.4	7.3	7.6	8.5	9.1
1035 to 1020	10.2	10.0	10.3	10.0	8.7	7.5	6.8	5.7	6.8	7.5	8.6	9.0
1020 to 1005	10.1	10.0	10.1	9.9	8.4	6.8	4.8	3.4	3.8	6.6	8.4	9.0
1005 to 990	10.2	10.2	10.0	9.6	8.2	6.2	4.5	3.0	1.9	2.3	8.6	9.1
990 to 975	10.4	10.4	10.0	9.3	7.6	5.7	4.6	2.6	1.5	0.5	5.5	9.1
975 to 960	10.7	10.4	10.0	8.2	6.0	3.5	2.1	0.8	0.2	0.1	0.4	7.8
960 to 945	10.7	10.6	9.9		5.9	1.8	0.8	0.8	0.0	0.0	0.0	1.4
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 946.5 ft

Jocassee F_2_554.8: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.8	10.1	10.4	9.9	9.0	8.7	8.4	8.3	8.1	7.7	8.4	8.9
1095 to 1080	9.7	10.2	10.4	10.0	9.5	8.9	9.0	8.5	7.7	7.8	8.4	8.9
1080 to 1065	9.7	10.0	10.2	9.9	9.4	8.7	8.5	8.0	7.4	7.7	8.3	8.9
1065 to 1050	9.6	9.9	10.1	9.8	8.9	8.3	7.3	7.3	7.1	7.6	8.3	8.8
1050 to 1035	9.6	9.9	10.0	9.6	8.7	7.6	6.7	6.4	6.9	7.5	8.3	8.8
1035 to 1020	9.6	9.8	9.8	9.4	8.6	7.3	5.8	4.9	5.4	7.2	8.1	8.8
1020 to 1005	9.6	9.7	9.8	9.2	8.4	7.2	5.6	4.1	3.9	6.0	8.0	8.8
1005 to 990	9.6	9.8	9.8	8.9	8.1	6.9	5.5	4.1	3.1	2.7	6.7	8.7
990 to 975	9.7	10.0	9.7	8.5	7.6	6.2	4.7	3.3	1.9	1.1	2.9	7.4
975 to 960	9.5	10.0	9.6	7.8	6.4	4.3	2.3	1.2	0.3	0.2	0.4	4.3
960 to 945	9.1	9.7	9.3	7.2	5.8	3.3	1.3	0.4	0.1	0.1	0.2	2.0
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 945.3 ft

Legend	0.0										10.0

Jocassee F_2_556.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.3	9.4	10.9	9.6	9.9	8.9	9.0	8.8	8.5	8.1	8.7	9.2
1095 to 1080	10.1	9.7	10.6	10.5	10.1	9.6	10.0	9.4	8.6	8.1	8.7	9.1
1080 to 1065	10.0	9.7	10.6	10.5	9.9	9.8	9.7	9.0	8.2	8.0	8.7	9.1
1065 to 1050	10.0	9.5	10.4	10.1	9.6	9.2	8.8	8.0	6.7	8.0	8.6	9.1
1050 to 1035	9.9	9.5	10.0	9.9	9.3	8.9	8.0	6.7	5.8	7.5	8.7	9.1
1035 to 1020	10.0	9.6	9.8	9.4	8.7	8.1	7.1	6.1	5.2	6.9	8.3	9.1
1020 to 1005	10.0	9.6	9.7	9.3	8.3	7.5	6.5	5.4	4.4	5.5	7.1	8.8
1005 to 990	10.0	9.6	9.7	9.2	8.3	7.2	6.3	5.0	3.8	3.9	5.5	7.7
990 to 975	10.1	9.9	9.5	9.4	8.0	7.0	5.9	4.5	3.7	2.9	3.2	7.3
975 to 960	10.1	9.8	9.8	8.9	7.5	6.7	5.2	4.4	2.8	2.1	1.3	5.7
960 to 945	10.3	10.0	9.8	8.8	7.3	5.6	4.0	2.8	1.5	0.7	0.1	2.9
945 to 930	10.4	10.1	9.7	8.2	6.3	4.3	3.2	1.7	0.6	0.1	0.0	2.0
930 to 915	10.5	10.1	8.7	7.2	5.5	3.1	2.5	1.9	0.1	0.0	0.0	4.9
915 to 900					4.6							
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 914.1 ft

Jocassee F_2_556.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	10.0	10.4	9.9	9.2	8.6	8.4	8.2	8.0	7.7	8.4	8.9
1095 to 1080	9.6	10.0	10.3	10.0	9.7	9.2	9.0	8.4	7.7	7.8	8.4	8.9
1080 to 1065	9.6	9.9	10.2	9.9	9.7	9.2	8.9	8.2	7.5	7.7	8.4	8.9
1065 to 1050	9.6	9.8	10.0	9.8	9.3	8.7	8.1	7.3	7.0	7.7	8.3	8.8
1050 to 1035	9.6	9.7	9.8	9.6	8.8	7.9	6.8	6.2	6.4	7.5	8.3	8.8
1035 to 1020	9.5	9.7	9.7	9.5	8.7	7.6	6.3	5.3	5.2	7.1	8.1	8.8
1020 to 1005	9.5	9.7	9.6	9.3	8.7	7.6	6.2	5.0	4.4	6.1	7.8	8.6
1005 to 990	9.5	9.7	9.6	9.2	8.5	7.7	6.7	5.7	4.7	4.2	6.8	8.2
990 to 975	9.5	9.8	9.5	9.0	8.2	7.4	6.5	5.6	4.8	3.8	3.9	7.2
975 to 960	9.3	9.8	9.5	8.7	7.7	6.6	5.7	4.7	3.9	2.8	2.0	4.4
960 to 945	9.2	9.7	9.4	8.1	7.0	5.7	4.6	3.6	2.6	1.6	0.9	2.7
945 to 930	8.4	9.4	9.0	7.3	6.1	4.4	3.4	2.3	1.5	0.7	0.4	1.0
930 to 915	7.9	8.5	9.2	7.4	5.4	4.0	2.4	2.1	1.1	0.5	0.4	1.2
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.4 ft

Lake Jocassee

Dissolved Oxygen Saturation

This page intentionally left blank.

Jocassee B_2_558.7: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee B_2_558.7: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	86.7	84.8	92.7	98.2	98.3	102.2	99.4	100.4	95.6	90.5	90.9	88.0
1095 to 1080	84.7	84.2	91.9	97.0	95.6	101.3	98.2	98.4	93.8	91.6	90.0	86.9
1080 to 1065	84.2	82.0	90.6	94.0	94.3	98.7	96.2	96.3	92.9	91.3	89.6	86.9
1065 to 1050	84.3	81.5	88.6	90.8	91.5	96.3	93.5	93.6	91.2	90.7	89.4	86.4
1050 to 1035	83.6	79.5	86.1	88.0	87.9	93.7	90.0	88.3	88.1	89.9	88.9	85.8
1035 to 1020	83.6	79.2	83.3	86.8	86.6	89.6	84.6	80.6	78.7	88.7	88.6	85.8
1020 to 1005	83.4	77.9	82.4	84.1	83.7	83.6	77.7	73.2	65.5	74.0	83.9	85.3
1005 to 990	82.9	76.3	80.8	81.2	79.4	78.6	72.6	69.3	64.9	59.7	68.7	80.4
990 to 975	76.3	75.8	79.0	78.4	75.1	73.0	67.5	65.2	63.2	59.4	55.8	59.6
975 to 960	63.0	72.9	76.7	74.7	71.1	66.9	63.0	61.9	59.7	55.4	53.1	46.2
960 to 945	52.4	66.5	71.8	70.2	65.7	62.3	58.5	57.4	55.9	52.3	49.8	43.4
945 to 930	45.9	65.5	67.7	66.6	63.7	58.0	55.7	54.5	53.0	48.5	47.9	40.9
930 to 915	39.3	64.4	65.0	59.2	59.5	53.7	48.7	48.6	50.1	45.6	45.6	37.2
915 to 900	31.2	61.0	62.5	58.7	57.7	49.9	47.9	46.7	48.6	41.4	42.0	34.5
900 to 885	28.6	58.3	62.1	57.7	57.3	48.4	45.3	46.4	44.4	38.8	40.3	34.0
885 to 870	29.3	54.8	59.3	52.2	54.3	47.9	44.2	40.0	41.4	36.1	38.7	28.4
870 to 855	25.0	59.1	60.2	54.4	54.1	44.0	38.7	38.7	39.4	33.0	33.3	25.6
< 855	25.2	59.4	59.3	52.2	51.5	43.3	38.7	37.1	34.9	28.9	30.3	24.3
	Legend	**0.0**										**100.00**

Jocassee B_3_558.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee B_3_558.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2020 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	87.2	83.8	92.8	97.8	97.5	101.3	97.4	99.3	94.6	90.3	91.0	88.2
1095 to 1080	85.3	84.0	92.0	96.3	95.2	99.0	95.8	96.9	93.9	91.3	90.1	87.5
1080 to 1065	84.3	82.7	89.9	93.7	93.9	97.2	95.1	94.6	93.2	91.0	89.5	87.4
1065 to 1050	84.3	82.6	88.3	90.7	91.2	95.2	92.1	92.6	91.7	90.5	89.4	87.0
1050 to 1035	83.6	82.5	86.4	88.2	88.4	93.4	89.8	88.5	89.3	89.9	88.9	86.4
1035 to 1020	83.7	81.1	84.5	87.1	87.2	89.8	84.9	81.9	82.3	89.2	88.4	86.3
1020 to 1005	83.2	79.8	83.3	84.5	84.1	85.1	78.7	74.6	68.8	81.4	86.7	86.0
1005 to 990	82.7	79.3	82.0	81.7	80.1	79.8	73.8	71.3	66.6	62.4	74.5	83.5
990 to 975	79.8	78.7	80.8	79.7	76.3	74.8	69.7	68.0	65.2	61.4	59.0	67.3
975 to 960	70.0	75.3	77.5	76.5	72.7	70.0	65.5	64.4	61.3	59.1	56.4	52.9
960 to 945	61.6	72.7	74.2	73.2	69.3	67.2	62.4	61.2	57.1	55.6	54.9	49.7
945 to 930	52.2	64.3	68.3	71.6	66.0	64.0	59.9	58.2	53.7	52.7	52.9	47.0
930 to 915	45.2	58.6	63.6	66.0	62.6	59.1	53.6	53.1	49.2	49.9	49.7	44.2
915 to 900	41.6	56.6	60.2	64.0	60.5	56.5	53.0	52.7	47.4	46.8	46.8	41.9
900 to 885	37.6	56.1	58.7	63.2	61.3	56.2	51.5	52.0	45.1	44.3	45.8	41.7
885 to 870	38.6	53.3	56.5	59.5	57.5	54.6	51.4	47.8	44.1	44.5	46.9	37.9
870 to 855	35.9	57.9	55.7	60.1	57.7	51.2	47.7	47.4	41.0	42.3	42.2	37.7
< 855	32.5	58.2	57.1	57.6	56.0	50.0	45.8	42.4	36.6	34.5	35.4	31.0
	Legend	**0.0**										**100.00**

Jocassee C_2_559.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee C_2_559.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	86.3	84.2	94.1	98.9	99.2	101.6	99.3	101.0	97.5	89.1	90.2	87.2
1095 to 1080	84.1	84.1	93.6	98.1	96.6	102.3	98.8	99.6	94.7	90.6	89.6	86.2
1080 to 1065	83.5	82.5	91.6	95.2	95.0	99.6	97.4	97.1	93.8	90.4	89.3	86.1
1065 to 1050	83.2	82.1	89.4	91.3	92.1	97.0	93.5	93.7	91.7	90.2	89.0	85.8
1050 to 1035	82.6	80.7	86.7	88.1	88.5	94.4	90.1	88.7	87.9	89.5	88.8	85.3
1035 to 1020	82.8	80.1	83.3	86.8	87.1	90.2	84.1	80.8	78.7	87.4	88.5	85.2
1020 to 1005	82.4	78.7	82.2	84.2	83.6	84.6	77.5	73.9	64.4	74.1	84.6	84.0
1005 to 990	82.2	76.8	80.2	80.4	78.9	78.8	72.5	70.3	64.3	58.4	68.9	79.0
990 to 975	75.3	75.6	77.8	77.0	74.2	72.7	65.6	64.0	60.5	56.5	53.0	59.1
975 to 960	60.1	70.7	74.5	72.9	69.8	65.4	59.2	57.8	54.9	50.0	48.7	44.7
960 to 945	47.6	64.2	68.2	68.0	63.9	59.6	53.4	52.9	50.2	45.4	44.7	40.5
945 to 930	37.2	55.9	64.2	63.9	61.7	54.4	50.9	49.3	47.4	41.6	41.7	36.6
930 to 915	30.5	53.1	58.1	54.0	56.4	48.7	42.6	42.7	43.1	37.1	38.7	31.1
915 to 900	25.6	51.8	55.4	53.2	54.1	45.2	40.9	40.7	40.1	33.8	34.1	27.9
900 to 885	22.0	44.5	55.1	51.9	54.2	42.2	38.9	40.5	36.7	30.6	33.0	27.8
885 to 870	24.9	45.0	52.3	44.4	51.1	43.0	39.9	37.0	35.3	29.6	31.9	22.0
870 to 855	19.9	50.6	54.4	47.3	51.1	39.7	35.6	35.7	33.7	26.3	27.7	19.8
< 855	23.5	51.1	55.1	46.2	49.1	41.4	36.8	35.9	33.0	24.8	26.4	21.4
	Legend	**0.0**										**100.00**

Jocassee C_2_560.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee C_2_560.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	85.8	84.8	94.3	98.7	99.4	101.7	98.5	100.6	95.8	87.4	89.2	88.0
1095 to 1080	83.3	84.3	92.9	97.4	96.2	100.1	96.2	98.7	92.9	88.8	88.4	85.7
1080 to 1065	82.8	82.1	90.9	94.8	94.5	99.0	95.6	95.8	90.9	88.3	87.8	85.7
1065 to 1050	83.1	81.6	88.6	92.2	92.2	96.8	93.4	93.3	89.0	88.3	87.5	85.2
1050 to 1035	82.0	80.9	86.7	88.9	88.8	94.2	90.1	88.5	86.3	87.6	87.3	84.9
1035 to 1020	82.1	80.1	84.0	87.5	87.5	90.1	84.2	81.0	78.3	84.6	86.9	84.9
1020 to 1005	81.9	77.9	82.3	84.6	84.1	84.8	78.3	74.8	66.1	72.1	83.1	83.7
1005 to 990	81.7	76.6	80.3	81.0	80.0	78.3	72.0	69.5	61.8	56.1	62.8	76.3
990 to 975	73.2	76.4	78.0	76.1	74.3	70.9	63.9	61.9	57.2	53.4	49.8	54.5
975 to 960	58.6	69.8	74.5	71.8	69.1	62.3	55.6	54.2	50.0	45.8	43.1	40.0
960 to 945	40.4	61.3	68.5	66.5	63.4	55.5	49.0	48.9	45.7	40.5	39.2	32.6
945 to 930	30.1	54.3	64.4	61.4	60.4	50.8	46.9	45.6	44.0	37.5	37.5	29.4
930 to 915	23.3	50.8	58.1	52.3	56.3	47.2	39.7	39.5	39.3	34.2	33.9	24.9
915 to 900	18.8	47.5	51.0	51.1	54.3	44.1	39.1	38.6	37.2	30.6	29.7	22.4
900 to 885	18.2	41.5	49.8	49.2	53.9	42.3	37.9	38.4	33.2	27.4	29.4	25.0
885 to 870	22.7	39.7	42.8	40.5	50.9	42.7	39.2	34.7	33.2	26.4	28.3	19.9
870 to 855	17.9	43.3	46.4	41.7	42.9	38.3	33.1	33.3	27.7	19.7	20.3	18.1
< 855	14.4	57.1	72.7	54.1	55.8	45.6	36.3	43.6	35.7	19.2	24.3	15.3
	Legend	**0.0**										**100.00**

Jocassee C_2_562.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee C_2_562.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	87.9	88.3	96.8	100.7	101.5	106.5	104.1	105.0	98.0	91.2	90.6	90.0
1095 to 1080	85.8	88.1	94.9	99.5	96.7	103.1	103.6	104.0	95.8	91.6	89.2	87.0
1080 to 1065	85.6	86.2	92.8	97.0	95.1	97.0	96.7	100.5	93.6	91.2	88.6	87.1
1065 to 1050	85.4	85.1	91.5	94.2	90.9	91.8	91.4	96.9	91.3	90.7	88.2	86.8
1050 to 1035	84.7	84.3	90.0	90.8	87.1	86.1	81.6	86.8	90.6	89.6	87.5	86.3
1035 to 1020	84.8	84.2	86.3	87.8	83.3	77.4	65.8	65.5	75.7	88.4	87.7	86.3
1020 to 1005	84.9	83.7	82.1	79.5	72.9	64.2	45.5	34.9	32.2	72.3	87.2	85.6
1005 to 990	81.8	82.0	75.4	68.5	60.5	43.3	22.7	7.8	3.4	12.6	70.5	78.5
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 992.9 ft

Legend **0.0** **100.00**

DO Saturation Not Monitored at 565.4

Jocassee D_2_551.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 2009

Jocassee D_2_551.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 2009 to 2011 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		90.1			100.5			99.0			88.4	
1095 to 1080		97.0						99.2			85.8	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1083.7 ft

Legend	0.0										100.00

Jocassee D_2_564.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1999

Jocassee D_2_564.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1999 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	87.0	86.4	94.6	99.0	99.8	101.8	98.9	101.0	95.8	87.5	88.7	88.7
1095 to 1080	83.8	84.2	92.3	96.8	96.1	100.4	96.5	98.2	92.4	88.4	87.8	85.9
1080 to 1065	83.3	82.3	89.8	94.4	94.5	99.2	95.1	95.9	90.7	88.1	87.5	85.9
1065 to 1050	83.3	82.2	88.3	92.0	92.7	97.2	93.7	93.7	88.9	87.8	87.0	85.5
1050 to 1035	82.5	81.2	86.7	89.5	89.3	94.3	90.3	89.2	87.1	86.9	87.0	85.1
1035 to 1020	82.4	80.5	83.9	87.2	87.4	89.7	83.2	81.7	78.8	84.8	86.5	85.3
1020 to 1005	82.2	79.3	81.9	83.4	83.6	83.6	77.1	73.3	65.3	72.9	82.7	83.6
1005 to 990	82.4	78.6	79.5	79.5	78.9	76.6	69.0	64.4	56.9	50.9	63.0	78.1
990 to 975	74.7	77.6	77.1	74.6	72.9	69.8	59.3	55.8	50.2	45.6	42.8	55.2
975 to 960	55.3	71.9	73.6	69.7	67.7	60.0	50.7	48.9	42.1	36.0	34.0	34.6
960 to 945	44.7	65.2	67.8	63.8	60.8	51.1	44.3	43.8	36.1	28.4	26.7	26.0
945 to 930	31.2	57.2	61.7	56.7	56.8	45.2	40.0	38.0	32.0	22.7	20.4	18.2
930 to 915	25.6	49.9	55.2	45.7	51.8	39.6	32.1	31.2	25.5	18.8	17.0	15.2
915 to 900	21.4	47.8	46.9	44.2	50.0	35.6	31.9	27.4	25.1	15.5	13.8	14.4
900 to 885	19.7	35.7	38.9	32.8	20.4	20.0	7.3	22.1	11.2	4.1	1.0	11.1
885 to 870	20.9	31.2	7.9	44.5	21.1	52.4	6.6	25.3	3.8	2.0	0.6	5.8
870 to 855	1.2	0.0					3.1					
< 855	*Minimum Reading 868.8 ft*											

Legend	0.0										100.00

Jocassee D_2_564.1: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1999

Jocassee D_2_564.1: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1999 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	88.1	88.0	92.0	96.7	98.2	99.7	96.3	98.0	90.4	85.5	88.6	88.9
1095 to 1080	84.9	85.0	90.2	95.1	95.3	98.9	94.5	96.3	89.7	87.2	86.9	85.8
1080 to 1065	84.9	84.1	89.3	93.6	93.9	98.2	95.2	94.7	89.5	87.2	86.5	86.0
1065 to 1050	85.2	83.8	89.1	92.8	92.7	98.0	94.5	93.4	88.5	87.0	86.0	85.8
1050 to 1035	84.6	83.7	88.9	91.4	91.1	97.8	92.4	92.8	88.4	86.4	85.4	85.2
1035 to 1020	84.8	83.7	88.2	90.9	91.4	97.6	90.9	93.1	88.3	86.2	85.7	85.5
1020 to 1005	84.2	83.0	88.5	89.5	90.7	96.8	90.9	92.9	87.7	86.2	85.4	85.7
1005 to 990	84.5	83.1	88.1	88.9	89.4	96.2	90.2	92.2	87.6	85.8	85.0	84.8
990 to 975	83.6	84.2	88.2	87.4	87.4	97.0	86.8	93.9	87.4	86.0	85.9	84.2
975 to 960	86.0	77.6	89.1	86.3	92.4	93.7	92.3	86.3	92.3	86.4	86.8	85.8
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 964.9 ft

Legend **0.0** **100.00**

Jocassee E_2_557.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee E_2_557.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	90.0	87.8	96.6	100.1	100.9	103.8	102.0	103.4	98.5	89.6	91.4	90.1
1095 to 1080	87.8	88.2	94.6	98.5	98.2	105.7	102.0	101.0	95.6	91.7	90.2	88.1
1080 to 1065	87.4	86.5	92.0	95.1	97.1	103.7	100.5	98.2	94.2	91.3	89.9	88.1
1065 to 1050	87.3	85.5	89.4	92.1	94.1	101.5	96.8	95.2	90.2	90.6	89.6	87.5
1050 to 1035	86.7	83.9	87.0	89.2	89.8	95.7	89.3	84.6	84.2	89.7	89.0	87.2
1035 to 1020	86.7	83.0	85.4	87.7	86.7	87.1	78.8	69.9	70.1	89.1	88.6	87.4
1020 to 1005	86.5	82.5	84.2	84.6	83.4	80.0	70.0	61.7	55.5	74.2	84.7	86.7
1005 to 990	85.9	81.9	82.5	81.0	78.8	74.9	66.3	59.7	51.3	45.4	68.5	80.6
990 to 975	83.7	82.9	81.6	78.5	74.9	70.2	61.4	56.4	50.8	44.6	41.4	63.3
975 to 960	74.7	80.3	80.5	76.1	71.8	65.9	58.4	53.2	49.7	44.1	38.2	43.7
960 to 945	54.8	76.2	79.7	73.0	68.6	62.0	54.6	49.1	46.4	41.5	34.0	29.2
945 to 930	42.8	76.9	75.2	70.2	65.7	57.8	51.8	46.1	42.4	37.4	31.1	23.1
930 to 915	34.6	74.3	73.8	65.3	63.0	54.2	47.2	41.9	39.6	34.7	29.8	18.7
915 to 900	29.3	72.6	71.0	65.5	61.0	53.2	45.5	42.2	40.0	33.6	30.4	20.5
900 to 885	31.7	66.7	71.1	64.4	59.3	50.2	45.3	42.5	38.2	32.2	29.7	22.7
885 to 870	28.4	60.0	72.2	58.9	57.1	49.3	43.6	38.3	34.9	30.5	28.9	19.9
870 to 855	24.8	63.0	68.5	59.7	53.5	44.7	37.8	34.6	33.8	26.3	22.9	15.9
< 855	25.2	64.9	64.0	55.0	54.9	42.4	39.0	35.0	27.8	22.3	21.7	15.2
	Legend	**0.0**										**100.00**

Jocassee F_2_554.8: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee F_2_554.8: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	91.0	91.9	99.5	101.7	100.2	106.3	104.9	107.6	99.7	72.6	91.2	90.6
1095 to 1080	89.2	92.4	97.7	100.1	99.3	105.9	109.5	107.2	95.7	86.6	89.7	88.3
1080 to 1065	89.1	90.3	94.2	95.8	96.3	103.3	102.9	103.4	91.5	85.9	89.0	88.2
1065 to 1050	88.7	88.9	91.6	92.4	89.6	95.3	87.5	93.5	88.8	84.5	88.6	87.7
1050 to 1035	88.6	87.7	89.8	89.2	85.3	83.6	79.0	83.3	87.0	81.3	88.0	87.4
1035 to 1020	88.2	86.8	88.2	87.1	82.3	75.7	62.3	59.2	76.3	81.5	87.7	87.1
1020 to 1005	87.9	86.1	87.7	83.0	77.6	68.9	53.2	40.1	46.9	68.8	86.4	87.1
1005 to 990	88.1	86.3	86.7	78.9	72.4	62.7	48.2	36.1	28.0	23.7	74.4	85.8
990 to 975	88.2	88.1	85.8	74.2	66.8	55.5	39.7	28.3	14.8	7.6	35.1	72.0
975 to 960	88.1	87.3	84.0	67.8	56.5	36.4	18.2	9.2	1.5	1.2	4.4	48.4
960 to 945	88.6	80.7	81.1	64.3	51.7	29.0	9.8	3.2	0.8	0.8	1.3	33.6
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 948.4 ft

Legend 0.0 — 100.00

Jocassee F_2_556.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee F_2_556.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	91.1	90.6	98.9	101.7	102.3	106.6	105.1	106.2	98.9	90.1	91.5	90.2
1095 to 1080	89.2	91.1	96.8	99.5	101.2	107.5	107.6	105.0	95.3	90.7	89.7	88.3
1080 to 1065	88.7	89.4	93.7	96.1	99.4	105.9	105.4	104.6	92.2	90.2	89.3	88.3
1065 to 1050	88.5	87.8	90.7	92.9	93.6	99.9	93.9	95.9	88.3	89.6	88.8	87.7
1050 to 1035	88.1	86.5	88.6	89.7	86.6	85.2	79.2	78.8	83.0	88.7	88.1	87.3
1035 to 1020	88.3	86.0	87.0	87.8	83.4	77.9	68.5	62.6	69.5	84.9	87.6	87.0
1020 to 1005	87.8	85.5	86.1	84.1	80.1	73.5	60.1	49.2	49.3	74.9	84.0	85.7
1005 to 990	86.7	85.3	84.7	81.2	76.3	71.0	60.4	51.8	41.0	40.8	73.7	82.7
990 to 975	85.6	86.1	84.0	78.8	72.6	66.4	56.6	50.0	41.5	32.9	38.2	68.9
975 to 960	84.8	85.8	83.7	74.8	68.1	57.7	48.1	41.0	33.6	24.4	19.1	46.2
960 to 945	84.0	83.7	82.3	69.2	62.1	48.6	38.1	31.3	22.6	12.7	7.8	31.1
945 to 930	74.1	80.4	77.2	61.5	54.4	37.3	29.3	21.1	13.1	5.3	3.4	8.0
930 to 915	62.3	56.3	81.2	65.1	51.4	37.7	18.8	19.6	7.3	1.8	2.2	11.5
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 919.4 ft

Legend **0.0** **100.00**

Lake Jocassee

pH Concentration

This page intentionally left blank.

Jocassee B_2_558.7: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1987 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.5	6.1	6.5	6.6	6.7	6.9	7.2	7.1	6.6	6.6	6.6	6.4
	1095 to 1080	6.5	6.5	6.7	6.7	6.7	6.9	7.0	7.0	6.8	6.8	6.9	6.4
	1080 to 1065	6.5	6.5	6.6	6.7	6.7	6.9	6.7	6.8	6.7	6.7	6.9	6.3
	1065 to 1050	6.5	6.4	6.7	6.7	6.7	6.8	6.7	6.7	6.7	6.8	6.8	6.3
	1050 to 1035	6.4	6.4	6.5	6.6	6.6	6.8	6.6	6.6	6.6	6.7	6.8	6.3
	1035 to 1020	6.4	6.4	6.5	6.6	6.7	6.6	6.5	6.5	6.3	6.6	6.8	6.3
	1020 to 1005	6.4	6.3	6.6	6.5	6.6	6.7	6.5	6.3	6.1	6.5	6.7	6.4
	1005 to 990	6.4	6.3	6.4	6.5	6.6	6.7	6.6	6.3	6.2	6.2	6.6	6.3
	990 to 975	6.3	6.2	6.4	6.5	6.5	6.6	6.6	6.3	6.2	6.2	6.1	6.2
	975 to 960	6.2	6.3	6.3	6.5	6.5	6.5	6.6	6.3	6.2	6.1	6.1	5.9
	960 to 945	6.0	6.2	6.4	6.4	6.4	6.5	6.5	6.2	6.2	6.1	6.0	5.7
	945 to 930	5.8	6.1	6.3	6.3	6.3	6.4	6.4	6.2	6.2	6.1	5.9	5.6
	930 to 915	5.8	6.1	6.2	6.3	6.3	6.3	6.4	6.1	6.1	6.0	6.0	5.5
	915 to 900	5.8	5.9	6.2	6.2	6.2	6.2	6.4	6.1	6.1	6.0	5.9	5.6
	900 to 885	5.7	5.9	6.1	6.2	6.2	6.2	6.4	6.1	6.0	6.0	5.8	5.4
	885 to 870	5.6	5.9	6.0	6.1	6.1	6.1	6.3	6.0	6.0	6.1	5.8	5.4
	870 to 855	5.7	5.9	6.0	6.1	6.1	6.1	6.4	5.9	5.9	5.9	5.8	5.4
	< 855	5.8	5.8	6.2	6.1	6.0	6.0	6.3	6.0	5.9	6.0	5.8	5.6

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.1	6.5	6.6	6.9	6.8	6.8	6.8	6.7	6.4	6.6	6.3
	1095 to 1080	6.4	6.3	6.5	6.7	6.9	6.8	6.8	6.9	6.8	6.7	6.7	6.5
	1080 to 1065	6.4	6.2	6.5	6.6	6.8	6.6	6.6	6.8	6.8	6.7	6.7	6.5
	1065 to 1050	6.4	6.2	6.4	6.5	6.7	6.5	6.5	6.6	6.7	6.7	6.7	6.5
	1050 to 1035	6.3	6.2	6.4	6.4	6.5	6.5	6.4	6.5	6.5	6.6	6.7	6.5
	1035 to 1020	6.3	6.2	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.6	6.7	6.5
	1020 to 1005	6.3	6.2	6.3	6.3	6.4	6.3	6.2	6.2	6.1	6.3	6.6	6.5
	1005 to 990	6.3	6.1	6.3	6.2	6.3	6.1	6.1	6.2	6.0	6.0	6.3	6.4
	990 to 975	6.2	6.2	6.2	6.2	6.2	6.1	6.0	6.1	6.0	6.0	6.0	6.0
	975 to 960	6.0	6.1	6.2	6.1	6.1	6.0	5.9	6.0	6.0	5.9	6.0	5.8
	960 to 945	5.9	6.0	6.1	6.0	6.1	5.9	5.9	6.0	5.9	5.9	5.9	5.8
	945 to 930	5.8	5.9	6.0	5.9	6.0	5.9	5.8	6.0	5.9	5.8	5.9	5.7
	930 to 915	5.7	5.9	6.0	5.9	6.0	5.9	5.8	5.9	5.9	5.8	5.9	5.7
	915 to 900	5.7	5.9	6.0	5.9	6.0	5.8	5.8	5.9	5.8	5.8	5.8	5.7
	900 to 885	5.7	5.8	6.0	5.8	6.0	5.8	5.7	5.9	5.8	5.8	5.8	5.7
	885 to 870	5.7	5.9	6.0	5.8	5.9	5.8	5.7	5.9	5.8	5.8	5.8	5.7
	870 to 855	5.7	5.9	6.0	5.8	5.9	5.7	5.7	5.9	5.8	5.8	5.8	5.7
	< 855	5.7	5.9	5.9	5.8	5.9	5.7	5.7	5.9	5.8	5.8	5.9	5.7

< Acidic						Neutral						Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee B_3_558.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1975 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.0	6.1	6.4	6.4	6.6	6.6	6.9	6.7	6.3	6.1	6.5	6.2
	1095 to 1080	6.1	6.1	6.3	6.4	6.7	6.5	6.8	6.6	6.4	6.2	6.4	6.2
	1080 to 1065	6.1	6.0	6.3	6.4	6.7	6.5	6.5	6.5	6.4	6.2	6.3	6.3
	1065 to 1050	6.0	6.0	6.2	6.4	6.7	6.5	6.4	6.4	6.4	6.2	6.4	6.2
	1050 to 1035	6.0	6.0	6.2	6.2	6.5	6.5	6.3	6.4	6.3	6.2	6.3	6.2
	1035 to 1020	6.0	6.0	6.2	6.1	6.6	6.4	6.2	6.3	6.1	6.2	6.3	6.2
	1020 to 1005	6.0	6.0	6.2	6.1	6.5	6.5	6.2	6.1	5.8	5.9	6.3	6.2
	1005 to 990	6.0	6.0	6.2	6.1	6.4	6.5	6.2	6.1	5.9	5.6	6.1	6.2
	990 to 975	5.9	6.0	6.2	6.1	6.4	6.3	6.3	6.1	5.9	5.7	5.7	6.1
	975 to 960	6.0	6.0	6.1	6.0	6.3	6.3	6.1	6.1	5.9	5.7	5.6	5.9
	960 to 945	5.9	6.0	6.0	6.0	6.3	6.2	6.1	6.0	5.9	5.7	5.6	5.7
	945 to 930	5.8	5.9	5.9	5.9	6.1	6.2	6.1	5.9	5.9	5.6	5.5	5.5
	930 to 915	5.7	5.8	5.8	5.8	6.1	6.0	6.0	5.8	5.8	5.5	5.5	5.4
	915 to 900	5.5	5.7	5.7	5.7	6.0	6.0	5.9	5.8	5.7	5.5	5.4	5.4
	900 to 885	5.4	5.7	5.6	5.6	5.9	5.9	6.0	5.8	5.7	5.5	5.4	5.4
	885 to 870	5.3	5.6	5.6	5.6	5.9	5.8	5.9	5.7	5.7	5.5	5.4	5.3
	870 to 855	5.3	5.6	5.6	5.6	5.8	5.9	5.9	5.7	5.6	5.5	5.4	5.3
	< 855	5.5	5.6	5.5	5.7	5.8	5.8	5.9	5.8	5.6	5.6	5.5	5.4

Measurement Reading Range (ft msl)	1991 to 2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.1	6.3	6.5	6.7	6.6	6.6	6.7	6.6	6.3	6.4	6.5
	1095 to 1080	6.4	6.1	6.4	6.5	6.7	6.5	6.5	6.7	6.7	6.6	6.6	6.5
	1080 to 1065	6.4	6.1	6.4	6.5	6.6	6.4	6.5	6.6	6.7	6.7	6.6	6.5
	1065 to 1050	6.3	6.1	6.3	6.4	6.5	6.3	6.4	6.5	6.6	6.6	6.7	6.5
	1050 to 1035	6.3	6.1	6.3	6.3	6.4	6.3	6.3	6.3	6.4	6.6	6.6	6.6
	1035 to 1020	6.3	6.1	6.3	6.3	6.3	6.3	6.2	6.2	6.3	6.6	6.7	6.5
	1020 to 1005	6.3	6.1	6.3	6.2	6.3	6.1	6.1	6.1	6.1	6.3	6.6	6.5
	1005 to 990	6.3	6.1	6.2	6.1	6.2	6.1	6.0	6.1	6.0	6.0	6.4	6.4
	990 to 975	6.2	6.1	6.2	6.1	6.1	6.0	6.0	6.1	5.9	6.0	6.0	6.1
	975 to 960	6.1	6.1	6.1	6.1	6.0	5.9	5.9	6.0	5.9	5.9	5.9	5.9
	960 to 945	6.0	6.0	6.1	6.0	6.0	5.8	5.9	6.0	5.8	5.9	5.9	5.8
	945 to 930	5.8	5.9	6.0	5.9	5.9	5.8	5.8	5.9	5.8	5.8	5.9	5.8
	930 to 915	5.7	5.8	6.0	5.9	5.9	5.8	5.8	5.9	5.8	5.8	5.9	5.8
	915 to 900	5.7	5.8	5.9	5.9	5.9	5.7	5.8	5.9	5.8	5.8	5.8	5.8
	900 to 885	5.7	5.7	5.9	5.8	5.9	5.7	5.7	5.9	5.8	5.8	5.8	5.8
	885 to 870	5.7	5.8	5.9	5.8	5.8	5.8	5.7	5.8	5.8	5.8	5.8	5.8
	870 to 855	5.7	5.8	5.9	5.8	5.8	5.7	5.7	5.8	5.8	5.8	5.8	5.7
	< 855	5.7	5.9	5.9	5.8	5.8	5.7	5.7	5.8	5.8	5.8	5.8	5.8

< Acidic						Neutral						Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee C_2_559.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1987 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.2	6.0	6.3	6.8	6.8	6.7	7.3	7.0	6.7	6.4	6.6	6.3
	1095 to 1080	6.3	6.3	6.6	6.7	6.7	7.0	7.2	7.0	6.8	6.6	6.8	6.3
	1080 to 1065	6.4	6.4	6.5	6.7	6.7	6.9	6.8	6.9	6.8	6.5	6.8	6.3
	1065 to 1050	6.4	6.3	6.6	6.7	6.6	6.8	6.7	6.7	6.7	6.6	6.7	6.3
	1050 to 1035	6.3	6.3	6.5	6.6	6.6	6.7	6.6	6.5	6.6	6.6	6.7	6.3
	1035 to 1020	6.2	6.4	6.4	6.6	6.6	6.6	6.5	6.5	6.4	6.4	6.7	6.3
	1020 to 1005	6.3	6.2	6.5	6.6	6.5	6.6	6.5	6.2	6.2	6.3	6.7	6.4
	1005 to 990	6.3	6.2	6.4	6.5	6.5	6.6	6.5	6.3	6.2	6.1	6.4	6.3
	990 to 975	6.2	6.1	6.4	6.5	6.4	6.5	6.5	6.2	6.2	6.2	6.1	6.1
	975 to 960	6.2	6.2	6.3	6.4	6.4	6.5	6.5	6.2	6.2	6.0	6.0	5.8
	960 to 945	5.8	6.0	6.4	6.4	6.3	6.4	6.4	6.2	6.2	6.1	6.0	5.8
	945 to 930	5.7	6.0	6.2	6.3	6.2	6.3	6.3	6.1	6.1	6.0	5.9	5.6
	930 to 915	5.6	6.0	6.1	6.2	6.2	6.2	6.3	6.1	6.0	5.8	5.8	5.5
	915 to 900	5.7	5.7	6.1	6.1	6.1	6.1	6.3	5.9	6.1	5.9	5.8	5.6
	900 to 885	5.6	5.7	6.0	6.1	6.1	6.1	6.3	5.9	6.0	6.0	5.8	5.5
	885 to 870	5.6	5.7	5.9	6.1	5.9	6.1	6.2	5.9	6.0	6.0	5.7	5.5
	870 to 855	5.7	5.8	6.0	6.0	6.0	6.1	6.2	5.8	5.9	5.9	5.7	5.5
	< 855	5.8	5.8	6.0	6.0	6.0	6.0	6.2	5.9	6.0	6.0	5.8	5.7

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.2	6.1	6.5	6.7	7.0	6.8	6.8	6.9	6.7	6.3	6.5	6.4
	1095 to 1080	6.3	6.3	6.6	6.8	6.9	6.9	6.8	7.0	6.8	6.6	6.7	6.5
	1080 to 1065	6.3	6.2	6.5	6.7	6.8	6.7	6.7	6.8	6.8	6.7	6.7	6.5
	1065 to 1050	6.3	6.2	6.5	6.6	6.7	6.5	6.6	6.7	6.7	6.7	6.7	6.5
	1050 to 1035	6.3	6.2	6.4	6.4	6.5	6.5	6.4	6.5	6.5	6.6	6.7	6.5
	1035 to 1020	6.3	6.2	6.4	6.4	6.5	6.4	6.3	6.3	6.3	6.6	6.7	6.5
	1020 to 1005	6.3	6.2	6.3	6.4	6.4	6.3	6.2	6.2	6.1	6.3	6.6	6.5
	1005 to 990	6.3	6.1	6.3	6.3	6.3	6.1	6.1	6.1	6.0	6.0	6.3	6.4
	990 to 975	6.2	6.1	6.2	6.2	6.2	6.1	6.0	6.1	6.0	5.9	6.0	6.0
	975 to 960	6.0	6.1	6.2	6.2	6.1	6.0	5.9	6.0	5.9	5.9	5.9	5.8
	960 to 945	5.8	6.0	6.1	6.1	6.1	5.9	5.8	5.9	5.8	5.8	5.9	5.8
	945 to 930	5.7	5.9	6.0	5.9	6.0	5.9	5.8	5.9	5.8	5.8	5.8	5.7
	930 to 915	5.7	5.8	6.0	5.9	5.9	5.8	5.8	5.9	5.8	5.8	5.8	5.7
	915 to 900	5.7	5.8	5.9	5.9	5.9	5.8	5.7	5.8	5.8	5.7	5.8	5.7
	900 to 885	5.7	5.7	5.9	5.8	5.9	5.7	5.7	5.8	5.7	5.7	5.8	5.7
	885 to 870	5.6	5.8	5.9	5.8	5.9	5.8	5.7	5.8	5.8	5.7	5.8	5.7
	870 to 855	5.7	5.9	5.9	5.8	5.9	5.7	5.7	5.8	5.8	5.7	5.8	5.7
	< 855	5.7	5.8	5.9	5.8	5.8	5.7	5.7	5.8	5.8	5.7	5.8	5.7

< Acidic					Neutral								Basic >
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee C_2_560.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1975 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.1	6.2	6.3	6.6	6.8	7.0	7.3	7.3	6.9	6.4	6.6	6.1
	1095 to 1080	6.3	6.3	6.5	6.6	6.7	7.0	7.3	7.1	6.9	6.5	6.6	6.1
	1080 to 1065	6.3	6.2	6.4	6.6	6.5	7.0	7.1	6.7	6.7	6.4	6.6	6.2
	1065 to 1050	6.2	6.1	6.4	6.5	6.5	6.8	6.7	6.5	6.4	6.4	6.4	6.2
	1050 to 1035	6.2	6.0	6.3	6.4	6.4	6.6	6.5	6.3	6.3	6.2	6.5	6.2
	1035 to 1020	6.2	6.0	6.3	6.3	6.3	6.5	6.3	6.2	6.2	6.1	6.3	6.1
	1020 to 1005	6.3	6.0	6.3	6.2	6.2	6.4	6.2	6.1	6.1	6.0	6.1	6.0
	1005 to 990	6.1	5.9	6.2	6.3	6.3	6.4	6.2	6.1	6.2	5.9	6.0	5.9
	990 to 975	6.0	5.9	6.1	6.2	6.2	6.4	6.2	6.0	6.2	5.9	5.8	5.8
	975 to 960	6.1	6.0	6.2	6.2	6.2	6.4	6.2	6.1	6.1	6.0	6.0	5.7
	960 to 945	6.0	6.1	6.2	6.2	6.3	6.5	6.2	6.1	6.2	6.0	5.9	5.7
	945 to 930	5.9	5.9	6.2	6.1	6.1	6.4	6.2	6.0	6.2	5.9	5.9	5.6
	930 to 915	5.7	6.0	6.1	6.1	6.2	6.4	6.2	6.1	6.1	6.0	5.8	5.5
	915 to 900	5.8	5.8	6.1	6.0	6.1	6.3	6.2	6.0	6.2	6.0	5.9	5.6
	900 to 885	5.6	5.8	6.0	6.1	6.1	6.2	6.3	6.0	6.1	5.9	5.8	5.5
	885 to 870	5.6	5.8	5.9	6.0	6.0	6.2	6.2	5.9	6.1	6.0	5.7	5.5
	870 to 855	5.8	6.0	5.9	6.0	6.0	6.2	6.2	5.9	5.9	5.9	5.7	5.5
	< 855	5.7	5.9	6.0	6.0	6.2	6.2	6.2	6.0	6.2	6.2	5.7	5.6

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.2	6.6	6.7	7.0	6.8	6.8	6.8	6.6	6.3	6.6	6.4
	1095 to 1080	6.4	6.3	6.6	6.8	6.9	6.8	6.7	6.9	6.7	6.6	6.7	6.5
	1080 to 1065	6.4	6.3	6.5	6.7	6.8	6.7	6.6	6.8	6.7	6.7	6.7	6.5
	1065 to 1050	6.4	6.3	6.5	6.6	6.7	6.6	6.5	6.6	6.6	6.6	6.7	6.5
	1050 to 1035	6.4	6.2	6.4	6.5	6.6	6.5	6.4	6.5	6.4	6.6	6.7	6.5
	1035 to 1020	6.3	6.3	6.4	6.4	6.5	6.4	6.3	6.3	6.3	6.5	6.7	6.5
	1020 to 1005	6.3	6.2	6.4	6.4	6.4	6.3	6.2	6.2	6.1	6.3	6.6	6.5
	1005 to 990	6.4	6.2	6.3	6.3	6.3	6.2	6.1	6.2	6.0	6.0	6.2	6.3
	990 to 975	6.2	6.2	6.3	6.2	6.2	6.1	6.0	6.1	6.0	5.9	6.0	5.9
	975 to 960	6.1	6.2	6.2	6.1	6.1	6.0	5.9	6.0	5.9	5.9	6.0	5.8
	960 to 945	5.9	6.1	6.2	6.0	6.1	5.9	5.8	5.9	5.8	5.8	5.9	5.7
	945 to 930	5.8	6.0	6.1	5.9	6.0	5.8	5.8	5.9	5.8	5.8	5.9	5.7
	930 to 915	5.7	5.9	6.1	5.9	6.0	5.8	5.8	5.9	5.8	5.8	5.9	5.7
	915 to 900	5.7	5.9	6.0	5.9	6.0	5.8	5.7	5.8	5.8	5.8	5.9	5.7
	900 to 885	5.7	5.8	5.9	5.8	6.0	5.8	5.7	5.8	5.8	5.7	5.9	5.7
	885 to 870	5.7	5.9	6.0	5.8	5.9	5.8	5.7	5.8	5.8	5.7	5.9	5.7
	870 to 855	5.7	5.9	6.0	5.9	5.8	5.8	5.7	5.8	5.8	5.8	5.9	5.7
	< 855	5.5	5.7	5.8	5.6	5.6	5.6	5.7	5.8	5.7	5.6	6.0	5.9

< Acidic					Neutral								Basic >
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee C_2_562.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1980 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.4	6.4	6.7	7.0	7.2	7.5	7.4	6.7	6.5	6.5	6.3
	1095 to 1080	6.4	6.4	6.6	6.7	6.7	7.1	7.3	7.4	7.0	6.6	6.7	6.3
	1080 to 1065	6.4	6.4	6.5	6.6	6.5	7.0	6.9	6.9	6.8	6.5	6.7	6.4
	1065 to 1050	6.3	6.3	6.6	6.5	6.5	6.8	6.6	6.6	6.6	6.4	6.6	6.4
	1050 to 1035	6.3	6.3	6.5	6.4	6.5	6.7	6.5	6.5	6.5	6.4	6.6	6.3
	1035 to 1020	6.4	6.3	6.5	6.4	6.4	6.6	6.3	6.2	6.4	6.3	6.6	6.3
	1020 to 1005	6.5	6.3	6.5	6.3	6.3	6.4	6.0	5.9	6.0	6.2	6.5	6.4
	1005 to 990	6.3	6.2	6.4	6.1	6.2	6.3	5.9	5.8	6.1	6.0	6.4	6.2
	990 to 975	6.3	6.2	6.7	5.9	5.5		5.6	6.2	6.5	6.1	6.6	
	975 to 960												
	960 to 945												
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 964.5 ft

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.3	6.6	6.7	7.1	6.9	6.9	6.9	6.7	6.4	6.6	6.4
	1095 to 1080	6.5	6.5	6.7	6.8	7.0	6.9	7.0	7.1	6.8	6.7	6.8	6.5
	1080 to 1065	6.4	6.4	6.6	6.7	6.9	6.6	6.7	6.8	6.8	6.7	6.8	6.5
	1065 to 1050	6.4	6.4	6.6	6.6	6.7	6.4	6.5	6.6	6.7	6.6	6.7	6.5
	1050 to 1035	6.4	6.3	6.5	6.4	6.5	6.3	6.3	6.4	6.6	6.6	6.7	6.5
	1035 to 1020	6.4	6.4	6.5	6.4	6.4	6.2	6.1	6.1	6.3	6.6	6.8	6.5
	1020 to 1005	6.4	6.4	6.4	6.3	6.3	6.1	5.9	5.9	5.9	6.3	6.7	6.5
	1005 to 990	6.4	6.3	6.3	6.1	6.1	5.9	5.8	5.9	5.9	5.9	6.5	6.4
	990 to 975												
	975 to 960												
	960 to 945												
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 992.2 ft

< Acidic					Neutral					Basic >				
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee C_2_565.4: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1987 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.6	6.2	6.2	6.5	7.2	7.3	7.4	6.9	6.7	6.7	6.3	6.3
	1095 to 1080	6.5	6.4	6.5	6.6	6.8	7.6	7.2	7.2	6.8	6.8	6.7	6.4
	1080 to 1065	6.5	6.4	6.4	6.6	6.8	7.5	7.2	7.0	6.7	6.8	6.7	6.4
	1065 to 1050	6.4	6.2	6.5	6.6	6.7	7.4	7.1	6.8	6.6	6.6	6.6	6.5
	1050 to 1035	6.4	6.2	6.4	6.5	6.7	7.1	6.9	6.7	6.5	6.7	6.7	6.4
	1035 to 1020	6.3	6.2	6.3	6.4	6.5	6.8	6.7	6.5	6.3	6.7	6.6	6.5
	1020 to 1005	6.4	6.1	6.3	6.4	6.5	6.6	6.5	6.3	5.9	6.5	6.6	6.5
	1005 to 990	6.3	6.1	6.3	6.4	6.4	6.6	6.5	6.2	5.9	6.2	6.4	6.3
	990 to 975	6.3	6.0	6.2	6.3	6.2	6.5	6.4	6.0	6.0	6.2	6.0	6.1
	975 to 960	6.3	6.1	6.1	6.2	6.2	6.4	6.4	6.0	5.9	6.2	6.0	5.8
	960 to 945	6.3	6.1	6.2	6.1	6.2	6.3	6.3	6.0	5.9	6.0	5.7	5.7
	945 to 930	6.5	6.2	5.9	6.0	6.1	6.2	6.2	5.9	5.9	6.1	5.5	5.7
	930 to 915			5.9		6.1	5.8		5.6	5.9			
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 918.1 ft

Measurement Reading Range (ft msl)	1991 to 1994	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.1	5.9	6.2	6.5	6.6	6.7	6.7	6.7	6.6	6.0	6.3	6.2
	1095 to 1080	6.1	6.0	6.2	6.5	6.6	6.7	6.7	6.6	6.4	6.2	6.3	6.2
	1080 to 1065	6.1	6.0	6.2	6.3	6.6	6.6	6.5	6.5	6.4	6.1	6.3	6.3
	1065 to 1050	6.0	6.0	6.1	6.2	6.4	6.4	6.3	6.3	6.2	6.1	6.3	6.2
	1050 to 1035	6.0	5.9	6.1	6.2	6.3	6.3	6.1	6.0	5.9	6.0	6.3	6.2
	1035 to 1020	6.0	5.9	6.0	6.1	6.2	6.2	6.0	5.9	5.8	5.9	6.2	6.2
	1020 to 1005	6.0	5.9	6.0	6.1	6.2	6.1	6.0	5.9	5.7	5.8	6.0	6.2
	1005 to 990	6.0	5.9	6.0	6.0	6.1	6.1	5.9	5.9	5.7	5.7	5.8	5.9
	990 to 975	6.0	5.9	5.9	5.9	6.0	6.0	5.9	5.8	5.7	5.6	5.6	5.8
	975 to 960	6.0	5.9	5.9	5.8	5.9	5.9	5.8	5.8	5.6	5.6	5.6	5.5
	960 to 945	5.9	5.9	5.9	5.8	5.9	5.9	5.8	5.8	5.6	5.5	5.5	5.5
	945 to 930	5.7	5.9	5.9	5.7	5.8	5.9	5.7	5.7	5.6	5.5	5.6	5.6
	930 to 915	6.0				5.8		5.7	5.8	5.6		5.3	
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 926.6 ft

< Acidic					Neutral							Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee D_2_551.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1975 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.4	6.3	6.3	6.4	6.4	6.5	6.8	6.5	6.7	6.6	6.4	6.2
	1095 to 1080	7.1	6.3	6.6	6.7	6.7	7.0	7.0	7.0	6.9	6.9	6.9	6.6
	1080 to 1065												
	1065 to 1050												
	1050 to 1035												
	1035 to 1020												
	1020 to 1005												
	1005 to 990												
	990 to 975												
	975 to 960												
	960 to 945												
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 1082.8 ft

Measurement Reading Range (ft msl)	1991 to 2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	5.8	6.5	6.4	6.9	6.7	5.7	6.7	6.6	6.6	6.7	6.8	6.2
	1095 to 1080		6.7						7.1			6.9	
	1080 to 1065												
	1065 to 1050												
	1050 to 1035												
	1035 to 1020												
	1020 to 1005												
	1005 to 990												
	990 to 975												
	975 to 960												
	960 to 945												
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 1083.7 ft

< Acidic					Neutral								Basic >
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee D_2_564.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1976 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.2	6.2	6.2	6.6	6.9	7.1	7.4	7.3	7.0	6.5	6.5	6.1
	1095 to 1080	6.4	6.3	6.4	6.6	6.8	7.2	7.3	7.1	7.0	6.6	6.6	6.2
	1080 to 1065	6.5	6.2	6.4	6.5	6.5	7.0	6.9	6.8	6.7	6.5	6.6	6.2
	1065 to 1050	6.3	6.1	6.4	6.5	6.5	6.8	6.6	6.4	6.4	6.5	6.5	6.2
	1050 to 1035	6.4	6.0	6.3	6.3	6.4	6.7	6.5	6.3	6.2	6.3	6.5	6.1
	1035 to 1020	6.3	6.0	6.2	6.3	6.3	6.5	6.3	6.2	6.2	6.2	6.3	6.1
	1020 to 1005	6.4	6.0	6.2	6.2	6.2	6.4	6.2	6.0	6.0	6.0	6.3	6.1
	1005 to 990	6.3	6.0	6.2	6.2	6.3	6.4	6.1	6.0	6.0	5.9	6.1	6.0
	990 to 975	6.3	6.0	6.2	6.2	6.2	6.4	6.3	6.0	6.1	5.9	5.9	5.9
	975 to 960	6.5	6.1	6.2	6.2	6.3	6.3	6.2	6.1	6.1	6.0	6.1	5.8
	960 to 945	6.3	6.1	6.3	6.2	6.3	6.4	6.2	6.2	6.2	5.9	5.9	5.7
	945 to 930	6.2	6.1	6.1	6.2	6.2	6.3	6.3	6.1	6.1	6.0	5.9	5.6
	930 to 915	6.1	6.1	6.1	6.2	6.2	6.3	6.3	6.1	6.0	6.0	5.8	5.5
	915 to 900	6.1	5.8	6.1	6.1	6.1	6.2	6.2	6.0	6.0	6.0	5.8	5.6
	900 to 885	6.1	5.8	6.1	6.1	6.2	6.1	6.1	5.9	6.0	6.0	5.8	5.5
	885 to 870	6.0	5.8	6.0	6.2	6.0	6.3	6.1	5.9	5.9	6.1	5.7	5.6
	870 to 855	5.4		5.9	6.4	6.1	6.0	6.1	6.2	5.6	5.9	5.5	5.6
	< 855	*Minimum Reading 864.7 ft*											

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.4	6.3	6.6	6.8	7.1	6.9	6.9	7.0	6.8	6.5	6.6	6.6
	1095 to 1080	6.5	6.5	6.6	6.8	7.0	6.9	6.8	7.0	6.8	6.7	6.8	6.6
	1080 to 1065	6.4	6.4	6.6	6.7	6.9	6.8	6.7	6.9	6.7	6.7	6.8	6.6
	1065 to 1050	6.5	6.4	6.5	6.6	6.8	6.7	6.6	6.7	6.7	6.7	6.7	6.6
	1050 to 1035	6.5	6.4	6.5	6.6	6.7	6.6	6.5	6.6	6.6	6.6	6.8	6.6
	1035 to 1020	6.4	6.4	6.5	6.5	6.6	6.5	6.4	6.5	6.4	6.6	6.7	6.6
	1020 to 1005	6.4	6.4	6.4	6.4	6.5	6.4	6.3	6.3	6.2	6.4	6.6	6.6
	1005 to 990	6.5	6.3	6.4	6.3	6.4	6.2	6.1	6.2	6.1	6.0	6.3	6.4
	990 to 975	6.4	6.4	6.4	6.3	6.3	6.1	6.0	6.0	6.0	5.9	6.0	6.1
	975 to 960	6.2	6.3	6.3	6.2	6.2	6.0	5.9	6.0	5.9	5.9	5.9	5.9
	960 to 945	6.1	6.2	6.3	6.1	6.2	5.9	5.8	6.0	5.8	5.8	5.9	5.8
	945 to 930	5.9	6.1	6.2	6.0	6.1	5.9	5.8	5.9	5.9	5.8	5.9	5.8
	930 to 915	5.8	6.1	6.2	6.0	6.0	5.9	5.8	5.9	5.8	5.8	5.9	5.8
	915 to 900	5.9	6.1	6.1	6.0	6.1	5.8	5.8	5.9	5.8	5.8	5.9	5.8
	900 to 885	5.7	5.8	6.0	5.8	5.8	5.8	5.7	5.9	5.7	5.7	5.7	5.5
	885 to 870	5.7	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.9	5.7
	870 to 855	5.6	5.7	5.7	5.6		5.8	6.3	6.0		5.7	6.1	
	< 855	*Minimum Reading 864.4 ft*											

< Acidic					Neutral							Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee D_2_564.1: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1987 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.2	6.3	6.3	6.3	6.8	7.4	7.2	6.9	6.5	6.5	6.3
	1095 to 1080	6.5	6.5	6.6	6.6	6.6	6.8	7.2	7.3	6.8	6.7	6.7	6.4
	1080 to 1065	6.6	6.5	6.7	6.6	6.7	6.8	6.9	6.9	6.7	6.8	6.8	6.4
	1065 to 1050	6.5	6.4	6.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6	6.4
	1050 to 1035	6.7	6.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.6	6.4	6.3
	1035 to 1020	6.7	6.3	6.4	6.4	6.3	6.3	6.3	6.3	6.2	6.4	6.4	6.3
	1020 to 1005	7.1	6.3	6.4	6.4	6.4	6.4	6.2	6.1	6.0	6.3	6.3	6.3
	1005 to 990	6.9	6.3	6.4	6.2	6.2	6.3	6.2	6.1	6.1	6.3	6.3	6.1
	990 to 975	6.9	6.3	6.4	6.2	5.9	6.1	6.2	6.0	6.0	6.5	6.2	6.1
	975 to 960	7.3	6.4	7.0	6.6	5.7	6.1	6.2	6.1	6.1	7.0	6.2	6.2
	960 to 945					5.8							
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 959.9 ft

Measurement Reading Range (ft msl)	1991 to 2017	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.5	6.3	6.6	6.6	7.0	6.8	6.8	6.9	6.6	6.4	6.7	6.5
	1095 to 1080	6.5	6.4	6.6	6.6	6.9	6.8	6.7	6.9	6.7	6.6	6.7	6.6
	1080 to 1065	6.5	6.4	6.6	6.6	6.8	6.7	6.7	6.8	6.7	6.7	6.7	6.6
	1065 to 1050	6.5	6.3	6.5	6.6	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.5
	1050 to 1035	6.5	6.4	6.5	6.5	6.7	6.6	6.6	6.6	6.6	6.6	6.7	6.6
	1035 to 1020	6.4	6.3	6.6	6.5	6.7	6.6	6.6	6.6	6.6	6.6	6.7	6.6
	1020 to 1005	6.5	6.4	6.6	6.5	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.6
	1005 to 990	6.4	6.3	6.5	6.4	6.7	6.5	6.5	6.6	6.6	6.5	6.7	6.6
	990 to 975	6.4	6.3	6.6	6.4	6.7	6.6	6.5	6.5	6.5	6.5	6.7	6.5
	975 to 960	6.2	6.0	6.4	6.3	6.4	6.4	6.3	6.1	6.2	6.3	6.5	6.3
	960 to 945												
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 963 ft

< Acidic						Neutral						Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee E_2_557.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1975 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.3	6.3	6.5	6.7	6.7	7.0	7.2	7.2	6.8	6.4	6.6	6.2
	1095 to 1080	6.4	6.4	6.6	6.7	6.7	7.0	7.2	7.0	6.9	6.5	6.7	6.2
	1080 to 1065	6.4	6.3	6.5	6.6	6.5	6.9	7.0	6.7	6.7	6.4	6.7	6.2
	1065 to 1050	6.3	6.2	6.5	6.5	6.5	6.6	6.7	6.4	6.4	6.5	6.6	6.2
	1050 to 1035	6.3	6.1	6.4	6.4	6.4	6.6	6.5	6.2	6.2	6.2	6.6	6.2
	1035 to 1020	6.3	6.1	6.4	6.3	6.3	6.4	6.3	6.1	6.1	6.1	6.4	6.2
	1020 to 1005	6.4	6.1	6.4	6.2	6.3	6.3	6.2	6.0	6.0	6.0	6.2	6.1
	1005 to 990	6.3	6.0	6.3	6.3	6.3	6.3	6.2	6.0	6.0	5.8	6.1	5.9
	990 to 975	6.3	6.1	6.3	6.3	6.3	6.3	6.1	6.0	6.1	5.8	5.8	5.8
	975 to 960	6.3	6.2	6.4	6.3	6.3	6.2	6.2	6.0	6.0	5.8	5.9	5.7
	960 to 945	6.4	6.4	6.4	6.3	6.4	6.4	6.2	6.0	6.0	5.9	5.9	5.7
	945 to 930	6.2	6.3	6.4	6.2	6.3	6.3	6.2	6.0	6.0	5.8	5.8	5.5
	930 to 915	6.1	6.4	6.3	6.2	6.3	6.2	6.2	6.0	5.9	5.8	5.8	5.5
	915 to 900	6.1	6.1	6.3	6.2	6.2	6.2	6.1	6.0	6.2	5.8	5.7	5.5
	900 to 885	6.0	6.2	6.3	6.2	6.2	6.2	6.2	5.9	6.0	5.9	5.8	5.5
	885 to 870	5.9	6.2	6.2	6.2	6.2	6.1	6.1	5.9	6.0	6.0	5.6	5.5
	870 to 855	5.8	6.2	6.2	6.2	6.2	6.1	6.3	5.9	6.0	5.9	5.7	5.5
	< 855	5.9	6.1	6.1	6.1	6.2	6.1	6.2	6.0	6.0	6.1	5.8	5.5

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.4	6.2	6.6	6.7	7.1	6.9	6.9	7.1	6.8	6.4	6.5	6.5
	1095 to 1080	6.5	6.4	6.7	6.8	7.0	7.1	7.0	7.1	6.8	6.7	6.7	6.6
	1080 to 1065	6.5	6.4	6.6	6.7	7.0	6.9	6.9	6.9	6.8	6.8	6.7	6.6
	1065 to 1050	6.5	6.4	6.5	6.6	6.8	6.7	6.7	6.7	6.6	6.7	6.7	6.6
	1050 to 1035	6.5	6.3	6.4	6.5	6.6	6.5	6.4	6.4	6.3	6.6	6.7	6.6
	1035 to 1020	6.5	6.3	6.4	6.4	6.5	6.4	6.2	6.2	6.1	6.6	6.7	6.6
	1020 to 1005	6.5	6.3	6.4	6.4	6.4	6.2	6.1	6.0	5.9	6.3	6.6	6.6
	1005 to 990	6.5	6.3	6.4	6.2	6.3	6.1	6.0	6.0	5.9	5.9	6.3	6.4
	990 to 975	6.4	6.3	6.4	6.2	6.2	6.1	5.9	6.0	5.9	5.8	5.9	6.1
	975 to 960	6.3	6.3	6.3	6.2	6.2	6.0	5.9	5.9	5.8	5.8	5.9	5.8
	960 to 945	6.1	6.3	6.3	6.1	6.2	6.0	5.8	5.9	5.8	5.8	5.8	5.7
	945 to 930	6.1	6.2	6.2	6.0	6.1	5.9	5.8	5.9	5.8	5.7	5.8	5.7
	930 to 915	6.0	6.2	6.2	6.0	6.1	5.9	5.8	5.9	5.8	5.8	5.8	5.7
	915 to 900	5.9	6.2	6.2	6.0	6.1	5.9	5.8	5.9	5.8	5.8	5.8	5.7
	900 to 885	5.9	6.1	6.2	5.9	6.1	5.8	5.7	5.8	5.7	5.7	5.8	5.7
	885 to 870	5.9	6.1	6.2	5.9	6.0	5.9	5.8	5.8	5.7	5.7	5.8	5.7
	870 to 855	6.0	6.1	6.1	5.9	6.0	5.8	5.7	5.8	5.7	5.7	5.8	5.7
	< 855	6.0	6.1	6.1	5.8	6.0	5.8	5.8	5.8	5.7	5.7	5.8	5.8

< Acidic						Neutral						Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee F_2_554.8: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1986 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.7	6.2	6.5	6.7	7.0	7.1	7.3	7.3	6.9	6.8	6.4	6.4
	1095 to 1080	6.7	6.6	6.8	6.8	7.1	7.6	7.3	7.4	6.9	6.8	6.9	6.4
	1080 to 1065	6.7	6.6	6.8	6.8	6.9	7.5	7.4	7.5	6.8	6.7	6.8	6.5
	1065 to 1050	6.6	6.5	6.9	6.7	6.8	7.3	7.3	7.0	6.6	6.8	6.9	6.5
	1050 to 1035	6.6	6.5	6.7	6.6	6.7	7.1	6.9	6.7	6.6	6.7	6.8	6.5
	1035 to 1020	6.6	6.5	6.7	6.5	6.5	6.6	6.7	6.4	6.4	6.6	6.8	6.5
	1020 to 1005	6.6	6.4	6.7	6.5	6.5	6.5	6.3	6.1	6.0	6.5	6.7	6.5
	1005 to 990	6.6	6.4	6.6	6.4	6.4	6.3	6.3	6.0	5.9	6.2	6.6	6.5
	990 to 975	6.5	6.3	6.5	6.4	6.3	6.2	6.3	6.0	5.9	6.1	6.4	6.5
	975 to 960	6.5	6.4	6.5	6.2	6.3	6.1	6.3	6.0	6.0	6.1	6.1	6.3
	960 to 945	6.5	6.0	6.6		5.8	6.0	6.0	6.3	6.0	6.3	6.3	6.1
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885					*Minimum Reading 946.5 ft*							
	885 to 870												
	870 to 855												
	< 855												

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.5	6.4	6.6	6.7	7.0	7.1	7.2	7.4	6.9	6.4	6.6	6.5
	1095 to 1080	6.6	6.5	6.7	6.8	7.0	7.2	7.6	7.6	6.8	6.6	6.8	6.6
	1080 to 1065	6.6	6.5	6.6	6.7	6.8	6.9	7.2	7.2	6.7	6.7	6.8	6.6
	1065 to 1050	6.6	6.5	6.6	6.5	6.6	6.6	6.5	6.7	6.6	6.6	6.7	6.6
	1050 to 1035	6.6	6.4	6.5	6.4	6.4	6.3	6.2	6.4	6.4	6.5	6.7	6.6
	1035 to 1020	6.6	6.4	6.5	6.4	6.3	6.2	6.0	6.1	6.2	6.5	6.7	6.6
	1020 to 1005	6.5	6.4	6.4	6.3	6.2	6.1	5.9	5.9	5.9	6.3	6.6	6.6
	1005 to 990	6.6	6.4	6.4	6.2	6.2	6.0	5.8	5.9	5.8	5.8	6.5	6.5
	990 to 975	6.5	6.4	6.4	6.1	6.1	5.9	5.8	5.9	5.8	5.7	6.1	6.3
	975 to 960	6.5	6.4	6.3	6.1	6.0	5.8	5.7	5.9	5.8	5.8	6.1	6.1
	960 to 945	6.3	6.3	6.2	5.9	6.0	5.8	5.8	5.9	6.0	5.9	6.1	6.1
	945 to 930												
	930 to 915												
	915 to 900												
	900 to 885					*Minimum Reading 945.3 ft*							
	885 to 870												
	870 to 855												
	< 855												

< Acidic					Neutral								Basic >
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee F_2_556.0: Monthly pH (SI) (Top: Pre Bad Creek Operation, Bottom: Post Bad Creek Operation)

Measurement Reading Range (ft msl)	1975 to 1991	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.6	6.3	6.4	6.7	6.8	7.2	7.2	7.3	6.9	6.3	6.6	6.3
	1095 to 1080	6.5	6.5	6.6	6.8	6.8	7.3	7.4	7.3	6.9	6.5	6.7	6.3
	1080 to 1065	6.6	6.3	6.6	6.9	6.6	6.8	7.1	6.8	6.6	6.4	6.6	6.3
	1065 to 1050	6.6	6.4	6.5	6.7	6.6	6.6	6.6	6.5	6.2	6.5	6.5	6.3
	1050 to 1035	6.5	6.2	6.4	6.6	6.5	6.6	6.5	6.2	6.1	6.3	6.5	6.2
	1035 to 1020	6.5	6.2	6.4	6.6	6.4	6.3	6.3	6.1	6.1	6.1	6.4	6.2
	1020 to 1005	6.6	6.2	6.4	6.5	6.3	6.2	6.3	6.0	5.9	6.0	6.2	6.2
	1005 to 990	6.5	6.1	6.3	6.5	6.4	6.2	6.2	6.0	5.9	5.9	6.1	6.1
	990 to 975	6.5	6.1	6.3	6.5	6.3	6.2	6.1	6.0	6.0	5.8	5.9	6.0
	975 to 960	6.5	6.3	6.4	6.4	6.3	6.2	6.1	6.0	5.9	5.8	5.9	5.9
	960 to 945	6.5	6.4	6.5	6.4	6.3	6.2	6.2	5.9	5.9	6.0	5.9	5.9
	945 to 930	6.5	6.3	6.3	6.2	6.2	6.2	6.1	5.9	6.0	5.9	5.8	5.9
	930 to 915	6.6	6.4	6.4	6.4	6.1	5.7	6.1	5.9	5.9	6.1	6.2	5.9
	915 to 900					6.3							
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 914.1 ft

Measurement Reading Range (ft msl)	1991 to 2015	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1110 to 1095	6.5	6.3	6.6	6.7	7.2	7.1	7.2	7.3	6.8	6.5	6.6	6.5
	1095 to 1080	6.6	6.5	6.7	6.9	7.3	7.3	7.5	7.5	6.9	6.7	6.8	6.6
	1080 to 1065	6.6	6.5	6.7	6.8	7.1	7.1	7.3	7.3	6.7	6.7	6.8	6.6
	1065 to 1050	6.6	6.4	6.6	6.6	6.8	6.8	6.8	6.8	6.6	6.6	6.8	6.6
	1050 to 1035	6.6	6.4	6.5	6.4	6.5	6.4	6.2	6.3	6.3	6.6	6.7	6.6
	1035 to 1020	6.6	6.4	6.5	6.4	6.4	6.2	6.1	6.1	6.1	6.5	6.7	6.6
	1020 to 1005	6.5	6.4	6.4	6.3	6.3	6.1	6.0	6.0	5.9	6.3	6.6	6.6
	1005 to 990	6.5	6.4	6.4	6.3	6.3	6.1	5.9	6.0	5.8	5.9	6.4	6.4
	990 to 975	6.5	6.4	6.4	6.2	6.2	6.0	5.9	6.0	5.8	5.8	6.0	6.2
	975 to 960	6.4	6.4	6.4	6.2	6.1	5.9	5.8	5.9	5.8	5.8	5.8	6.0
	960 to 945	6.4	6.4	6.3	6.1	6.1	5.9	5.7	5.9	5.7	5.7	5.8	5.9
	945 to 930	6.4	6.3	6.3	6.0	6.0	5.8	5.7	5.8	5.8	5.8	5.9	5.8
	930 to 915	6.2	6.2	6.5	5.9	6.0	5.7	5.8	5.8	5.7	5.8	5.9	5.9
	915 to 900												
	900 to 885												
	885 to 870												
	870 to 855												
	< 855												

Minimum Reading 918.4 ft

< Acidic **Neutral** **Basic >**

1	2	3	4	5	6	7	8	9	10	11	12	13	14

Lake Jocassee

Phosphorus

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Averaged Phosphorus (mg/L) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.008	0.005	0.011	0.028	0.008	0.005	0.005	0.006	0.008	0.005	0.039	
1095 to 1080	0.015	0.015	0.015	0.019	0.015	0.015		0.015	0.015	0.015	0.015	0.015
1080 to 1065		0.005	0.011	0.017	0.008	0.005	0.005	0.016	0.006	0.005	0.029	
1065 to 1050	0.015	0.015	0.015	0.015	0.015	0.015	0.037	0.015	0.015	0.015	0.015	0.017
1050 to 1035				0.016	0.017	0.005	0.005	0.007	0.006	0.015		
1035 to 1020	0.015	0.010	0.013	0.015	0.015	0.015	0.015	0.015	0.015		0.038	
1020 to 1005							0.005		0.005	0.015	0.015	0.040
1005 to 990	0.015	0.010	0.013	0.014	0.008	0.005		0.010		0.005	0.027	
990 to 975				0.015	0.015	0.032	0.015	0.015	0.015	0.015	0.015	0.015
975 to 960		0.010	0.009	0.018	0.006	0.005	0.005	0.034	0.007	0.005	0.042	
960 to 945	0.015		0.015	0.015	0.015	0.034	0.015	0.015	0.015	0.015	0.015	0.015
945 to 930		0.005	0.011	0.015	0.008	0.005	0.005	0.009	0.005	0.005	0.036	
930 to 915	0.015	0.015	0.015	0.020	0.020	0.015	0.019	0.015	0.015	0.015	0.015	0.015
915 to 900		0.005	0.010	0.014	0.006	0.005	0.005	0.024	0.005	0.023	0.032	
900 to 885	0.015	0.015	0.015	0.015	0.015			0.015	0.015	0.015	0.015	0.026
885 to 870			0.010		0.020	0.005	0.005	0.013	0.005	0.016		
870 to 855	0.015	0.010	0.015	0.015	0.015	0.015	0.015	0.015	0.015			
< 855		0.005	0.012	0.019	0.016	0.011	0.005	0.013	0.006	0.016	0.015	0.015

Jocassee B_2_558.7: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.003	0.006	0.006	0.006	0.006	0.003	0.005	0.005	0.004	0.005	0.006	0.008
1095 to 1080	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.005	0.005	0.006	0.006	0.005
1080 to 1065	0.005	0.005	0.005	0.006	0.005	0.006	0.005	0.006	0.005	0.006	0.006	0.005
1065 to 1050	0.005	0.005	0.005	0.006	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.005
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855											0.004	

Legend 0.000 ... **0.020**

Jocassee B_3_558.0: Monthly Averaged Phosphorus (mg/L) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.008	0.007	0.008	0.011	0.010	0.010	0.008	0.011	0.008	0.011	0.014	0.005
1095 to 1080	0.010	0.015	0.009	0.008	0.012	0.013	0.011	0.013	0.011	0.012	0.027	0.011
1080 to 1065	0.005	0.007	0.008	0.010	0.009	0.008	0.009	0.010	0.007	0.011	0.010	0.005
1065 to 1050	0.011	0.013	0.014	0.014	0.014	0.009	0.012	0.012	0.010	0.012	0.011	0.017
1050 to 1035	0.009	0.008	0.005	0.009	0.006	0.009	0.008	0.008	0.006	0.012	0.009	0.005
1035 to 1020	0.010	0.009	0.011	0.018	0.017	0.010	0.011	0.011	0.008	0.019	0.013	0.011
1020 to 1005	0.007	0.011	0.006	0.006	0.008	0.013	0.008	0.007	0.007	0.009	0.014	0.011
1005 to 990	0.015	0.009	0.010	0.012	0.012	0.008	0.008	0.009	0.006	0.009	0.019	0.008
990 to 975	0.006	0.008	0.006	0.008	0.017	0.025	0.019	0.009	0.008	0.009	0.010	0.026
975 to 960	0.005	0.008	0.010	0.009	0.013	0.007	0.006	0.010	0.006	0.007	0.009	0.006
960 to 945	0.021	0.015	0.015	0.015	0.015	0.015	0.034	0.015	0.015	0.015	0.015	0.015
945 to 930	0.006	0.005	0.008	0.010	0.007	0.005	0.005	0.007	0.007	0.007	0.014	0.005
930 to 915	0.015	0.015	0.015	0.016	0.015	0.015	0.038	0.015	0.015	0.015	0.029	0.017
915 to 900	0.005	0.009	0.007	0.013	0.014	0.010	0.009	0.013	0.008	0.011	0.014	0.007
900 to 885	0.027	0.019	0.015	0.015	0.015	0.015	0.029	0.015	0.012	0.010	0.010	0.013
885 to 870	0.009	0.005	0.008	0.010	0.006	0.006	0.006	0.025	0.007	0.022	0.005	0.005
870 to 855	0.017	0.010	0.015	0.016	0.015	0.056	0.015	0.015	0.010	0.005	0.022	0.008
< 855	0.021	0.010	0.010	0.012	0.017	0.012	0.009	0.011	0.012	0.011	0.016	0.011

Jocassee B_3_558.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.006	0.008	0.009	0.007	0.007	0.007	0.005	0.008	0.006	0.007	0.007	0.010
1095 to 1080	0.005	0.005	0.005	0.006	0.006	0.005	0.005	0.006	0.005	0.007	0.012	0.008
1080 to 1065	0.009	0.012	0.008	0.008	0.007	0.010	0.006	0.009	0.009	0.006	0.008	0.019
1065 to 1050	0.005	0.006	0.008	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.005	0.004
1050 to 1035	0.014	0.014	0.008	0.008	0.007	0.010	0.006	0.007	0.011	0.012	0.006	0.019
1035 to 1020	0.002	0.006	0.006					0.005	0.004	0.004	0.005	0.005
1020 to 1005	0.013	0.011	0.010	0.009	0.010	0.010	0.007	0.007	0.012	0.011	0.007	0.018
1005 to 990	0.002		0.005				0.005	0.005	0.004	0.002	0.002	0.004
990 to 975	0.014	0.006	0.009	0.010	0.008	0.009	0.008	0.012	0.011	0.010	0.007	0.017
975 to 960	0.002	0.005	0.023					0.004	0.002	0.002	0.002	0.002
960 to 945	0.005	0.004	0.005		0.003			0.002		0.005		0.002
945 to 930	0.013	0.007	0.011	0.009	0.010	0.013	0.006	0.011	0.006	0.014	0.007	0.019
930 to 915			0.005							0.002		
915 to 900	0.011	0.006	0.009	0.010	0.007	0.012	0.006	0.010	0.011	0.011	0.007	0.020
900 to 885		0.041	0.027						0.002	0.002	0.002	0.002
885 to 870	0.014	0.007	0.009	0.010	0.007	0.011	0.006	0.008	0.011	0.012	0.007	0.025
870 to 855	0.002								0.002	0.002	0.002	0.002
< 855	0.012	0.007	0.012	0.011	0.006	0.012	0.007	0.011	0.009	0.011	0.008	0.016
	Legend	**0.000**										**0.020**

Jocassee C_2_559.0: Monthly Averaged Phosphorus (mg/L) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.006	0.007	0.010	0.014	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.006
1095 to 1080	0.016	0.015	0.015	0.016	0.036	0.027	0.032	0.015	0.015	0.015	0.032	0.013
1080 to 1065	0.005	0.006	0.010	0.010	0.005	0.006	0.006	0.005	0.006	0.005	0.005	0.005
1065 to 1050	0.040	0.020	0.015	0.055	0.015	0.020	0.038		0.015	0.010	0.010	0.012
1050 to 1035	0.009	0.005	0.006	0.024	0.006	0.006	0.005	0.005	0.007	0.005	0.005	0.005
1035 to 1020	0.015	0.010	0.014	0.018	0.015	0.031	0.020	0.015	0.012	0.005	0.030	0.008
1020 to 1005	0.005	0.015	0.005	0.005	0.006	0.006	0.005	0.005	0.005	0.015	0.010	0.015
1005 to 990	0.015	0.010	0.013	0.017	0.012	0.005		0.074	0.006	0.020	0.005	0.006
990 to 975	0.006	0.010	0.005	0.012	0.006	0.020	0.018	0.010	0.015	0.015	0.010	0.015
975 to 960		0.010	0.010	0.016	0.014	0.005	0.005	0.033	0.007	0.007	0.030	0.006
960 to 945	0.015	0.015	0.015	0.015	0.015	0.016	0.016	0.015	0.015	0.015	0.015	0.015
945 to 930	0.022	0.005	0.009	0.010	0.006	0.005	0.005	0.016	0.006	0.005	0.016	0.005
930 to 915	0.015	0.015	0.015	0.015	0.015	0.035	0.015	0.015	0.015	0.015	0.015	0.011
915 to 900	0.014	0.006	0.008	0.010	0.006	0.005	0.005	0.010	0.005	0.006	0.005	0.005
900 to 885	0.015	0.015	0.015	0.018	0.015	0.015		0.015	0.015	0.015	0.016	0.011
885 to 870	0.006	0.006	0.006	0.032	0.010	0.005	0.005	0.008	0.006	0.033	0.005	0.005
870 to 855	0.015	0.010	0.014	0.015	0.015	0.016	0.015	0.015	0.010	0.005	0.006	0.005
< 855	0.023	0.011	0.011	0.013	0.010	0.010	0.020	0.023	0.009	0.015	0.013	0.011

Jocassee C_2_559.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.006	0.007	0.007	0.008	0.006	0.009	0.003	0.007	0.005	0.005	0.007	0.013
1095 to 1080	0.005	0.005	0.005	0.006	0.006	0.005	0.006	0.006	0.004	0.005	0.006	0.004
1080 to 1065	0.009	0.008	0.010	0.009	0.007	0.009	0.005	0.008	0.009	0.007	0.005	0.013
1065 to 1050	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.004
1050 to 1035	0.013	0.010	0.011	0.009	0.009	0.011	0.006	0.010	0.012	0.008	0.013	0.018
1035 to 1020	0.002								0.002	0.004	0.004	0.002
1020 to 1005	0.014	0.009	0.011	0.010	0.007	0.008	0.004	0.012	0.011	0.008	0.013	0.019
1005 to 990	0.015								0.002	0.002	0.002	0.002
990 to 975	0.019	0.010	0.010	0.009	0.008	0.011	0.004	0.010	0.010	0.004	0.015	0.018
975 to 960	0.004		0.031					0.002	0.002	0.002	0.002	0.002
960 to 945		0.005		0.005				0.004		0.005	0.035	0.002
945 to 930	0.011	0.011	0.009	0.010	0.008	0.015	0.005	0.014	0.008	0.010	0.003	0.016
930 to 915										0.002		
915 to 900	0.011	0.013	0.010	0.010	0.008	0.012	0.007	0.013	0.011	0.007	0.015	0.011
900 to 885			0.013						0.002	0.002	0.002	0.002
885 to 870	0.011	0.011	0.011	0.009	0.009	0.013	0.005	0.012	0.011	0.007	0.015	0.010
870 to 855									0.002	0.002	0.003	0.002
< 855	0.012	0.011	0.011	0.010	0.009	0.015	0.006	0.011	0.010	0.008	0.013	0.008

Legend **0.000** **0.020**

Jocassee C_2_560.0: Monthly Averaged Phosphorus (mg/L) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.011	0.009	0.008	0.009	0.012	0.007	0.009	0.008	0.007	0.010	0.009	0.005
1095 to 1080	0.017	0.015	0.009	0.020	0.016	0.011	0.014	0.012	0.012	0.012	0.017	0.010
1080 to 1065	0.008	0.007	0.008	0.008	0.009	0.008	0.011	0.010	0.006	0.013	0.008	0.005
1065 to 1050	0.017	0.010	0.010	0.051	0.012	0.011	0.013	0.010	0.011	0.011	0.016	0.009
1050 to 1035	0.008	0.007	0.006	0.008	0.006	0.008	0.010	0.011	0.008	0.008	0.008	0.005
1035 to 1020	0.014	0.008	0.011	0.010	0.014	0.013	0.011	0.010	0.010	0.008	0.011	0.013
1020 to 1005	0.008	0.008	0.006	0.007	0.008	0.006	0.009	0.007	0.005	0.009	0.010	0.008
1005 to 990	0.010	0.008	0.010	0.017	0.014	0.007	0.009	0.012	0.008	0.008	0.010	0.006
990 to 975	0.009	0.010	0.006	0.006	0.008	0.009	0.014	0.011	0.010	0.010	0.009	0.010
975 to 960	0.011	0.008	0.011	0.010	0.012	0.005	0.009	0.011	0.010	0.007	0.007	0.005
960 to 945		0.024	0.015	0.033	0.015	0.015	0.015	0.015	0.015	0.015		0.010
945 to 930	0.005	0.007	0.010	0.010	0.005	0.005	0.005	0.010	0.006	0.006	0.015	0.005
930 to 915	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.012
915 to 900	0.008	0.007	0.007	0.010	0.010	0.008	0.009	0.012	0.010	0.008	0.010	0.005
900 to 885	0.015	0.016	0.015	0.018	0.022	0.015	0.015	0.015	0.015	0.010	0.014	0.011
885 to 870	0.007	0.006	0.006	0.010	0.011	0.005	0.005	0.017	0.005	0.007	0.005	0.008
870 to 855	0.015	0.009	0.014		0.011	0.015	0.015	0.015	0.009	0.005	0.019	0.005
< 855	0.011	0.012	0.012	0.012	0.013	0.008	0.008	0.011	0.011	0.008	0.013	0.022

Jocassee C_2_560.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.007	0.007	0.009	0.009	0.006	0.009	0.005	0.008	0.007	0.005	0.007	0.013
1095 to 1080	0.005	0.009	0.006	0.006	0.005	0.006	0.007	0.005	0.005	0.004	0.005	0.005
1080 to 1065	0.009	0.009	0.011	0.009	0.007	0.009	0.007	0.008	0.009	0.007	0.009	0.008
1065 to 1050	0.005	0.005	0.005	0.006	0.005	0.005	0.007	0.005	0.005	0.004	0.004	0.005
1050 to 1035	0.013	0.009	0.010	0.010	0.006	0.012	0.006	0.013	0.013	0.007	0.009	0.010
1035 to 1020	0.002								0.002	0.002	0.004	0.002
1020 to 1005	0.013	0.008	0.010	0.010	0.007	0.012	0.005	0.014	0.010	0.007	0.010	0.010
1005 to 990	0.002								0.002	0.002	0.003	0.002
990 to 975	0.017	0.010	0.011	0.011	0.006	0.011	0.005	0.010	0.011	0.009	0.010	0.011
975 to 960	0.004		0.003					0.002	0.002	0.002	0.003	0.002
960 to 945		0.004		0.007				0.004		0.005	0.023	0.002
945 to 930	0.011	0.008	0.011	0.012	0.006	0.011	0.006	0.014	0.009	0.009	0.003	0.008
930 to 915										0.002		
915 to 900	0.011	0.010	0.011	0.010	0.006	0.013	0.004	0.011	0.013	0.009	0.009	0.009
900 to 885									0.002	0.002	0.003	0.002
885 to 870	0.012	0.009	0.010	0.010	0.006	0.012	0.005	0.011	0.010	0.007	0.008	0.010
870 to 855	0.005	0.006	0.004	0.005	0.010	0.012	0.010	0.004	0.003	0.007	0.011	0.002
< 855	0.014	0.014	0.018	0.012	0.003	0.017	0.002	0.017	0.013	0.005	0.007	0.010
	Legend	**0.000**										**0.020**

Jocassee C_2_562.0: Monthly Averaged Phosphorus (mg/L) 1980 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.011	0.009	0.012	0.011	0.010	0.006	0.008	0.011	0.007	0.009	0.007	0.005
1095 to 1080	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.013	0.015	0.015	0.013
1080 to 1065	0.005	0.009	0.011	0.015	0.014	0.015	0.010	0.012	0.011	0.008	0.006	0.005
1065 to 1050	0.015	0.012	0.015	0.015	0.019	0.015	0.042	0.015	0.013	0.012	0.017	0.011
1050 to 1035	0.007	0.010	0.013	0.012	0.007	0.020	0.011	0.017	0.007	0.008	0.007	0.005
1035 to 1020	0.023	0.010	0.014	0.019	0.015		0.019	0.020	0.010	0.009	0.016	0.009
1020 to 1005		0.010	0.010	0.015	0.006		0.012	0.009		0.011		0.015
1005 to 990	0.017	0.013	0.014	0.023	0.011	0.020	0.019	0.016	0.013	0.015	0.010	0.009
990 to 975	0.005	0.009	0.021	0.015	0.008		0.013	0.012		0.009	0.010	
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870	*Minimum Reading 964.5 ft*											
870 to 855												
< 855												

Jocassee C_2_562.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.008	0.009	0.009	0.011	0.007	0.009	0.006	0.007	0.006	0.007	0.009	0.015
1095 to 1080	0.005	0.005	0.006	0.007	0.007	0.007	0.006	0.005	0.004	0.004	0.005	0.004
1080 to 1065	0.009	0.010	0.010	0.011	0.008	0.014	0.008	0.009	0.008	0.008	0.011	0.008
1065 to 1050	0.005	0.006	0.007	0.008	0.009	0.008	0.010	0.005	0.004	0.004	0.005	0.004
1050 to 1035	0.013	0.011	0.011	0.010	0.008	0.014	0.008	0.016	0.013	0.009	0.009	0.004
1035 to 1020	0.002								0.003	0.003	0.004	0.002
1020 to 1005		0.007			0.006			0.012			0.009	
1005 to 990	0.010	0.010	0.011	0.013	0.010	0.021	0.012	0.012	0.012	0.010	0.010	0.008
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870	*Minimum Reading 993.5 ft*											
870 to 855												
< 855												

Legend	0.000										0.020

Jocassee C_2_565.4: Monthly Averaged Phosphorus (mg/L) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.010	0.016	0.011	0.012	0.007	0.007	0.008	0.006	0.009	0.009	0.008	0.006
1095 to 1080	0.031	0.015	0.015	0.034	0.015	0.017	0.015	0.015	0.015	0.015	0.012	0.013
1080 to 1065	0.037	0.010	0.010	0.011	0.007	0.006	0.007	0.017	0.007	0.006		0.005
1065 to 1050	0.015	0.013	0.015	0.015	0.015	0.015	0.048	0.015	0.015	0.011	0.016	0.011
1050 to 1035	0.012	0.007	0.009	0.011	0.006	0.006	0.006	0.025	0.008	0.005		0.005
1035 to 1020	0.015	0.015	0.013	0.021	0.015	0.015	0.034	0.015	0.011	0.006	0.011	0.008
1020 to 1005	0.006	0.017	0.008	0.005	0.005	0.005	0.007	0.005	0.007	0.015	0.043	0.015
1005 to 990	0.015	0.010	0.014	0.031	0.011	0.005		0.070	0.006	0.008	0.039	0.012
990 to 975	0.011	0.016	0.009	0.006	0.005	0.010	0.013	0.010	0.015	0.015	0.019	0.015
975 to 960	0.016	0.015	0.013	0.017	0.013	0.005	0.005	0.062	0.007	0.006	0.012	0.005
960 to 945		0.005	0.015	0.026		0.015	0.015	0.015	0.015	0.015		0.014
945 to 930	0.017	0.018	0.011	0.012	0.015	0.011	0.006	0.015	0.008	0.010	0.023	0.009
930 to 915			0.009		0.006	0.007		0.006	0.015			
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.1 ft

Jocassee C_2_565.4: Monthly Averaged Phosphorus (mg/L) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.013	0.015	0.010	0.011	0.009	0.012	0.008	0.010	0.013	0.009	0.012	0.011
1095 to 1080									0.003	0.002	0.004	0.002
1080 to 1065	0.011	0.011	0.006	0.011	0.009	0.011	0.006	0.009	0.011	0.009	0.014	0.010
1065 to 1050									0.004	0.002	0.002	0.002
1050 to 1035	0.014	0.009	0.009	0.013	0.009	0.013	0.008	0.014	0.013	0.010	0.010	0.009
1035 to 1020	0.002								0.004	0.002	0.003	0.002
1020 to 1005	0.016	0.010	0.007	0.009	0.008	0.013	0.006	0.012	0.012	0.004	0.014	0.010
1005 to 990	0.002								0.002	0.002	0.005	0.002
990 to 975	0.021	0.010	0.011	0.009	0.008	0.013	0.007	0.013	0.012	0.009	0.014	0.009
975 to 960	0.004							0.002	0.003	0.002	0.004	0.002
960 to 945												0.002
945 to 930	0.014	0.011	0.010	0.004	0.014	0.011	0.003	0.012	0.002	0.009	0.016	0.010
930 to 915	0.002				0.004		0.012	0.005	0.012		0.002	
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 926.6 ft

Legend 0.000 ... 0.020

Jocassee D_2_551.0: Monthly Averaged Phosphorus (mg/L) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.010	0.008	0.010	0.013	0.011	0.019	0.014	0.013	0.012	0.012	0.016	0.006
1095 to 1080	0.028	0.042	0.023	0.019	0.015	0.017	0.017	0.015	0.014	0.015	0.009	0.035
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945	*Minimum Reading 1082.8 ft*											
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Jocassee D_2_551.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2011 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.020	0.011	0.005	0.006	0.008	0.020	0.017	0.020	0.034	0.033	0.011	0.058
1095 to 1080		0.007						0.005			0.008	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945	*Minimum Reading 1083.7 ft*											
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Legend 0.000 ... 0.020

Jocassee D_2_564.0: Monthly Averaged Phosphorus (mg/L) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.007	0.007	0.008	0.010	0.007	0.005	0.008	0.010	0.007	0.008	0.007	0.014
1095 to 1080	0.015	0.013	0.010	0.020	0.014	0.015	0.015	0.014	0.010	0.010	0.009	0.010
1080 to 1065	0.016	0.008	0.008	0.010	0.005	0.006	0.009	0.009	0.007	0.008	0.007	0.006
1065 to 1050	0.015	0.010	0.018	0.029	0.012	0.008	0.015	0.015	0.011	0.010	0.027	0.016
1050 to 1035	0.005	0.007	0.011	0.010	0.006	0.006	0.012	0.013	0.009	0.011	0.007	0.005
1035 to 1020	0.015	0.007	0.013	0.015	0.012	0.008	0.013	0.010	0.013	0.006	0.008	0.009
1020 to 1005	0.010	0.010	0.010	0.012	0.008	0.005	0.014	0.008	0.008	0.012	0.008	0.011
1005 to 990	0.010	0.007	0.008	0.019	0.011	0.005	0.009	0.020	0.010	0.014	0.017	0.008
990 to 975	0.037	0.010	0.010	0.010	0.007	0.008	0.007	0.012	0.010	0.013	0.015	0.012
975 to 960	0.010	0.014	0.010	0.011	0.014	0.005	0.012	0.022	0.012	0.007	0.012	0.005
960 to 945	0.015	0.015	0.015	0.016	0.015	0.011	0.015	0.015	0.015	0.015	0.015	0.011
945 to 930	0.007	0.009	0.006	0.011	0.006	0.005	0.005	0.007	0.007	0.005	0.015	0.007
930 to 915	0.015	0.016	0.027	0.015	0.015	0.011	0.015	0.015	0.015	0.015	0.015	0.012
915 to 900	0.008	0.009	0.011	0.005	0.007	0.005	0.005	0.007	0.006	0.005	0.007	0.005
900 to 885	0.021	0.017	0.015	0.016	0.015	0.011	0.012	0.025	0.015	0.010	0.037	0.014
885 to 870	0.025	0.016	0.012	0.015	0.015	0.008	0.005	0.022	0.006	0.015	0.033	0.014
870 to 855	0.015		0.065	0.015	0.009		0.006	0.005	0.007	0.006	0.007	0.009
< 855	Minimum Reading 864.7 ft											

Jocassee D_2_564.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.013	0.011	0.011	0.010	0.008	0.010	0.006	0.008	0.009	0.015	0.012	0.010
1095 to 1080	0.005	0.005	0.005	0.007	0.006	0.005	0.006	0.005	0.005	0.004	0.005	0.004
1080 to 1065	0.010	0.008	0.010	0.013	0.007	0.012	0.007	0.018	0.009	0.005	0.010	0.008
1065 to 1050	0.005	0.006	0.006	0.007	0.005	0.005	0.008	0.005	0.004	0.004	0.005	0.004
1050 to 1035	0.014	0.010	0.011	0.010	0.009	0.012	0.005	0.013	0.012	0.007	0.014	0.009
1035 to 1020	0.002								0.002	0.003	0.003	0.002
1020 to 1005	0.013	0.009	0.008	0.010	0.008	0.013	0.006	0.011	0.011	0.009	0.015	0.010
1005 to 990	0.006								0.002	0.002	0.004	0.002
990 to 975	0.019	0.010	0.010	0.011	0.008	0.010	0.006	0.012	0.011	0.007	0.015	0.010
975 to 960	0.008							0.002	0.002	0.002	0.003	0.002
960 to 945		0.005		0.007				0.004		0.005	0.038	0.002
945 to 930	0.012	0.010	0.009	0.012	0.008	0.012	0.006	0.015	0.010	0.009	0.003	0.011
930 to 915										0.002		
915 to 900	0.012	0.011	0.009	0.014	0.020	0.013	0.006	0.010	0.011	0.009	0.015	0.008
900 to 885	0.005	0.005			0.006	0.003			0.005	0.002	0.003	0.014
885 to 870	0.004	0.029	0.002	0.006	0.028	0.017	0.007	0.016	0.018	0.004	0.008	0.005
870 to 855	0.037	0.006	0.016	0.011		0.018		0.004		0.014	0.005	
< 855	Minimum Reading 864.4 ft											

Legend 0.000 ... 0.020

Jocassee D_2_564.1: Monthly Averaged Phosphorus (mg/L) 1988 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.005	0.014	0.008	0.005	0.006	0.006	0.010	0.010	0.009	0.006	0.007	0.006
1095 to 1080	0.014	0.013	0.024	0.017	0.012	0.011	0.009	0.011	0.010	0.009	0.009	0.009
1080 to 1065	0.018	0.013	0.012	0.012	0.013	0.015	0.019	0.019	0.014	0.011	0.014	0.020
1065 to 1050	0.022	0.030	0.025	0.014	0.012	0.014	0.011	0.021	0.013	0.009	0.013	0.009
1050 to 1035	0.012	0.012	0.013	0.018	0.020	0.009	0.010	0.033	0.022	0.009	0.009	0.035
1035 to 1020	0.006	0.014	0.015	0.016	0.016	0.016	0.010	0.031	0.025	0.006	0.010	0.011
1020 to 1005	0.017	0.015	0.018	0.018	0.012	0.016	0.014	0.034	0.041	0.012	0.034	0.027
1005 to 990	0.013	0.026	0.025	0.037	0.019	0.012	0.012	0.033	0.027	0.022	0.018	0.006
990 to 975	0.011	0.056	0.038	0.016	0.019	0.014	0.018	0.033	0.046	0.043	0.031	0.008
975 to 960	0.013	0.024	0.041	0.044		0.020	0.017	0.051	0.054	0.032	0.021	0.005
960 to 945					0.008							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.011	0.010	0.009	0.011	0.008	0.014	0.006	0.008	0.026	0.007	0.012	0.009
1095 to 1080	0.009	0.009	0.008	0.008	0.009	0.012	0.006	0.008	0.009	0.004	0.009	0.007
1080 to 1065	0.009	0.009	0.009	0.009	0.008	0.012	0.007	0.009	0.010	0.005	0.009	0.007
1065 to 1050	0.009	0.009	0.009	0.016	0.008	0.012	0.006	0.015	0.009	0.007	0.011	0.008
1050 to 1035	0.013	0.010	0.011	0.010	0.008	0.012	0.008	0.021	0.011	0.007	0.012	0.008
1035 to 1020	0.011	0.011	0.009	0.010	0.008	0.016	0.007	0.014	0.010	0.007	0.012	0.006
1020 to 1005	0.010	0.011	0.013	0.011	0.008	0.011	0.009	0.018	0.010	0.006	0.012	0.008
1005 to 990	0.012	0.010	0.009	0.010	0.009	0.012	0.008	0.026	0.012	0.005	0.013	0.009
990 to 975	0.002	0.005					0.012	0.002	0.003	0.003	0.003	0.002
975 to 960	0.011	0.011	0.014	0.009	0.008	0.012	0.007	0.021	0.010	0.011	0.013	0.011
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend **0.000** **0.020**

Jocassee E_2_557.0: Monthly Averaged Phosphorus (mg/L) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.029	0.007	0.007	0.009	0.012	0.008	0.010	0.014	0.007	0.007	0.014	0.006
1095 to 1080	0.014	0.016	0.008	0.010	0.015	0.023	0.012	0.014	0.011	0.011	0.011	0.008
1080 to 1065	0.007	0.007	0.006	0.009	0.008	0.011	0.010	0.008	0.008	0.009	0.012	0.005
1065 to 1050	0.018	0.013	0.010	0.058	0.015	0.020	0.020	0.011	0.010	0.012	0.024	0.008
1050 to 1035	0.007	0.007	0.006	0.014	0.006	0.007	0.009	0.025	0.008	0.008	0.009	0.005
1035 to 1020	0.011	0.008	0.010	0.012	0.014	0.017	0.012	0.012	0.011	0.007	0.023	0.006
1020 to 1005	0.010	0.010	0.005	0.006	0.009	0.007	0.012	0.007	0.005	0.009	0.010	0.008
1005 to 990	0.043	0.008	0.011	0.012	0.013	0.006	0.008	0.024	0.009	0.009	0.020	0.005
990 to 975	0.008	0.008	0.008	0.009	0.011	0.011	0.011	0.009	0.014	0.012	0.022	0.010
975 to 960	0.005	0.008	0.010	0.010	0.011	0.013	0.007	0.009	0.008	0.008	0.024	0.006
960 to 945		0.015	0.015	0.027	0.015	0.064		0.015	0.015	0.015	0.015	0.015
945 to 930	0.006	0.006	0.011	0.012	0.009	0.006	0.007	0.006	0.006	0.016	0.011	0.005
930 to 915	0.015	0.015	0.015	0.026	0.015	0.015	0.017	0.015	0.015	0.015	0.091	0.010
915 to 900	0.006	0.008	0.009	0.010	0.014	0.009	0.015	0.011	0.009	0.011	0.017	0.006
900 to 885		0.015	0.015	0.015	0.015		0.015		0.013	0.011	0.016	0.011
885 to 870	0.039	0.007	0.008	0.012	0.006	0.008	0.005	0.005			0.006	0.005
870 to 855		0.009	0.015	0.015	0.023			0.015	0.010	0.005	0.030	0.006
< 855	0.008	0.019	0.012	0.017	0.011	0.008		0.009	0.010	0.011	0.014	0.010

Jocassee E_2_557.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.007	0.006	0.014	0.008	0.007	0.009	0.006	0.009	0.004	0.008	0.008	0.016
1095 to 1080	0.005	0.005	0.006	0.007	0.007	0.006	0.005	0.006	0.004	0.004	0.006	0.004
1080 to 1065	0.009	0.008	0.008	0.009	0.007	0.010	0.006	0.008	0.008	0.007	0.010	0.012
1065 to 1050	0.005	0.006	0.005	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.005	0.004
1050 to 1035	0.015	0.009	0.015	0.009	0.009	0.012	0.006	0.011	0.012	0.010	0.012	0.025
1035 to 1020	0.002								0.002	0.002	0.004	0.002
1020 to 1005	0.013	0.010	0.010	0.010	0.008	0.012	0.006	0.009	0.012	0.012	0.013	0.025
1005 to 990	0.002								0.002	0.002	0.002	0.002
990 to 975	0.014	0.010	0.009	0.011	0.009	0.012	0.006	0.012	0.011	0.009	0.014	0.017
975 to 960	0.002	0.005						0.004	0.002	0.002	0.003	0.002
960 to 945	0.005	0.005			0.003			0.002		0.002		0.002
945 to 930	0.015	0.010	0.010	0.010	0.014	0.012	0.006	0.011	0.008	0.013	0.011	0.019
930 to 915										0.002		
915 to 900	0.012	0.012	0.009	0.010	0.008	0.012	0.006	0.009	0.013	0.004	0.021	0.025
900 to 885									0.002	0.002	0.003	0.002
885 to 870	0.015	0.010	0.010	0.012	0.008	0.015	0.006	0.010	0.012	0.011	0.019	0.037
870 to 855	0.002								0.003	0.002	0.003	0.002
< 855	0.012	0.011	0.011	0.011	0.009	0.013	0.013	0.011	0.009	0.010	0.014	0.017

Legend 0.000 ... **0.020**

Jocassee F_2_554.8: Monthly Averaged Phosphorus (mg/L) 1986 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.006	0.013	0.013	0.016	0.008	0.007	0.006	0.008	0.006	0.008	0.029	0.006
1095 to 1080	0.018	0.015	0.015	0.017	0.015	0.018	0.015	0.015	0.015	0.013	0.015	0.011
1080 to 1065	0.057	0.006	0.011	0.014	0.008	0.006	0.007	0.010	0.006	0.015	0.006	0.005
1065 to 1050	0.015	0.015	0.015	0.021	0.015	0.026	0.048	0.015	0.015	0.013	0.015	0.013
1050 to 1035	0.008	0.005	0.006	0.012	0.007	0.006	0.006	0.009	0.008	0.011		0.006
1035 to 1020	0.015	0.010	0.012	0.015	0.015	0.025	0.015	0.015	0.012	0.011	0.030	0.007
1020 to 1005	0.018	0.005	0.006	0.006	0.006	0.006	0.007	0.007	0.009	0.015	0.015	0.015
1005 to 990	0.015	0.010	0.013	0.022	0.011	0.005		0.011	0.006	0.011	0.041	0.007
990 to 975				0.032	0.015	0.026	0.015	0.015	0.015	0.015	0.015	0.024
975 to 960		0.015	0.010	0.015	0.012	0.006	0.005	0.023	0.007	0.011		0.012
960 to 945	0.023	0.011	0.012	0.020	0.006	0.011	0.014	0.015	0.011	0.016	0.019	0.011
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 946.5 ft

Jocassee F_2_554.8: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.009	0.007	0.010	0.010	0.008	0.010	0.006	0.007	0.007	0.010	0.010	0.023
1095 to 1080	0.005	0.006	0.008	0.009	0.009	0.008	0.007	0.006	0.005	0.005	0.006	0.004
1080 to 1065	0.010	0.008	0.009	0.013	0.009	0.012	0.007	0.009	0.010	0.011	0.008	0.014
1065 to 1050	0.005	0.007	0.006	0.009	0.009	0.008	0.008	0.005	0.004	0.004	0.005	0.004
1050 to 1035	0.014	0.006	0.010	0.012	0.009	0.014	0.006	0.010	0.016	0.011	0.010	0.020
1035 to 1020	0.002								0.002	0.003	0.007	0.002
1020 to 1005	0.015	0.007	0.013	0.010	0.008	0.013	0.006	0.009	0.012	0.011	0.012	0.020
1005 to 990	0.002								0.003	0.002	0.003	0.002
990 to 975		0.006			0.008			0.005			0.005	
975 to 960		0.006		0.005								0.005
960 to 945	0.012	0.012	0.010	0.016	0.009	0.016	0.006	0.012	0.013	0.010	0.012	0.023
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 946.2 ft

Legend **0.000** **0.020**

Jocassee F_2_556.0: Monthly Averaged Phosphorus (mg/L) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.011	0.006	0.009	0.019	0.010	0.007	0.008	0.007	0.008	0.009	0.013	0.005
1095 to 1080	0.013	0.015	0.009	0.016	0.017	0.016	0.017	0.012	0.013	0.013	0.010	0.010
1080 to 1065	0.006	0.009	0.007	0.008	0.010	0.010	0.007	0.011	0.007	0.017	0.009	0.005
1065 to 1050	0.012	0.018	0.010	0.021	0.012	0.020	0.020	0.013	0.012	0.014	0.010	0.009
1050 to 1035	0.006	0.012	0.005	0.008	0.009	0.007	0.010	0.008	0.013	0.010	0.009	0.005
1035 to 1020	0.011	0.009	0.011	0.015	0.019	0.013	0.012	0.015	0.010	0.010	0.011	0.006
1020 to 1005	0.006	0.011	0.005	0.008	0.009	0.010	0.009	0.009	0.005	0.013	0.009	0.008
1005 to 990	0.015	0.010	0.010	0.015	0.013	0.016	0.007	0.008	0.011	0.023	0.030	0.005
990 to 975	0.008	0.009	0.006	0.008	0.009	0.017	0.014	0.008	0.017	0.014	0.010	
975 to 960	0.014	0.015	0.011	0.015	0.019	0.006	0.007	0.009	0.010	0.008	0.010	0.007
960 to 945	0.035	0.021	0.015	0.022	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.025
945 to 930		0.005	0.011	0.015		0.015		0.006	0.007	0.005	0.018	0.013
930 to 915	0.026	0.013		0.031	0.011	0.008	0.025	0.010	0.011	0.017	0.015	0.006
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 920.3 ft

Jocassee F_2_556.0: Monthly Averaged Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.008	0.007	0.008	0.008	0.008	0.009	0.005	0.007	0.007	0.012	0.008	0.005
1095 to 1080	0.005	0.005	0.006	0.008	0.006	0.008	0.006	0.006	0.004	0.005	0.006	0.005
1080 to 1065	0.010	0.009	0.008	0.010	0.008	0.011	0.006	0.010	0.010	0.008	0.008	0.005
1065 to 1050	0.005	0.006	0.006	0.007	0.005	0.005	0.006	0.005	0.004	0.004	0.004	0.004
1050 to 1035	0.015	0.008	0.013	0.011	0.007	0.015	0.006	0.012	0.012	0.011	0.009	0.004
1035 to 1020	0.002								0.002	0.002	0.005	0.002
1020 to 1005	0.015	0.011	0.010	0.010	0.007	0.009	0.006	0.010	0.011	0.010	0.009	0.004
1005 to 990	0.002								0.002	0.002	0.003	0.002
990 to 975	0.015	0.007	0.013	0.012	0.007	0.014	0.006	0.011	0.011	0.010	0.010	0.004
975 to 960	0.002	0.005						0.003	0.002	0.002	0.004	0.002
960 to 945		0.004			0.002							
945 to 930		0.008	0.013	0.007	0.007	0.010	0.005	0.010		0.023	0.009	
930 to 915	0.011	0.004	0.005	0.017	0.012	0.028	0.006	0.014	0.009	0.005	0.005	0.003
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 919.9 ft

Legend 0.000 ... 0.020

Lake Jocassee

Nitrogen

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.22	0.16	0.22	0.27	0.16	0.17	0.21	0.44	0.23	0.22	0.17	
1095 to 1080	0.24	0.25	0.23	0.24	0.23	0.20	0.20	0.29	0.20	0.20	0.21	0.21
1080 to 1065		0.16	0.17	0.18	0.17	0.18	0.19	0.39	0.17	0.27	0.15	
1065 to 1050	0.23	0.26	0.23	0.23	0.23	0.20	0.20	0.20	0.20	0.20	0.20	0.22
1050 to 1035				0.18	0.18	0.20	0.16	0.35	0.16	0.23		
1035 to 1020	0.23	0.21	0.20	0.23	0.23	0.20	0.20	0.21	0.20		0.17	
1020 to 1005							0.21		0.22	0.20	0.21	0.21
1005 to 990	0.23	0.21	0.20	0.18	0.18	0.20		0.36		0.36	0.19	
990 to 975				0.23	0.25	0.22	0.22	0.24	0.26	0.26	0.26	0.21
975 to 960		0.20	0.17	0.26	0.19	0.22	0.23	0.28	0.23	0.32	0.25	
960 to 945	0.25		0.23	0.23	0.27	0.27	0.24	0.27	0.27	0.27	0.28	0.28
945 to 930		0.16	0.17	0.30	0.20	0.24	0.23	0.46	0.28	0.27	0.24	
930 to 915	0.28	0.25	0.23	0.24	0.25	0.27	0.25	0.28	0.28	0.27	0.24	0.25
915 to 900		0.14	0.18	0.27	0.21	0.24	0.24	0.38	0.34	0.25	0.24	
900 to 885	0.31	0.24	0.24	0.24	0.28	0.28	0.26	0.28	0.28	0.28	0.29	0.28
885 to 870			0.17	0.27	0.22	0.25	0.25	0.36	0.27	0.27		
870 to 855	0.32	0.18	0.23	0.25	0.28	0.28	0.26	0.28	0.29		0.26	
< 855		0.15	0.16	0.27	0.21	0.27	0.25	0.33	0.25	0.27	0.29	0.29

Jocassee B_2_558.7: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.16			0.16						0.17	
1095 to 1080		0.25			0.23			0.29			0.21	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855											0.29	

Legend	0.00										0.35

Jocassee B_3_558.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.17	0.21	0.18	0.18	0.18	0.17	0.29	0.33	0.20	0.38	0.21	
1095 to 1080	0.22	0.24	0.22	0.29	0.24	0.20	0.20	0.33	0.20	0.20	0.22	0.18
1080 to 1065		0.20	0.18	0.18	0.19	0.18	0.19	0.27	0.25	0.33	0.22	
1065 to 1050	0.22	0.24	0.23	0.23	0.23	0.20	0.20	0.10	0.20	0.20	0.20	0.20
1050 to 1035		0.24		0.19	0.20	0.19	0.16	0.29	0.23	0.26	0.22	
1035 to 1020	0.23	0.21	0.20	0.23	0.24	0.20	0.20	0.10	0.20		0.19	0.16
1020 to 1005		0.24			0.24		0.18	0.27	0.20	0.20	0.21	0.21
1005 to 990	0.23	0.21	0.21	0.18	0.28	0.20		0.36		0.34	0.20	0.16
990 to 975		0.24		0.24	0.24	0.24	0.22	0.29	0.26	0.25	0.24	0.21
975 to 960		0.21	0.18	0.21	0.25	0.21	0.23	0.30	0.21	0.50	0.28	0.24
960 to 945	0.23	0.24	0.24	0.25	0.27	0.26	0.24		0.27	0.27	0.27	0.27
945 to 930		0.21	0.18	0.19	0.22	0.24	0.24	0.34	0.24	0.39	0.36	
930 to 915	0.31	0.25	0.24	0.25	0.29	0.28	0.25		0.27	0.27	0.28	0.26
915 to 900		0.21	0.18	0.22	0.23	0.25	0.24	0.34	0.24	0.47	0.34	
900 to 885	0.32	0.25	0.23	0.25	0.29	0.28	0.26		0.27	0.27	0.28	0.27
885 to 870		0.22	0.17	0.21	0.23	0.25	0.24	0.30	0.25	0.40	0.30	
870 to 855	0.32	0.23	0.22	0.25	0.29	0.27	0.25		0.28		0.27	0.34
< 855	0.35	0.23	0.19	0.21	0.26	0.27	0.28	0.35	0.28	0.32	0.28	0.28

Jocassee B_3_558.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.24			0.21			0.23			0.22	
1095 to 1080		0.23			0.16			0.21			0.31	
1080 to 1065		0.23			0.21			0.22			0.21	
1065 to 1050											0.20	
1050 to 1035		0.23			0.20			0.21			0.33	
1035 to 1020											0.20	
1020 to 1005		0.24			0.23			0.24			0.19	
1005 to 990											0.26	
990 to 975		0.23			0.23			0.26			0.26	
975 to 960		0.23						0.24			0.27	
960 to 945		0.25			0.11							
945 to 930		0.29			0.26			0.26			0.27	
930 to 915												
915 to 900		0.28			0.24			0.26			0.28	
900 to 885											0.26	
885 to 870		0.28			0.25			0.26			0.27	
870 to 855											0.29	
< 855		0.31			0.26			0.31			0.31	

Legend 0.00 ... 0.35

Jocassee C_2_559.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.19	0.20	0.78	0.23	0.18	0.15	0.14	0.26	0.26	0.78	0.24	
1095 to 1080	0.23	0.24	0.23	0.23	0.22	0.20	0.20	0.25	0.20	0.20	0.22	0.19
1080 to 1065		0.23	0.22	0.20	0.21	0.17	0.16	0.29	0.16	0.43	0.23	
1065 to 1050	0.23	0.22	0.23	0.23	0.22	0.20	0.20		0.20	0.20	0.19	0.19
1050 to 1035		0.24		0.24	0.20	0.17	0.18	0.23	0.15	0.44	0.22	
1035 to 1020	0.23	0.21	0.21	0.23	0.23	0.20	0.20	0.20	0.20		0.24	0.17
1020 to 1005		0.24			0.25		0.19	0.21	0.29	0.20	0.22	0.21
1005 to 990	0.28	0.21	0.21	0.26	0.22	0.19		0.32		0.55	0.19	0.16
990 to 975		0.23		0.25	0.25	0.24	0.23	0.28	0.27	0.26	0.29	0.21
975 to 960		0.21	0.19	0.23	0.23	0.22	0.22	0.30	0.23	0.52	0.24	0.24
960 to 945	0.29	0.23	0.25	0.26	0.26	0.28	0.25	0.27	0.28	0.27	0.24	0.29
945 to 930		0.21	0.19	0.21	0.24	0.24	0.24	0.35	0.24	0.44	0.29	
930 to 915	0.32	0.25	0.25	0.26	0.27	0.27	0.26	0.28	0.29	0.28	0.29	0.28
915 to 900		0.21	0.23	0.29	0.24	0.25	0.26	0.31	0.27	0.93	0.31	
900 to 885	0.34	0.28	0.25	0.26	0.28	0.29	0.27	0.29	0.29	0.29	0.23	0.29
885 to 870		0.23		0.33	0.25	0.26	0.27	0.39	0.27	1.07	0.29	
870 to 855	0.32	0.18	0.25	0.26	0.28	0.29	0.27	0.29	0.30		0.27	0.26
< 855	0.29	0.23	0.21	0.27	0.26	0.28	0.27	0.32	0.29	0.52	0.25	0.28

Jocassee C_2_559.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2000 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.28			0.19			0.39			0.20	
1095 to 1080												
1080 to 1065		0.24			0.18			0.31			0.21	
1065 to 1050											0.20	
1050 to 1035		0.32			0.25			0.21			0.22	
1035 to 1020											0.22	
1020 to 1005		0.37			0.21			0.24			0.26	
1005 to 990											0.26	
990 to 975		0.26			0.20			0.24			0.27	
975 to 960								0.24			0.27	
960 to 945		0.21						0.32			0.28	
945 to 930		0.25			0.23			0.40			0.26	
930 to 915												
915 to 900		0.28			0.22			0.28			0.25	
900 to 885											0.28	
885 to 870		0.30			0.20			0.32			0.20	
870 to 855											0.28	
< 855		0.29			0.19			0.29			0.26	

Legend	0.00										0.35

Jocassee C_2_560.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.21	0.21	0.17	0.20	0.18	0.16	0.18	0.29	0.22		0.24	
1095 to 1080	0.23	0.25	0.25	0.23	0.23	0.20	0.20	0.25	0.20	0.20	0.18	0.20
1080 to 1065		0.23	0.18	0.18	0.18	0.14	0.14	0.23	0.18	0.65	0.24	
1065 to 1050	0.24	0.23	0.24	0.23	0.22	0.20	0.20	0.20	0.20	0.20	0.20	0.19
1050 to 1035		0.24		0.19	0.19	0.15	0.14	0.23	0.20	0.55	0.22	
1035 to 1020	0.23	0.23	0.21	0.23	0.23	0.20	0.20	0.20	0.20		0.19	0.18
1020 to 1005		0.24			0.24		0.29	0.27	0.49	0.20	0.21	0.21
1005 to 990	0.23	0.23	0.23	0.35	0.22	0.20		0.44		0.73	0.22	0.19
990 to 975		0.29			0.24	0.23	0.22	0.27	0.26	0.26	0.27	0.21
975 to 960	0.25	0.23	0.19	0.23	0.22	0.24	0.22	0.27	0.28	0.38	0.27	
960 to 945		0.25	0.24	0.25	0.26	0.27	0.25	0.28	0.29	0.28	0.28	0.28
945 to 930		0.21	0.20	0.24	0.28	0.29	0.26	0.29	0.29	0.34	0.34	
930 to 915	0.27	0.28	0.24	0.25	0.27	0.28	0.26	0.29	0.29	0.28	0.29	0.29
915 to 900		0.22	0.26	0.32	0.26	0.31	0.28	0.29	0.33		0.32	
900 to 885	0.34	0.29	0.25	0.26	0.28	0.29	0.27	0.29	0.30	0.29	0.29	0.29
885 to 870		0.28		0.28	0.28	0.31	0.28	0.32	0.31	0.70	0.31	
870 to 855	0.34	0.25	0.27	0.26	0.25	0.28	0.27	0.30	0.30		0.55	0.29
< 855	0.34	0.30	0.25	0.27	0.29	0.30	0.28	0.32	0.29	0.56	0.29	0.29

Jocassee C_2_560.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.23			0.25			0.21			0.22	
1095 to 1080		0.29			0.22			0.19			0.30	
1080 to 1065		0.24			0.21			0.21			0.21	
1065 to 1050											0.22	
1050 to 1035		0.22			0.20			0.30			0.20	
1035 to 1020											0.25	
1020 to 1005		0.26			0.22			0.24			0.21	
1005 to 990											0.27	
990 to 975		0.23			0.23			0.28			0.27	
975 to 960								0.24				
960 to 945		0.25						0.27			0.28	
945 to 930		0.25			0.23			0.31			0.28	
930 to 915												
915 to 900		0.25			0.24			0.32			0.28	
900 to 885											0.27	
885 to 870		0.28			0.25			0.28			0.28	
870 to 855		0.24			0.19			0.26			0.25	
< 855		0.25			0.28			0.29			0.33	

Legend	0.00										0.35

Jocassee C_2_562.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.22	0.24	0.37	0.18	0.18	0.17	0.18	0.31	0.15	0.56	0.33	
1095 to 1080	0.25	0.28	0.26	0.26	0.23	0.20	0.26	0.20	0.22	0.24	0.20	0.21
1080 to 1065		0.45	0.17	0.19	0.42	0.35	0.22	0.34	0.22	0.68	0.34	
1065 to 1050	0.24	0.27	0.30	0.31	0.27	0.25	0.33	0.30	0.22	0.24	0.26	0.24
1050 to 1035		0.51		0.18	0.23	0.19	0.33	0.35	0.16	0.58	0.40	
1035 to 1020	0.26	0.25	0.26	0.30	0.24		0.32	0.35	0.26		0.21	0.19
1020 to 1005		0.32		0.29						0.24	0.24	0.24
1005 to 990	0.29	0.30	0.26	0.19	0.25	0.23	0.22	0.33	0.24	0.44	0.28	0.24
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 991.4 ft

Jocassee C_2_562.0: Monthly Averaged Nitrogen (mg/l) 1991 to 1997 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.26			0.24						0.20	
1095 to 1080											0.20	
1080 to 1065		0.25			0.24						0.20	
1065 to 1050											0.20	
1050 to 1035		0.27			0.23						0.20	
1035 to 1020											0.22	
1020 to 1005		0.31			0.24						0.20	
1005 to 990		0.29			0.25						0.24	
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 995.2 ft

Legend 0.00 ... 0.35

Jocassee C_2_565.4: Monthly Averaged Nitrogen (mg/l) 1987 to 1988 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.19	0.18	0.18	0.23	0.16	0.13	0.14	0.25	0.14	0.47		
1095 to 1080	0.24	0.26	0.26	0.23	0.21	0.20	0.20	0.20	0.20	0.20	0.18	0.19
1080 to 1065			0.18	0.18	0.16	0.15	0.15	0.28	0.18	0.50		
1065 to 1050	0.24	0.22	0.25	0.23	0.22	0.20	0.20	0.20	0.20	0.20	0.18	0.18
1050 to 1035				0.20	0.18	0.15	0.18	0.22	0.16	0.56		
1035 to 1020	0.23	0.22	0.22	0.23	0.23	0.20	0.20	0.20	0.20		0.16	0.17
1020 to 1005							0.21		0.25	0.20	0.20	0.20
1005 to 990	0.23	0.22	0.22	0.32	0.21	0.17		0.23		0.36	0.22	0.20
990 to 975						0.23	0.22	0.29	0.29	0.27	0.22	0.20
975 to 960	0.23	0.25	0.22	0.19	0.19	0.22	0.23	0.27	0.32	0.75	0.25	
960 to 945		0.19	0.26	0.26		0.21	0.24	0.27	0.30	0.26		0.25
945 to 930	0.27	0.25	0.17	0.20	0.26	0.27		0.36	0.30	0.57	0.29	0.26
930 to 915					0.23				0.27			
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.1 ft

Jocassee C_2_565.4: Monthly Averaged Nitrogen (mg/l)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Measurements Only 1987 and 1988

Legend	0.00										0.35

Jocassee D_2_551.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.19										
1095 to 1080		0.21										
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1083.4 ft

Jocassee D_2_551.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.16			0.16						0.24	
1095 to 1080		0.16						0.16				
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1084.2 ft

Legend 0.00 — 0.35

Jocassee D_2_564.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.22	0.23	0.51	0.21	0.19	0.18	0.22	0.27	0.16	0.32	0.22	
1095 to 1080	0.24	0.26	0.24	0.23	0.23	0.20	0.20	0.20	0.20	0.20	0.22	0.20
1080 to 1065		0.23	0.25	0.35	0.20	0.17	0.16	0.24	0.19	0.79	0.22	
1065 to 1050	0.24	0.23	0.24	0.23	0.22	0.20	0.20	0.20	0.20	0.20	0.23	0.19
1050 to 1035		0.24		3.00	0.19	0.20	0.16	0.24	0.28	0.34	0.23	
1035 to 1020	0.23	0.23	0.23	0.23	0.23	0.20	0.20	0.20	0.20		0.18	0.18
1020 to 1005		0.34			0.23		0.36	0.27	0.54	0.20	0.21	0.20
1005 to 990	0.24	0.25	0.23	0.22	0.22	0.25		0.52		0.93	0.21	0.20
990 to 975		0.22			0.25	0.23	0.23	0.22	0.27	0.26	0.26	0.20
975 to 960	0.24	0.36	0.19	0.26	0.25	0.39	0.44	0.34	0.34	0.71	0.30	
960 to 945		0.22	0.25	0.24	0.26	0.27	0.27	0.27	0.30	0.28	0.26	0.29
945 to 930		0.23	0.18	0.23	0.28	0.35	0.30	0.30	0.32	0.47	0.30	
930 to 915	0.24	0.26	0.26	0.25	0.27	0.28	0.27		0.30	0.29	0.29	0.30
915 to 900		0.22	0.29		0.30	0.37	0.29	0.31	0.32	0.76	0.32	
900 to 885	0.24	0.28	0.25	0.28	0.28	0.28	0.27	0.43	0.31	0.29	0.31	0.30
885 to 870	0.24	0.35	0.29		0.31	0.31	0.29	0.29	0.29	0.28	0.30	0.29
870 to 855			0.40	0.24	0.29			0.28		0.92	0.30	0.29
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Averaged Nitrogen (mg/l) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.23			0.17			0.22			0.20	
1095 to 1080											0.20	
1080 to 1065		0.22			0.17			0.21			0.20	
1065 to 1050											0.20	
1050 to 1035		0.22			0.23			0.23			0.21	
1035 to 1020											0.23	
1020 to 1005		0.29			0.21			0.27			0.22	
1005 to 990											0.27	
990 to 975		0.22			0.21			0.27			0.26	
975 to 960								0.25			0.28	
960 to 945		0.20						0.24			0.28	
945 to 930		0.23			0.22			0.37			0.27	
930 to 915												
915 to 900		0.21			0.21			0.33			0.20	
900 to 885		0.22			0.24						0.30	
885 to 870		0.20			0.21			0.25			0.25	
870 to 855		0.23						0.21			0.26	
< 855	*Minimum Reading 868.7 ft*											

Legend	0.00										0.35

Jocassee D_2_564.1: Monthly Averaged Nitrogen (mg/l) 1988 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.23			0.20			0.24			0.21	
1095 to 1080	0.20	0.33	0.24	0.19	0.22	0.36	0.15		0.32	0.21	0.16	0.20
1080 to 1065		0.21			0.20			0.20			0.22	
1065 to 1050	0.18	0.28	0.37	0.18	0.18	0.30		0.20	0.80	0.28	0.18	0.20
1050 to 1035		0.21			0.21			0.20			0.24	
1035 to 1020	0.23	0.24	1.61	0.20	0.19		0.29	0.28	0.36		0.23	
1020 to 1005		0.22			0.20			0.24		0.15	0.19	0.20
1005 to 990	0.28	0.25	0.26	0.20	0.20						0.20	
990 to 975		0.22			0.20					0.15	0.19	
975 to 960								0.31			0.20	
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Averaged Nitrogen (mg/l) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.22			0.20			0.22			0.21	
1095 to 1080											0.20	
1080 to 1065		0.21			0.20			0.20			0.20	
1065 to 1050											0.20	
1050 to 1035		0.22			0.26			0.20			0.20	
1035 to 1020											0.20	
1020 to 1005		0.22			0.30			0.20			0.23	
1005 to 990											0.20	
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend	0.00										0.35

Jocassee E_2_557.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.22	0.20	0.18	0.18	0.17	0.16	0.16	0.22	0.20	0.21	0.23	
1095 to 1080	0.38	0.22	0.21	0.23	0.23	0.20	0.20	0.20	0.20	0.20	0.20	0.18
1080 to 1065		0.21	0.17	0.20	0.19	0.17	0.17	0.27	0.13	0.21	0.18	
1065 to 1050	0.20	0.23	0.22	0.22	0.24	0.20	0.20	0.20	0.20	0.20	0.20	0.20
1050 to 1035		0.24		0.21	0.19	0.18	0.21	0.23	0.13	0.24	0.23	
1035 to 1020	0.21	0.19	0.20	0.23	0.25	0.20	0.20	0.20	0.20		0.17	0.16
1020 to 1005		0.23			0.23		0.17	0.27	0.21	0.20	0.20	0.20
1005 to 990	0.20	0.19	0.20	0.19	0.23	0.19		0.38		0.33	0.25	0.15
990 to 975		0.22		0.22	0.24	0.23	0.20	0.24	0.27	0.27	0.34	0.20
975 to 960		0.19	0.18	0.20	0.24	0.22	0.22	0.33	0.26	0.22	0.29	0.25
960 to 945	0.20	0.25	0.22	0.23	0.25	0.26	0.24	0.28	0.29	0.29	0.30	0.29
945 to 930		0.19	0.17	0.20	0.22	0.23	0.23	0.34	0.23	0.37	0.37	
930 to 915	0.20	0.22	0.22	0.23	0.28	0.28	0.26	0.30	0.29	0.29	0.30	0.29
915 to 900		0.19	0.17	0.19	0.23	0.25	0.24	0.32	0.23	0.24	0.30	
900 to 885		0.23	0.21	0.23	0.28		0.26		0.29	0.29	0.30	0.28
885 to 870		0.22		0.18	0.23	0.22	0.23	0.32			0.54	
870 to 855		0.18	0.22	0.24	0.28			0.28	0.29		0.27	0.25
< 855		0.21	0.19	0.21	0.26	0.24	0.26	0.34	0.29	0.29	0.24	0.29

Jocassee E_2_557.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.25			0.18			0.23			0.19	
1095 to 1080		0.18			0.19			0.14			0.33	
1080 to 1065		0.23			0.22			0.21			0.20	
1065 to 1050											0.20	
1050 to 1035		0.28			0.24			0.21			0.20	
1035 to 1020											0.20	
1020 to 1005		0.24			0.23			0.22			0.20	
1005 to 990											0.28	
990 to 975		0.25			0.25			0.22			0.28	
975 to 960		0.23						0.23			0.27	
960 to 945		0.20			0.15							
945 to 930		0.24			0.30			0.28			0.28	
930 to 915												
915 to 900		0.25			0.25			0.26			0.30	
900 to 885											0.29	
885 to 870		0.24			0.22			0.31			0.29	
870 to 855											0.31	
< 855		0.23			0.23			0.28			0.27	

Legend	0.00										0.35

Jocassee F_2_554.8: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.16	0.15	0.20	0.15	0.16	0.13	0.14	0.30	0.23	0.33	0.16	
1095 to 1080	0.22	0.22	0.21	0.22	0.22	0.20	0.20	0.20	0.20	0.20	0.20	0.17
1080 to 1065		0.14	0.18	0.19	0.18	0.14	0.16	0.47	0.29	0.19	0.12	
1065 to 1050	0.20	0.23	0.21	0.21	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.17
1050 to 1035				0.27	0.18	0.15	0.14		0.16	0.20		
1035 to 1020	0.20	0.20	0.20	0.22	0.20	0.20	0.20	0.20	0.20		0.14	0.18
1020 to 1005					0.21		0.19		0.20	0.20	0.20	0.20
1005 to 990	0.20	0.18	0.21	0.16	0.17	0.18		0.27		0.23	0.18	0.16
990 to 975				0.22	0.21	0.22	0.20	0.25	0.25	0.24	0.20	0.20
975 to 960		0.23	0.21	0.20	0.19	0.18	0.18	0.46	0.34			0.36
960 to 945	0.20	0.14	0.28	0.28	0.22	0.28	0.29	0.54	0.34	0.34	0.28	0.19
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 946.5 ft*							
885 to 870												
870 to 855												
< 855												

Jocassee F_2_554.8: Monthly Averaged Nitrogen (mg/l) 1991 to 1997 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.20			0.23			0.29			0.20	
1095 to 1080												
1080 to 1065		0.20			0.20			0.20			0.20	
1065 to 1050												
1050 to 1035		0.21			0.20			0.23			0.20	
1035 to 1020												
1020 to 1005		0.20			0.22			0.27			0.22	
1005 to 990												
990 to 975		0.20			0.22			0.31			0.25	
975 to 960		0.21										
960 to 945		0.20			0.22			0.23			0.31	
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 948.1 ft*							
885 to 870												
870 to 855												
< 855												

Legend	0.00										0.35

Jocassee F_2_556.0: Monthly Averaged Nitrogen (mg/l) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.17	0.19	0.17	0.17	0.16	0.14	0.18	0.31	0.23	0.25	0.18	
1095 to 1080	0.20	0.22	0.20	0.21	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.17
1080 to 1065		0.19	0.18	0.18	0.18	0.16	0.15	0.24	0.23	0.19	0.18	
1065 to 1050	0.20	0.22	0.22	0.22	0.22	0.20	0.20	0.20	0.20	0.20	0.20	0.17
1050 to 1035		0.21		0.18	0.18	0.15	0.14	0.28	0.18	0.14	0.20	
1035 to 1020	0.20	0.18	0.23	0.23	0.22	0.20	0.22	0.21	0.20		0.17	0.15
1020 to 1005		0.22			0.22		0.17	0.26	0.22	0.20	0.20	0.20
1005 to 990	0.20	0.19	0.22	0.17	0.20	0.16		0.52		0.23	0.23	0.14
990 to 975		0.22		0.22	0.23	0.23	0.20	0.30	0.28	0.29	0.29	0.20
975 to 960		0.18	0.49	0.16	0.20	0.19	0.22	0.38	0.24	0.32	0.21	0.21
960 to 945	0.20	0.21	0.20	0.22	0.24	0.23	0.22	0.26		0.28	0.23	0.25
945 to 930		0.14	0.19	0.18		0.22		0.46	0.19		0.23	0.26
930 to 915	0.20	0.22		0.22	0.22		0.23	0.24	0.28	0.33	0.23	
915 to 900												
900 to 885												
885 to 870					*Minimum Reading 920.3 ft*							
870 to 855												
< 855												

Jocassee F_2_556.0: Monthly Averaged Nitrogen (mg/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		0.25			0.21			0.21			0.22	
1095 to 1080		0.23			0.20			0.19			0.29	
1080 to 1065		0.22			0.21			0.22			0.20	
1065 to 1050											0.20	
1050 to 1035		0.22			0.22			0.23			0.26	
1035 to 1020											0.20	
1020 to 1005		0.24			0.37			0.23			0.20	
1005 to 990											0.30	
990 to 975		0.25			0.23			0.26			0.31	
975 to 960		0.21						0.26			0.32	
960 to 945		0.20										
945 to 930		0.24			0.25			0.29			0.27	
930 to 915		0.22			0.24			0.29			0.31	
915 to 900												
900 to 885												
885 to 870					*Minimum Reading 922 ft*							
870 to 855												
< 855												

Legend	0.00										0.35

Lake Jocassee

Chlorophyll a

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.61	1.03	2.14	1.19	1.19	1.05	0.70	1.45	2.10	1.53	2.02	3.62
1095 to 1080	0.83	1.29	1.74	1.49	1.21	0.75	1.01	1.70	2.30	2.18	2.57	3.62
1080 to 1065	0.77	0.65	0.97	1.37	1.09	0.81	0.73	2.10	2.34	2.30	2.82	3.82
1065 to 1050	0.77	0.57	1.22	0.93	1.09	1.01	1.37	1.61				3.22
1050 to 1035	0.69	0.61	0.85	0.55	0.81	1.10	1.25	1.53	2.14	2.02	2.72	3.72
1035 to 1020	0.77	0.55	0.73	0.38	0.79	0.77	0.81	1.09	2.14	2.02	2.67	
1020 to 1005	0.73	0.47	0.37	0.28	0.32	0.22	0.45	0.93	1.53	2.74	2.87	3.82
1005 to 990									0.32	0.77	2.62	3.02
990 to 975	0.73	0.41	0.47	0.30	0.23	0.15	0.35	0.27				
975 to 960									0.52	0.49	0.37	1.09
960 to 945												
945 to 930												
930 to 915												
915 to 900	0.49	0.24	0.61	0.13	0.10	0.08	0.07	0.11	0.49	0.12	0.13	0.25
900 to 885												
885 to 870												
870 to 855												
< 855	1.01	0.20	0.21	0.06	0.03	0.08	0.06	0.06	0.08	0.12	0.08	0.09

Jocassee B_2_558.7: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.82	1.63	2.09	2.95	2.24	1.22	1.18	1.76	2.32	3.07	3.10	2.88
1095 to 1080	2.07	1.54	2.55	3.57	2.68	1.99	1.91	1.88	2.31	3.47	2.89	2.84
1080 to 1065	2.18	1.91	2.20	2.59	3.14	2.90	2.85	2.70	3.14	3.53	3.56	2.84
1065 to 1050	2.17	1.73	2.00	2.18	2.62	2.61	2.52	2.54	2.62	3.76	3.45	2.89
1050 to 1035	2.38	1.64	1.72	1.80	1.79	2.10	2.10	2.22	1.89	3.39	3.32	2.83
1035 to 1020	2.16	1.55	1.41	1.33	0.83	1.09	1.21	1.00	1.09	2.87	3.38	2.85
1020 to 1005	2.18	1.66	1.13	0.72	0.56	0.67	0.72	0.53	0.68	1.17	2.54	2.56
1005 to 990	1.13								0.81	3.41	0.82	0.91
990 to 975	2.19	1.70	0.95	0.58	0.40	0.34	0.38	0.57	0.37	0.55	0.51	1.07
975 to 960	1.09	2.89						0.46	0.33	0.32	1.56	0.41
960 to 945												
945 to 930												
930 to 915												
915 to 900	0.53	0.94	0.92	0.32	0.24	0.19	0.21	0.16	0.13	0.27	0.30	0.32
900 to 885									0.18	0.31	0.95	0.25
885 to 870												
870 to 855												
< 855	0.38	0.83	0.52	0.22	0.45	0.15	0.12	0.10	0.12	0.10	0.26	0.15
Legend	**0.00**											**10.00**

Jocassee B_3_558.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.65	1.17	1.25	1.17	1.11	0.91	1.33	1.29	2.38	1.92	2.34	3.27
1095 to 1080	1.03	0.89	1.49	1.53	1.37	0.77	1.08	1.82	2.54	2.14	2.52	3.42
1080 to 1065	0.95	0.77	1.05	1.61	1.45	2.42	1.78	1.61	2.58	2.10	2.62	3.42
1065 to 1050	0.93	0.63	0.77	1.25	1.21	1.29	1.41	1.41				3.82
1050 to 1035	0.87	0.59	0.57	0.97	1.21	0.57	1.17	1.41	2.54	1.94	2.27	3.92
1035 to 1020	0.87	0.53	0.47	0.45	0.81	0.57	0.85	1.21	2.54	2.62	2.82	
1020 to 1005	0.95	0.47	0.39	0.45	0.39	0.49	0.65	0.93	1.61	2.34	2.62	3.02
1005 to 990									1.29	0.89	2.72	3.62
990 to 975	0.95	0.35	0.38	0.29	0.25	0.39	0.26	0.32				
975 to 960									0.83	0.55	0.51	0.77
960 to 945												
945 to 930												
930 to 915												
915 to 900	0.49	0.10	0.23	0.25	0.11	0.11	0.11	0.15	0.16	0.23	0.27	0.18
900 to 885												
885 to 870												
870 to 855												
< 855	0.28	0.09	0.14	0.10	0.06	0.05	0.05	0.13	0.08	0.09	0.38	0.13

Jocassee B_3_558.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.66	1.69	1.97	2.69	2.22	1.44	1.32	1.51	2.34	3.18	3.14	2.96
1095 to 1080	1.79	1.95	2.43	2.38	2.72	1.73	1.75	2.08	2.36	3.14	2.99	2.84
1080 to 1065	2.13	1.60	2.30	2.54	2.40	2.38	2.11	2.32	2.70	3.56	3.22	2.98
1065 to 1050	2.09	1.71	1.91	1.79	2.11	2.42	2.43	2.36	2.42	3.40	3.51	2.80
1050 to 1035	2.10	1.73	1.55	1.16	1.59	2.03	1.90	1.64	1.88	3.16	3.34	3.16
1035 to 1020	2.26	1.67	1.43	0.93	1.05	1.09	1.14	1.08	1.13	3.28	3.24	2.89
1020 to 1005	2.27	1.63	1.25	0.66	0.62	0.67	0.68	0.69	0.66	1.14	2.55	2.74
1005 to 990	1.15								0.66	0.69	0.58	1.18
990 to 975	1.72	1.25	0.93	0.59	0.37	0.30	0.29	0.28	0.36	0.53	0.58	0.60
975 to 960	1.07	2.85	0.53					0.39	0.24	0.27	0.34	0.40
960 to 945	0.32		0.45	0.31								
945 to 930	0.45	0.37	0.34	0.31	0.21	0.24	0.15	0.11	0.17	0.35	0.33	0.24
930 to 915												
915 to 900	0.37	0.46	0.70	0.28	0.22	0.18	0.15	0.11	0.18	0.23	0.22	0.25
900 to 885									0.28	0.16	0.26	0.27
885 to 870	0.18	0.25	0.24	0.17	0.12	0.06	0.15	0.06	0.13	0.17	0.15	0.15
870 to 855												
< 855	0.26	0.25	0.42	0.26	0.13	0.12	0.10	0.19	0.14	0.13	0.13	0.16

Legend	0.00										10.00

Jocassee C_2_559.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.49	0.71	1.41	1.05	0.93	0.58	0.81	1.03	1.86	2.97	2.57	2.82
1095 to 1080	0.73	1.05	1.70	1.25	1.25	0.67	1.29	1.49	1.90	2.92	2.92	3.02
1080 to 1065	1.57	1.14	0.71	1.29	1.33	1.61	1.86	1.90	1.90	2.92	2.51	2.72
1065 to 1050	0.73	1.16	0.43	0.73	1.17	2.14	1.74	1.82				2.92
1050 to 1035	0.75	1.10	0.57	0.47	0.83	1.53	1.21	1.74	1.94	2.82	3.02	2.92
1035 to 1020	0.79	0.69	0.51	0.30	0.61	0.81	0.47	1.08	1.21	3.12	2.92	
1020 to 1005	0.71	0.71	0.41	0.32	0.28	0.39	0.47	0.81	1.09	1.94	2.92	2.82
1005 to 990									0.69	0.57	3.02	2.82
990 to 975	0.69	0.35	0.33	0.26	0.20	0.20	0.28	0.24				
975 to 960									0.41	0.53	3.52	1.09
960 to 945												
945 to 930												
930 to 915												
915 to 900	0.28	0.15	0.18	0.18	0.07	0.08	0.09	0.09	0.06	0.15	3.42	0.22
900 to 885												
885 to 870												
870 to 855												
< 855	0.11	0.02	0.04	0.03	0.04	0.03	0.07	0.05	0.07	0.09	3.42	0.11

Jocassee C_2_559.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 1997 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.86	1.84	2.08	2.34	1.92	1.34	1.23	1.45	2.02	3.06	2.93	2.53
1095 to 1080	2.06	1.79	2.29	2.21	3.00	2.04	1.98	1.71	2.27	2.84	2.80	2.19
1080 to 1065	2.01	1.90	2.37	2.21	3.54	3.05	3.02	2.63	2.58	3.32	3.16	2.49
1065 to 1050	1.95	1.93	1.87	1.81	2.68	2.35	3.25	2.22	2.78	2.88	2.91	2.42
1050 to 1035	2.15	1.82	1.62	1.45	1.62	1.48	2.64	1.79	1.80	3.81	2.79	2.22
1035 to 1020	1.87	1.83	1.30	0.76	0.80	0.88	1.58	1.14	0.80	2.65	3.47	2.62
1020 to 1005	1.87	1.60	1.09	0.77	0.55	0.90	0.71	0.65	0.68	1.08	2.09	2.14
1005 to 990	0.98								0.79	0.79	1.28	0.80
990 to 975	1.94	1.21	1.07	0.77	0.51	0.34	0.46	0.34	0.33	0.57	0.54	0.58
975 to 960	0.86	2.64						0.51	0.36	0.26	0.36	0.38
960 to 945												
945 to 930												
930 to 915												
915 to 900	0.44	0.37	0.63	0.35	0.23	0.19	0.20	0.13	0.12	0.28	0.21	0.27
900 to 885									0.10	0.17	0.18	0.20
885 to 870												
870 to 855												
< 855	0.39	0.31	0.40	0.19	0.13	0.08	0.09	0.07	0.07	0.11	0.12	0.67

Legend	0.00										10.00

Jocassee C_2_560.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.75	1.33	1.29	1.05	1.05	1.17	0.99	0.83	1.78	2.46	2.51	2.11
1095 to 1080	0.83	1.61	1.25	1.25	1.49	1.29	1.25	1.13	2.02	2.51	2.62	2.31
1080 to 1065	0.89	1.12	1.17	1.21	1.65	1.53	2.02	1.78	2.06	2.82	2.31	3.02
1065 to 1050	0.93	0.95	0.55	0.69	1.09	2.62	1.41	1.01				2.31
1050 to 1035	1.01	0.39	0.43	0.37	0.81	2.18	1.09	1.21	1.61	2.72	2.72	2.31
1035 to 1020	0.97	0.18	0.39	0.81	0.49	1.25	0.77	0.93	0.81	2.54	2.92	
1020 to 1005	0.95	0.37	0.37	0.22	0.32	0.43	0.48	0.53	0.59	2.06	3.12	2.31
1005 to 990									0.51	0.53	2.82	2.62
990 to 975	0.87	0.28	0.32	0.17	0.14	0.22	0.24	0.26				
975 to 960									0.24	0.28	1.53	1.01
960 to 945												
945 to 930												
930 to 915												
915 to 900		0.15	0.18	0.09	0.07		0.10	0.09	0.07	0.10	0.18	0.21
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 901.1 ft

Jocassee C_2_560.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.66	1.34	2.12	3.55	2.65	1.32	1.64	1.50	2.10	3.12	2.99	2.61
1095 to 1080	1.83	1.41	2.28	2.76	2.95	1.85	1.69	1.82	2.29	2.61	2.44	2.01
1080 to 1065	1.81	1.49	1.90	2.24	3.25	2.49	2.89	2.27	2.28	2.93	2.83	2.33
1065 to 1050	1.84	1.42	1.46	1.70	2.77	2.94	3.36	2.57	2.02	2.85	2.69	2.23
1050 to 1035	1.73	1.31	1.50	1.32	1.64	1.96	2.52	1.72	1.60	2.87	2.69	2.23
1035 to 1020	1.65	1.16	1.15	0.96	0.82	1.01	1.30	0.82	0.79	3.32	2.65	2.21
1020 to 1005	1.72	1.11	0.94	0.66	0.61	0.50	0.76	0.49	0.46	0.80	2.08	2.06
1005 to 990	0.91								0.46	0.47	0.73	0.65
990 to 975	2.23	0.86	1.11	0.53	0.40	0.33	0.46	0.26	0.29	0.39	0.32	0.58
975 to 960	1.02	1.75						0.34	0.26	0.23	0.35	0.33
960 to 945												
945 to 930		0.35		0.13	0.24			0.17			0.21	
930 to 915												
915 to 900	0.46	0.31	0.70	0.41	0.19	0.18	0.25	0.13	0.11	0.17	0.17	0.21
900 to 885									0.18	0.16	0.19	0.15
885 to 870		0.28		0.08	0.10			0.07			0.11	
870 to 855												
< 855				0.10								

Legend	0.00										10.00

Jocassee C_2_562.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.69	2.26	1.33	1.67	1.51	1.37	1.35	1.09	1.53	2.51	2.42	3.17
1095 to 1080	1.24	1.08	1.65	2.02	2.26	1.94	2.42	1.53	2.46	2.62	3.02	2.82
1080 to 1065	0.89	0.81	1.25	1.49	0.67	0.77	1.17	2.46	2.38	3.42	1.91	3.32
1065 to 1050	0.91	0.65	0.83	0.57	0.60	0.43	0.73	1.21				3.92
1050 to 1035	0.99	0.53	0.75	0.35	0.39	0.26	0.48	0.57	2.22	2.51	2.92	3.32
1035 to 1020		0.28	0.45	0.25		0.14	0.31	0.24	2.14	3.02	2.92	
1020 to 1005	0.99	0.37	0.39	0.30	0.30	0.13	0.23	0.22	1.98	2.72	3.02	3.42
1005 to 990									0.48	0.65	3.02	3.32
990 to 975	0.89											
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 975.3 ft

Jocassee C_2_562.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 1999 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	2.68	2.53	3.14	3.68	3.62	1.98	2.19	1.95	1.92	3.18	4.33	3.73
1095 to 1080	2.88	2.21	2.40	2.72	4.30	2.64	3.27	2.38	3.02	3.15	3.96	3.00
1080 to 1065	2.31	2.02	2.68	2.01	2.89	2.24	1.89	3.60	3.48	3.84	4.05	2.90
1065 to 1050	2.39	2.08	2.00	1.24	2.55	0.97	0.98	1.57	3.08	3.56	3.89	3.04
1050 to 1035	2.47	1.90	1.62	0.81	1.18	0.52	0.53	0.73	1.83	3.52	3.75	3.14
1035 to 1020	2.41	1.93	1.43	0.73	0.54	0.39	0.42	0.38	0.66	2.77	3.35	2.98
1020 to 1005	2.34	1.79	1.35	0.74	1.11	0.41	0.34	0.24	0.40	1.22	2.53	2.96
1005 to 990	1.21											0.85
990 to 975				0.32								
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 976.6 ft

Legend	0.00										10.00

Jocassee C_2_565.4: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.55	2.02	1.29	1.19	1.41	0.65	1.25	0.94	1.55	2.11	2.37	2.87
1095 to 1080	0.67	1.94	1.37	1.45	1.98	1.41	1.90	1.57	2.18	2.46	3.02	2.72
1080 to 1065	0.79	0.75	0.53	1.41	1.86	1.82	1.78	2.37	2.02	1.91	3.22	2.11
1065 to 1050	0.71	0.59	0.61	0.45	0.77	2.22	1.25	2.34				2.41
1050 to 1035	0.73	0.47	0.53	0.39	0.83	0.77	1.25	1.25	1.98	2.62	2.82	2.62
1035 to 1020	0.75	1.53	0.41	0.32	0.45	0.41	0.69	0.77	1.94	2.62	3.02	
1020 to 1005	0.79	0.39	0.30	0.28	0.28	0.37	0.43	0.47	1.37	1.91	3.52	2.62
1005 to 990									0.47	0.47	2.62	2.72
990 to 975	0.69	0.39	0.37	0.26	0.21	0.22	0.24	0.24				
975 to 960									0.32	0.28	0.37	1.11
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 966.8 ft*							
885 to 870												
870 to 855												
< 855												

Jocassee C_2_565.4: Monthly Averaged Chlorophyll (ug/l) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	2.35	2.43	2.38	4.34	3.23	1.43	1.27	1.54	1.95	3.62	3.45	3.78
1095 to 1080	2.68	2.52	2.46	3.69	4.20	2.29	2.74	2.47	2.88	2.54	3.29	3.08
1080 to 1065	2.63	2.31	2.22	2.74	4.25	3.49	4.20	3.28	3.39	2.94	3.67	3.52
1065 to 1050	2.49	2.01	1.92	1.78	3.34	2.61	2.83	2.21	2.48	3.27	3.79	3.40
1050 to 1035	2.84	1.89	1.36	1.43	1.80	1.58	2.07	1.20	1.55	3.16	3.36	3.41
1035 to 1020	2.53	1.64	1.41	0.77	0.92	0.72	0.85	0.92	0.70	3.17	3.18	3.64
1020 to 1005	2.56	1.56	1.32	0.77	0.68	0.59	0.52	0.43	0.36	1.05	2.35	2.86
1005 to 990	1.12								0.40	0.34	0.61	0.57
990 to 975	2.93	1.19	1.10	0.67	0.61	0.44	0.33	0.35	0.21	0.46	0.64	1.06
975 to 960	1.28	3.54						0.32	0.29	0.32	0.44	0.53
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 962.2 ft*							
885 to 870												
870 to 855												
< 855												

Legend	0.00										10.00

Jocassee D_2_551.0: Monthly Averaged Chlorophyll (ug/l)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Readings Began in 2009

Jocassee D_2_551.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080		0.25			1.16							
1080 to 1065												
1065 to 1050								1.86			1.43	
1050 to 1035		0.35										
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1043.6 ft

Legend	0.00										10.00

Jocassee D_2_564.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.53	1.82	1.33	1.13	1.21	1.61	1.13	0.79	1.72	2.26	2.49	2.14
1095 to 1080	0.59	1.18	1.41	1.37	1.70	2.02	1.70	1.57	2.34	3.02	2.82	2.92
1080 to 1065	0.69	0.93	1.25	0.97	1.78	2.62	1.41	2.54	0.97	2.31	2.62	3.22
1065 to 1050	0.67	0.65	0.65	0.51	1.25	2.37	1.29	1.29				2.82
1050 to 1035	0.71	0.43	0.53	0.39	0.75	1.98	0.81	1.17	1.87	2.11	3.22	3.32
1035 to 1020	0.75	0.45	0.45	0.30	0.39	1.33	0.65	0.48	1.54	2.30	2.92	
1020 to 1005	0.75	0.37	0.37	0.30	0.28	0.89	0.48	0.45	1.01	1.82	3.12	2.62
1005 to 990									0.45	0.47	2.26	2.51
990 to 975	0.75	0.39	0.30	0.28	0.15	0.23	0.25	0.23				
975 to 960									0.25	0.32	0.37	0.89
960 to 945												
945 to 930												
930 to 915												
915 to 900		0.18	1.41	0.09	0.09	0.08	0.07	0.08	0.09	0.09	0.16	0.16
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 901.1 ft

Jocassee D_2_564.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.87	2.14	2.15	3.54	2.88	1.25	1.38	1.57	2.11	3.32	3.03	2.75
1095 to 1080	2.01	2.79	2.15	2.44	4.09	1.63	1.49	1.83	2.31	2.40	2.90	2.63
1080 to 1065	2.23	2.53	2.19	2.20	3.72	2.65	2.70	2.40	2.22	2.82	3.55	2.44
1065 to 1050	2.05	1.39	2.18	1.72	2.82	3.09	3.67	2.63	2.42	3.13	3.87	2.88
1050 to 1035	2.60	2.17	1.72	1.13	3.15	1.87	2.85	1.72	1.83	3.25	3.54	2.84
1035 to 1020	2.12	1.67	1.59	0.80	1.56	1.05	1.78	1.07	0.84	2.91	3.57	2.94
1020 to 1005	2.27	1.47	1.47	0.66	1.08	0.61	0.86	0.69	0.47	1.17	2.26	2.52
1005 to 990	1.21								0.56	0.50	0.75	0.66
990 to 975	2.20	1.33	1.24	0.62	0.75	0.34	0.42	0.34	0.24	0.52	0.43	0.52
975 to 960	0.86	2.02						0.17	0.23	0.37	0.29	0.30
960 to 945												
945 to 930												
930 to 915												
915 to 900	1.07	1.88	0.84	0.39	0.36	0.17	0.59	0.72	0.21	0.20	0.24	0.15
900 to 885									0.24	0.16	0.13	0.13
885 to 870												
870 to 855												
< 855												

Minimum Reading 896.5 ft

Legend	0.00										10.00

Jocassee D_2_564.1: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.69	2.62	0.65	1.84	1.43	1.43	1.09	1.94	1.44	2.92	2.51	2.57
1095 to 1080	0.75	1.37	1.17	1.13	1.05	2.54	1.53	1.18	1.66	3.02	2.62	2.92
1080 to 1065	0.67	0.63	0.63	0.93	0.81	2.34	0.77	0.61	1.34	3.32	2.62	3.12
1065 to 1050	0.63	0.49	0.43	0.55	0.55	1.49	0.61	0.31				1.81
1050 to 1035	0.61	0.18	0.57	0.35	0.24	0.48	0.41	0.20	1.14	1.57	1.71	1.91
1035 to 1020	0.51	0.35	0.49	0.30	0.14	0.47	0.22	0.17	1.22	1.46	3.31	
1020 to 1005	0.45	0.23	0.35	0.21	0.11	0.10	0.13	0.20	0.49	0.89	2.34	1.86
1005 to 990									0.45	0.31	2.02	2.07
990 to 975	0.57	0.28	0.35	0.25	0.11	0.10	0.05	0.15				
975 to 960									0.69	0.45	1.86	2.17
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 966.8 ft

Jocassee D_2_564.1: Monthly Averaged Chlorophyll (ug/l) 1991 to 1999 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.92	1.94	1.91	2.48	3.05	1.52	1.45	1.79	2.26	2.88	3.22	2.81
1095 to 1080	1.85	1.86	1.86	1.86	2.68	2.22	1.68	1.98	1.83	2.09	2.34	2.02
1080 to 1065	1.93	1.72	1.78	1.89	2.96	2.30	2.43	1.86	2.02	2.43	2.91	2.19
1065 to 1050	1.87	1.81	1.75	1.90	3.24	2.40	2.99	2.29	2.06	2.64	2.78	2.19
1050 to 1035	2.09	1.76	1.51	1.86	2.77	2.41	3.48	1.95	1.97	2.58	2.59	2.24
1035 to 1020	1.87	1.64	1.55	1.73	2.80	2.78	3.63	1.82	1.88	2.50	2.65	2.22
1020 to 1005	1.81	1.60	1.50	1.88	2.49	2.65	3.45	1.82	1.82	2.45	2.82	2.06
1005 to 990	0.93								1.50	2.19	2.02	1.54
990 to 975	1.97	1.60	1.62	1.70	2.55	2.59	3.45	2.10	1.88	2.64	2.93	2.76
975 to 960	0.96	2.00						2.06				2.34
960 to 945												
945 to 930	0.69											
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 938.2 ft

Legend	0.00										10.00

Jocassee E_2_557.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	0.61	1.41	1.98	1.31	1.39	1.07	0.87	0.89	1.86	1.74	2.21	3.52
1095 to 1080	0.67	1.78	2.54	1.25	1.49	1.25	1.29	1.09	1.94	2.22	3.07	3.32
1080 to 1065	0.85	0.87	0.93	1.21	1.74	2.14	2.22	2.34	1.94	2.21	2.67	3.72
1065 to 1050	0.77	0.20	0.63	1.01	1.74	2.58	1.78	2.30				3.12
1050 to 1035	0.85	0.53	0.65	0.63	1.25	1.45	1.82	2.22	2.02	2.41	3.07	3.42
1035 to 1020	0.87	0.49	0.61	0.35	0.65	0.77	0.57	0.81	2.10	2.92	2.62	
1020 to 1005	0.83	0.41	0.45	0.29	0.30	0.53	0.45	0.89	0.61	0.81	3.12	1.31
1005 to 990									0.51	0.57	3.02	4.53
990 to 975	0.83	0.49	0.30	0.22	0.22	0.22	0.15	0.32				
975 to 960									0.31	0.30	0.39	2.11
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 901.1 ft

Jocassee E_2_557.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	2.15	2.33	1.99	3.36	2.06	1.21	1.02	1.32	1.80	3.24	4.12	3.54
1095 to 1080	2.29	2.55	2.62	3.26	2.64	2.33	2.39	2.05	1.88	3.03	3.40	2.58
1080 to 1065	2.63	2.37	2.49	3.60	3.77	2.83	3.78	3.40	4.06	3.25	3.87	3.09
1065 to 1050	2.66	2.20	2.13	2.48	3.58	3.34	4.24	4.05	4.52	3.42	3.42	3.97
1050 to 1035	3.21	1.97	1.84	1.70	2.63	2.07	3.40	1.87	2.05	4.41	3.39	3.25
1035 to 1020	2.65	1.76	1.52	1.00	1.06	1.39	1.92	1.32	1.22	3.88	3.74	2.88
1020 to 1005	2.87	1.61	1.46	1.01	0.68	0.68	1.00	0.61	0.68	1.42	3.29	2.40
1005 to 990	1.29								0.64	0.41	0.58	0.70
990 to 975	2.69	1.75	1.35	0.79	0.49	0.42	0.46	0.45	0.37	0.42	0.62	1.85
975 to 960	1.41	2.89						0.52	0.36	0.24	0.41	0.39
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 896.5 ft

Legend	0.00											10.00

Jocassee F_2_554.8: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.45	3.83	1.98	1.53	1.21	0.69	0.99	0.68	1.84	2.77	2.97	4.73
1095 to 1080	1.37	0.49	1.17	1.70	2.72	4.93	3.02	0.97	2.31	4.02	3.02	4.02
1080 to 1065	1.53	0.89	0.73	1.33	1.78	1.53	1.37	1.41	2.82	4.53	3.92	3.82
1065 to 1050	1.41	0.59	0.59	0.63	0.77	1.33	0.81	1.49				3.92
1050 to 1035	1.57	0.53	0.55	0.45	0.61	0.48	0.57	0.73	2.82	4.12	3.72	3.92
1035 to 1020	1.53	0.51	0.73	0.41	0.35	0.39	0.37	0.35	2.41	3.02	3.32	
1020 to 1005	1.29	0.51	0.65	0.28	0.22	0.25	0.26	0.14	2.06	3.02	3.22	6.14
1005 to 990									0.43	2.31	3.22	2.92
990 to 975	1.21	0.47	0.43	0.20	0.18	0.11	0.90	0.22				
975 to 960									0.24	0.37	0.30	2.62
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 966.8 ft

Jocassee F_2_554.8: Monthly Averaged Chlorophyll (ug/l) 1991 to 1997 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	3.16	3.97	3.27	3.39	2.93	1.79	1.45	1.70	2.02	3.73	4.71	4.48
1095 to 1080	3.53	4.07	3.56	4.08	3.52	4.61	4.14	2.21	2.81	4.02	4.55	3.48
1080 to 1065	3.35	3.53	3.20	3.05	3.71	2.77	4.07	4.57	4.28	4.56	4.72	3.77
1065 to 1050	2.96	3.01	2.47	2.00	1.88	1.32	1.97	1.96	3.02	3.90	4.11	3.52
1050 to 1035	2.92	2.77	2.24	1.13	1.12	0.66	0.85	0.86	2.23	3.51	3.98	4.01
1035 to 1020	2.74	2.48	1.83	0.89	0.60	0.51	0.38	0.44	0.75	3.02	3.40	3.67
1020 to 1005	2.72	2.24	1.57	0.59	0.44	0.35	0.25	0.22	0.40	1.39	2.72	3.46
1005 to 990	1.70								0.18	0.24	0.34	0.96
990 to 975	3.41	2.43	2.48	0.65	0.41	0.27	0.26	0.27	0.25	0.36	3.27	2.34
975 to 960	1.20	2.96						0.18	0.18	0.28	0.24	0.25
960 to 945												
945 to 930				0.26								
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 943.8 ft

Legend	0.00										10.00

Jocassee F_2_556.0: Monthly Averaged Chlorophyll (ug/l) 1990 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	1.01	1.21	1.65	1.21	1.29	1.05	0.91	0.34	1.67	3.22	2.48	3.57
1095 to 1080	1.08	0.97	1.53	1.57	1.65	0.77	1.09	2.82	2.26	3.62	1.51	3.72
1080 to 1065	1.12	0.99	0.93	1.33	2.58	1.53	1.37	2.54	2.30	4.83	2.72	3.92
1065 to 1050	1.16	0.57	0.77	0.85	1.41	2.30	1.09	0.73				3.72
1050 to 1035	1.03	0.57	0.61	0.47	0.73	2.06	1.09	1.53	2.06	3.92	3.72	3.92
1035 to 1020	1.03	0.45	0.49	0.32	0.45	1.05	0.43	0.65	1.94	3.12	2.82	
1020 to 1005	0.97	0.43	0.41	0.30	0.37	0.20	0.41	0.45	1.17	2.62	3.12	3.42
1005 to 990									0.35	1.65	2.26	2.72
990 to 975	1.03	0.43	0.43	0.17	0.23	0.21	0.15	0.28				
975 to 960									0.22	0.32	2.77	3.22
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 966.8 ft

Jocassee F_2_556.0: Monthly Averaged Chlorophyll (ug/l) 1991 to 2010 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	2.73	2.69	3.15	4.06	2.60	1.36	1.12	1.26	2.04	3.56	3.35	3.47
1095 to 1080	3.07	2.64	3.16	4.58	3.22	3.47	2.29	1.70	2.73	3.71	3.53	3.02
1080 to 1065	3.12	2.85	2.67	4.39	4.05	3.02	3.62	3.98	3.53	3.68	4.21	3.24
1065 to 1050	2.75	2.48	2.33	2.71	3.18	2.05	3.48	2.40	2.96	3.96	3.59	3.24
1050 to 1035	2.91	2.38	1.92	1.65	1.83	1.25	1.85	0.96	1.91	3.91	3.45	3.09
1035 to 1020	2.87	2.38	1.71	1.01	1.31	0.73	0.70	0.60	0.70	2.71	2.95	3.16
1020 to 1005	2.30	1.60	1.54	0.75	0.61	0.43	0.46	0.25	0.42	0.99	2.15	1.88
1005 to 990	1.34								0.38	0.26	0.46	0.98
990 to 975	2.93	1.65	1.68	0.65	0.42	0.34	0.35	0.21	0.18	0.43	0.43	2.29
975 to 960	1.31	3.05						0.21	0.32	0.27	0.39	0.28
960 to 945												
945 to 930		1.16		0.36	0.13			0.05			0.18	
930 to 915												
915 to 900		1.14		0.17				0.34				
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 910.9 ft

Legend	0.00										10.00

Lake Jocassee

Conductivity

This page intentionally left blank.

Jocassee B_2_558.7: Monthly Averaged Conductivity (uS/cm) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	18.3	19.0	18.0	19.3	19.0	18.5	19.6	19.8	20.5	19.2	19.8	21.0
1095 to 1080	20.5	19.0	20.0	20.4	20.0	20.5	20.6	20.6	21.0	19.7	20.8	21.7
1080 to 1065	20.5	19.0	20.5	20.3	20.0	20.5	20.8	20.3	20.9	20.0	20.7	21.7
1065 to 1050	20.4	19.0	20.8	20.3	20.0	20.7	20.9	20.3	21.1	20.2	20.6	21.7
1050 to 1035	20.0	19.0	20.2	20.6	20.0	20.2	20.4	20.1	21.3	19.6	20.4	20.9
1035 to 1020	19.8	19.0	20.5	20.7	19.4	20.3	19.9	20.4	20.8	19.4	20.2	21.1
1020 to 1005	19.4	19.0	20.6	20.7	19.7	19.9	20.3	19.9	20.4	19.3	20.2	21.0
1005 to 990	19.5	19.0	20.0	20.5	19.7	19.7	19.9	19.9	20.0	18.4	19.6	20.4
990 to 975	19.2	19.0	19.6	20.1	19.3	19.5	22.7	19.8	20.3	17.1	19.1	20.6
975 to 960	19.0	19.0	19.5	20.3	19.3	19.5	20.7	20.2	20.3	18.3	18.9	20.0
960 to 945	18.8	18.5	19.8	20.2	19.3	19.7	20.1	20.0	20.0	18.2	18.9	19.6
945 to 930	18.8	18.8	18.6	20.0	19.3	19.1	19.7	19.4	20.0	17.3	19.1	19.7
930 to 915	18.4	18.5	19.3	19.9	19.3	19.2	19.8	19.7	19.7	18.1	19.4	20.6
915 to 900	17.6	18.5	19.6	19.8	19.3	19.6	19.9	20.3	19.6	17.9	19.0	19.4
900 to 885	18.8	18.5	19.8	20.0	19.3	19.0	19.8	19.9	19.8	17.4	18.8	19.4
885 to 870	19.6	18.4	19.6	20.0	19.6	19.7	19.9	19.8	20.0	16.8	19.2	20.4
870 to 855	19.5	18.0	20.0	20.2	19.7	19.5	20.1	20.4	20.3	18.0	18.2	20.0
< 855	22.0	23.5	20.8	20.4	19.7	19.9	20.0	21.5	23.3	22.4	22.1	28.6

Jocassee B_2_558.7: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.1	17.0	17.0	17.5	18.2	18.0	18.6	18.6	18.5	18.2	18.3	16.6
1095 to 1080	17.1	17.6	17.3	18.0	18.2	18.3	18.9	18.9	18.3	18.8	18.1	17.6
1080 to 1065	17.2	17.5	17.3	18.1	18.4	18.6	18.9	19.1	18.5	18.9	18.2	17.5
1065 to 1050	17.4	17.5	17.1	17.9	18.2	18.2	18.8	19.1	18.2	18.9	18.1	17.6
1050 to 1035	17.2	17.3	17.3	17.7	17.9	18.1	18.5	18.8	18.1	18.7	18.1	17.5
1035 to 1020	17.3	17.4	17.3	17.9	18.0	17.9	18.3	18.6	17.9	18.6	18.2	17.5
1020 to 1005	17.2	17.5	17.3	17.8	17.9	17.8	17.6	17.9	17.1	18.4	18.0	17.5
1005 to 990	17.4	17.2	17.0	17.7	17.9	17.2	17.3	17.4	16.7	17.4	17.5	17.3
990 to 975	17.0	17.5	17.1	17.5	17.5	17.4	17.4	17.4	16.8	17.5	17.0	17.0
975 to 960	17.0	17.4	17.1	17.7	17.7	17.3	17.4	17.4	16.7	17.7	17.2	16.9
960 to 945	17.3	17.2	17.0	17.5	17.7	17.3	17.4	17.4	16.5	17.6	17.1	17.0
945 to 930	17.2	17.0	17.0	17.5	17.7	17.3	17.4	17.3	16.6	17.5	17.1	17.0
930 to 915	17.4	17.3	17.0	18.0	17.9	17.6	17.6	17.5	17.0	17.6	17.2	17.2
915 to 900	17.8	17.4	17.0	17.8	17.9	17.4	17.5	17.5	16.8	17.7	17.4	17.5
900 to 885	18.1	17.2	17.0	17.7	17.8	17.3	17.4	17.9	16.9	17.7	17.6	17.6
885 to 870	17.9	17.5	17.2	17.8	17.7	17.5	17.6	17.9	17.3	17.8	17.6	18.0
870 to 855	18.6	17.4	17.2	18.0	17.9	17.7	17.8	18.2	17.5	18.0	18.0	18.4
< 855	20.1	18.3	17.4	18.2	18.2	18.0	18.3	18.9	19.2	19.4	20.3	20.0

Legend	15.0										25.0

Jocassee B_3_558.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	15.8	17.2	17.1	17.0	15.3	16.5	19.0	18.1	17.4	17.8	15.9	17.9
1095 to 1080	17.5	17.5	17.8	18.1	17.2	18.2	18.6	19.4	18.1	19.0	17.6	18.0
1080 to 1065	17.4	17.6	17.2	17.8	17.4	18.2	19.0	18.8	18.0	18.6	17.3	17.8
1065 to 1050	17.0	17.0	17.9	17.3	17.9	18.1	19.4	19.1	18.7	18.5	18.1	18.4
1050 to 1035	16.8	17.3	17.2	17.6	16.9	17.9	18.6	18.6	16.8	18.3	17.9	19.1
1035 to 1020	17.3	17.1	17.8	17.3	16.6	17.6	18.0	18.9	17.6	18.2	17.2	18.3
1020 to 1005	17.0	16.9	17.7	17.0	16.2	17.3	19.1	17.7	16.8	17.6	16.8	17.8
1005 to 990	17.3	16.7	17.3	16.5	16.7	17.1	17.5	17.5	16.9	16.7	16.3	18.5
990 to 975	17.2	16.7	17.1	17.7	16.7	17.7	17.9	18.8	16.5	16.2	15.9	18.1
975 to 960	17.7	19.0	20.0	19.0	17.9	17.8	22.1	18.6	18.7	17.2	17.1	18.8
960 to 945	18.8	16.8	19.7	18.3	20.3	19.8	20.8	19.5	21.1	17.3	19.6	19.6
945 to 930	18.5	17.4	19.2	18.8	19.7	18.8	20.0	20.7	18.6	17.6	18.6	19.9
930 to 915	18.6	17.1	19.5	19.0	20.1	19.0	20.7	19.8	21.0	17.5	19.4	20.3
915 to 900	19.4	18.1	17.7	18.0	19.2	18.7	18.9	18.9	19.2	17.8	18.3	20.0
900 to 885	19.0	16.7	20.0	18.9	20.3	19.4	20.8	20.2	20.4	17.1	18.9	19.7
885 to 870	19.6	18.1	20.6	19.5	20.2	19.8	20.6	20.3	20.5	17.5	19.7	20.2
870 to 855	19.5	18.0	21.0	19.3	20.7	19.8	20.9	19.6	20.6	17.8	19.1	19.1
< 855	23.1	20.1	20.6	19.7	20.3	19.6	20.5	21.7	21.5	21.4	22.5	24.6

Jocassee B_3_558.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2020 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.3	17.5	17.4	17.6	18.3	18.3	19.0	19.2	19.2	18.7	18.9	16.8
1095 to 1080	17.4	17.8	17.9	18.2	18.5	18.7	19.4	19.4	19.1	19.0	18.5	17.6
1080 to 1065	17.5	17.7	17.8	18.3	18.8	18.7	19.3	19.4	19.1	19.2	18.4	17.8
1065 to 1050	17.5	17.7	17.5	18.0	18.4	18.3	19.0	19.3	18.8	19.1	18.5	17.8
1050 to 1035	17.3	17.5	17.7	18.0	18.2	18.2	18.9	19.1	18.7	19.0	18.4	17.6
1035 to 1020	17.4	17.7	17.7	18.0	18.2	18.0	18.5	18.8	18.6	18.9	18.4	17.7
1020 to 1005	17.4	17.7	17.6	18.0	18.0	17.6	17.9	18.1	17.9	18.6	18.2	17.6
1005 to 990	17.4	17.5	17.5	17.8	18.0	17.3	17.6	17.5	17.3	17.6	17.9	17.4
990 to 975	17.3	17.7	17.5	17.8	17.7	17.4	17.7	17.6	17.2	17.7	17.2	17.2
975 to 960	17.2	17.6	17.4	17.9	17.9	17.4	17.5	17.4	17.2	17.7	17.3	17.0
960 to 945	17.5	17.7	17.3	17.7	17.9	17.4	17.4	17.6	17.0	17.9	17.3	17.0
945 to 930	17.7	17.5	17.5	17.7	17.9	17.5	17.6	17.4	17.1	17.6	17.4	17.1
930 to 915	17.6	17.9	17.5	17.9	18.0	17.7	17.8	17.6	17.5	17.8	17.5	17.2
915 to 900	17.9	17.9	17.6	17.9	18.1	17.6	17.7	17.6	17.3	17.9	17.7	17.5
900 to 885	18.1	17.9	17.5	17.9	18.0	17.6	17.7	17.5	17.4	17.8	17.9	17.4
885 to 870	18.1	18.1	17.9	18.0	17.9	17.5	17.7	17.8	17.6	17.9	17.7	17.9
870 to 855	18.6	18.4	17.7	18.1	18.0	17.7	17.8	18.0	17.9	18.1	18.2	18.1
< 855	20.0	18.9	17.9	18.3	18.2	18.0	18.5	18.8	18.9	20.4	20.3	20.1
Legend	**15.0**											**25.0**

Jocassee C_2_559.0: Monthly Averaged Conductivity (uS/cm) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	18.0	19.0	18.7		20.5	19.2	19.6	19.4	20.5	19.3	19.8	20.5
1095 to 1080	20.5	19.0	20.0	20.0	21.0	20.7	20.5	20.2	21.0	20.1	20.1	21.2
1080 to 1065	20.5	19.0	20.0	20.0	21.0	20.6	20.5	20.2	20.6	20.1	20.0	21.1
1065 to 1050	20.4	19.0	20.2	20.0	21.0	20.5	20.5	20.1	20.4	20.4	20.2	21.2
1050 to 1035	20.0	19.0	20.0	19.9	20.7	20.5	20.3	20.1	20.6	19.8	19.8	20.8
1035 to 1020	20.0	19.0	19.8	20.1	21.2	20.6	19.8	20.7	20.9	19.6	20.0	20.8
1020 to 1005	19.4	19.0	20.2	20.0	20.5	20.6	20.4	19.9	20.2	19.6	20.2	20.9
1005 to 990	19.5	19.3	20.5	19.8	20.3	20.1	19.8	20.1	20.4	18.8	19.0	20.2
990 to 975	19.2	19.0	20.4	19.9	20.0	20.0	19.7	19.9	19.9	29.3	19.0	20.4
975 to 960	19.0	19.0	20.5	19.7	19.6	19.4	20.1	20.1	19.9	18.6	18.8	19.7
960 to 945	18.2	19.0	20.4	19.7	19.6	19.5	19.8	20.0	19.6	18.5	18.8	19.7
945 to 930	18.8	19.0	20.0	19.5	19.3	19.6	19.6	19.9	19.8	17.8	18.5	19.6
930 to 915	19.4	19.0	20.0	20.0	19.7	19.3	20.0	19.9	19.9	17.8	18.8	20.3
915 to 900	18.4	19.5	20.6	19.7	19.8	19.8	20.2	20.4	19.6	18.2	19.0	19.8
900 to 885	19.0	19.3	20.7	19.8	19.4	19.6	20.0	20.3	19.8	17.9	18.0	20.0
885 to 870	20.0	19.8	23.2	20.4	20.3	19.8	20.0	20.0	20.1	17.3	19.3	21.4
870 to 855	19.0	19.8	22.0	20.8	20.3	23.9	20.3	20.6	20.2	18.4	19.6	21.6
< 855	25.0	24.0	23.7	22.9	20.0	19.8	20.3	21.0	20.8	23.0	23.1	29.1

Jocassee C_2_559.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	16.9	16.8	17.3	18.1	17.8	18.4	18.5	18.3	18.1	18.1	17.4
1095 to 1080	16.6	17.4	17.2	17.7	18.0	18.2	18.6	18.7	18.6	18.6	17.9	17.6
1080 to 1065	16.7	17.3	17.2	17.8	18.2	18.2	18.8	18.9	18.8	18.7	18.0	17.6
1065 to 1050	16.9	17.3	16.9	17.6	18.1	18.1	18.6	18.8	18.6	18.7	17.9	17.7
1050 to 1035	16.8	17.1	17.2	17.6	17.9	18.0	18.5	18.6	18.3	18.6	17.9	17.7
1035 to 1020	16.9	17.3	17.2	17.7	18.0	17.9	18.3	18.4	18.1	18.5	18.0	17.6
1020 to 1005	16.8	17.3	17.1	17.7	17.9	17.5	17.8	17.8	17.5	18.3	17.7	17.6
1005 to 990	17.0	17.0	16.9	17.5	17.8	17.2	17.5	17.3	17.1	17.6	17.5	17.7
990 to 975	16.7	17.2	17.1	17.4	17.5	17.3	17.5	17.3	17.1	17.7	17.3	17.4
975 to 960	16.9	17.2	17.0	17.6	17.6	17.2	17.4	17.3	17.1	17.9	17.2	17.3
960 to 945	17.2	17.3	16.9	17.8	17.8	17.2	17.4	17.4	17.0	17.7	17.2	17.4
945 to 930	17.4	17.2	17.2	17.4	17.6	17.3	17.4	17.2	17.0	17.7	17.3	17.6
930 to 915	17.6	17.6	17.3	17.6	18.0	17.5	17.6	17.5	17.4	17.8	17.4	17.8
915 to 900	18.1	17.7	17.4	17.8	17.9	17.6	17.7	17.8	17.4	18.0	18.0	18.3
900 to 885	18.6	17.9	17.4	17.8	18.0	17.7	17.7	17.8	17.5	18.0	18.2	18.3
885 to 870	18.7	18.1	17.7	18.2	18.0	17.7	17.9	18.2	17.9	18.1	18.2	19.1
870 to 855	21.7	18.2	17.9	18.4	18.2	18.0	18.3	18.6	18.4	18.5	18.9	19.6
< 855	20.7	19.0	19.0	19.5	19.0	18.2	18.8	18.7	18.6	20.0	20.5	21.7

Legend	15.0										25.0

Jocassee C_2_560.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	15.6	16.4	16.6	16.6	16.6	15.9	18.1	17.7	16.7	16.7	15.6	16.8
1095 to 1080	17.3	16.7	17.5	17.6	17.4	17.5	17.8	19.2	17.7	17.6	17.0	17.7
1080 to 1065	17.4	17.0	17.1	17.4	17.3	17.3	18.1	18.5	17.2	17.7	16.8	17.3
1065 to 1050	16.6	16.3	17.8	16.8	17.5	17.4	18.3	18.8	17.5	17.4	17.3	18.1
1050 to 1035	16.6	16.7	16.7	17.2	17.6	17.3	18.0	18.0	16.4	17.1	17.4	18.3
1035 to 1020	16.8	16.5	17.5	17.0	16.8	16.9	17.3	18.6	17.2	16.9	16.6	17.8
1020 to 1005	16.6	16.1	16.9	16.8	16.7	16.6	18.1	17.8	16.4	16.8	16.7	17.6
1005 to 990	16.1	16.2	17.1	16.6	17.6	16.8	17.1	17.8	17.1	16.6	16.4	17.9
990 to 975	16.6	15.9	16.7	17.0	16.9	17.1	17.3	18.7	16.3	16.3	16.0	17.8
975 to 960	17.0	18.1	19.8	18.4	17.7	17.2	18.1	18.4	18.0	16.8	17.2	18.3
960 to 945	18.8	16.0	19.5	17.3	19.5	18.6	19.6	19.4	19.6	16.7	18.2	19.8
945 to 930	18.5	16.6	19.3	17.5	19.3	18.5	19.8	20.2	17.9	17.3	17.6	19.9
930 to 915	19.2	16.4	19.2	18.1	19.6	18.8	20.1	20.3	20.2	16.6	18.5	20.9
915 to 900	20.4	17.3	17.3	18.0	18.7	17.8	18.4	19.4	17.8	17.0	17.8	20.1
900 to 885	19.8	17.0	20.0	18.2	19.6	19.1	20.0	20.6	20.3	16.5	18.0	20.0
885 to 870	20.0	17.7	20.6	18.2	20.2	19.4	20.1	20.3	20.8	16.5	19.3	20.9
870 to 855	19.6	16.8	21.0	19.1	20.5	19.6	20.4	20.0	20.9	18.7	20.1	21.1
< 855	24.5	15.7	21.0	21.3	19.1	19.9	21.1	26.4	21.3	17.8	20.0	21.1

Jocassee C_2_560.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	16.5	17.0	17.3	18.1	17.9	18.2	18.5	18.1	17.8	17.9	17.2
1095 to 1080	16.5	16.9	17.4	17.7	18.1	18.2	18.5	18.7	18.2	18.3	17.7	17.2
1080 to 1065	16.7	16.9	17.2	17.8	18.1	18.2	18.5	18.8	18.3	18.4	17.6	17.4
1065 to 1050	16.7	16.7	17.2	17.7	18.1	18.2	18.5	18.8	18.1	18.4	17.7	17.5
1050 to 1035	16.6	16.6	17.1	17.6	18.0	18.2	18.5	18.6	17.9	18.3	17.7	17.5
1035 to 1020	16.6	16.8	17.4	17.7	18.0	18.0	18.3	18.6	17.9	18.3	17.6	17.5
1020 to 1005	16.6	16.8	17.1	17.6	17.8	17.5	17.8	18.1	17.4	18.2	17.4	17.4
1005 to 990	16.8	16.5	17.2	17.6	17.6	17.1	17.3	17.4	17.1	17.7	17.4	17.4
990 to 975	16.5	16.8	17.5	17.4	17.4	17.3	17.5	17.4	17.1	17.7	17.3	17.5
975 to 960	16.8	16.8	17.1	17.5	17.5	17.3	17.4	17.5	17.1	17.9	17.4	17.8
960 to 945	17.5	16.8	17.2	17.4	17.5	17.4	17.4	17.6	17.0	17.9	17.6	18.1
945 to 930	18.2	17.2	17.3	17.5	17.7	17.6	17.5	17.5	17.1	17.9	17.7	18.3
930 to 915	18.5	17.6	17.7	17.8	18.0	17.8	17.7	17.9	17.6	18.1	18.0	18.4
915 to 900	19.0	17.8	17.8	18.0	17.9	18.0	17.8	18.2	18.0	18.3	18.4	19.1
900 to 885	19.3	18.3	17.9	18.1	18.1	18.0	17.8	18.1	18.0	18.3	18.6	18.9
885 to 870	19.1	18.9	18.7	18.2	18.2	18.3	18.1	18.5	18.5	18.6	18.6	19.4
870 to 855	20.0	19.3	18.8	18.7	18.8	18.8	18.9	18.8	19.3	19.6	20.2	20.3
< 855	19.6	20.5	19.5	23.3	17.7	17.9	17.5	18.7	18.6	20.1	18.4	26.8
	Legend	**15.0**										**25.0**

Jocassee C_2_562.0: Monthly Averaged Conductivity (uS/cm) 1980 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	17.6	18.5	17.2	19.1	18.7	20.8	20.9	20.6	18.9	19.3	21.0
1095 to 1080	19.6	17.7	19.3	18.2	20.5	21.4	22.2	22.1	21.4	19.4	19.3	21.5
1080 to 1065	19.1	17.4	19.3	18.0	20.7	21.8	22.6	21.9	21.0	19.7	20.0	21.5
1065 to 1050	18.0	17.0	19.7	17.8	20.4	22.1	24.0	23.4	21.8	19.3	19.6	21.7
1050 to 1035	18.5	17.6	19.7	18.1	20.8	22.4	22.2	23.1	22.1	19.1	19.2	21.3
1035 to 1020	18.7	16.9	19.6	18.3	20.1	21.8	21.8	23.2	22.5	19.1	19.4	21.7
1020 to 1005	18.1	16.5	19.7	18.2	20.3	22.4	22.5	24.7	25.9	20.8	19.7	21.4
1005 to 990	18.0	17.5	20.0	17.6	21.3	23.2	25.8	30.0	40.4	29.6	26.3	21.7
990 to 975	14.0	16.4	16.0	16.9	18.0		25.0	24.0		43.6	56.0	
975 to 960									32.0			
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 964.5 ft

Jocassee C_2_562.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.9	16.8	17.1	17.3	18.1	18.0	18.2	18.4	18.1	18.0	17.9	17.5
1095 to 1080	16.7	17.1	17.4	17.3	18.5	18.6	18.8	18.6	18.3	18.4	17.8	17.6
1080 to 1065	17.0	17.0	17.3	17.6	18.5	18.6	19.3	19.0	18.4	18.5	17.9	17.5
1065 to 1050	16.9	17.0	17.3	17.4	18.2	18.1	18.8	19.2	18.4	18.6	17.9	17.5
1050 to 1035	16.9	16.9	17.3	17.4	18.1	18.2	18.6	18.9	18.4	18.5	17.9	17.7
1035 to 1020	16.9	17.1	17.6	17.6	18.2	18.5	19.1	19.5	18.9	18.6	17.9	17.6
1020 to 1005	16.8	17.1	17.5	17.9	18.6	19.1	19.9	20.6	20.7	19.2	17.9	17.5
1005 to 990	17.1	17.3	17.6	18.4	19.7	21.2	21.4	25.1	30.9	27.6	22.1	21.4
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 992.2 ft

Legend	15.0										25.0

Jocassee C_2_565.4: Monthly Averaged Conductivity (uS/cm) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	18.0	18.0	17.0	17.3	20.0	18.0	19.5	19.2	20.6	18.0	18.0	19.0
1095 to 1080	20.5	18.5	19.5	18.5	20.0	19.5	20.3	20.0	20.9	19.8	19.8	20.9
1080 to 1065	20.6	18.8	20.0	18.5	20.5	19.2	20.0	20.1	20.5	20.1	20.3	20.8
1065 to 1050	20.0	19.0	20.2	18.3	20.0	18.7	20.0	19.8	20.9	19.4	19.6	20.9
1050 to 1035	20.0	18.8	19.8	18.7	20.0	19.3	20.0	19.7	20.1	19.4	19.4	20.4
1035 to 1020	20.0	18.6	19.8	19.0	19.5	18.7	19.9	20.1	19.9	19.0	19.5	20.3
1020 to 1005	19.2	18.0	20.0	18.5	19.0	18.8	19.5	20.2	20.4	19.3	19.4	20.5
1005 to 990	19.0	18.3	19.8	18.4	19.1	18.6	19.7	20.3	21.3	19.8	19.0	19.4
990 to 975	19.0	17.0	18.8	17.8	18.7	19.3	19.4	20.1	21.2	17.9	19.8	20.0
975 to 960	17.2	16.8	19.0	18.5	19.0	19.0	19.6	20.9	21.3	20.1	22.1	20.5
960 to 945	16.3	16.0	18.8	18.5	19.3	19.0	20.6	20.7	21.6	21.3	21.6	22.1
945 to 930	14.5	16.2	17.0	16.0	18.3	19.1	19.3	20.2	22.8	23.7	22.0	23.6
930 to 915			17.0		17.7	20.0		20.0	25.7			
915 to 900												
900 to 885												
885 to 870					*Minimum Reading 918.1 ft*							
870 to 855												
< 855												

Jocassee C_2_565.4: Monthly Averaged Conductivity (uS/cm) 1991 to 1994 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.9	15.4	17.6	16.3	17.9	16.8	17.1	17.7	17.5	16.7	16.5	16.0
1095 to 1080	16.7	15.9	17.5	15.5	17.4	15.4	17.0	17.3	17.3	16.8	16.2	15.9
1080 to 1065	16.8	15.5	17.5	15.4	17.5	15.5	17.3	17.1	17.0	16.8	16.4	15.9
1065 to 1050	16.8	15.2	17.5	16.1	17.6	15.9	16.8	16.4	16.3	16.7	16.7	15.8
1050 to 1035	16.9	15.2	17.3	16.2	17.4	16.2	16.6	16.3	15.8	16.8	16.1	16.0
1035 to 1020	16.6	15.3	17.3	16.2	17.6	16.0	16.6	16.4	16.4	16.6	16.3	15.8
1020 to 1005	16.8	15.3	17.1	16.1	17.5	15.8	16.4	17.0	16.9	17.1	16.3	15.4
1005 to 990	16.7	15.2	17.0	16.2	17.9	16.4	16.4	17.5	16.9	17.6	17.1	16.0
990 to 975	16.5	15.3	16.7	15.8	18.2	16.7	17.2	17.9	17.9	18.2	17.6	17.3
975 to 960	16.2	15.1	16.6	16.0	18.5	16.8	17.1	18.3	18.3	18.6	18.5	19.0
960 to 945	16.3	14.8	16.5	16.3	18.5	16.8	17.3	18.8	18.9	19.4	20.1	19.4
945 to 930	18.3	14.1	16.4	16.1	18.8	17.8	17.8	18.7	19.0	20.3	20.9	22.0
930 to 915	14.0				19.0		19.5	22.0	21.0		18.0	
915 to 900												
900 to 885												
885 to 870					*Minimum Reading 926.6 ft*							
870 to 855												
< 855												

Legend	15.0										25.0

Jocassee D_2_551.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095		8.9	7.8	9.6	8.3	10.1	10.4	13.7	8.8	10.3	9.1	10.0
1095 to 1080	11.0	11.5	10.0	11.0	14.5	13.5	14.0	14.0	14.0	12.0	10.3	10.5
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1082.8 ft

Jocassee D_2_551.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2011 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.0	12.7	10.0	9.0	17.3	9.0	12.0	16.0	16.0	14.0	17.0	7.0
1095 to 1080		11.4						21.0			20.0	
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 1083.7 ft

Legend 15.0 — 25.0

Jocassee D_2_564.0: Monthly Averaged Conductivity (uS/cm) 1976 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.3	16.3	15.9	16.5	17.5	17.7	19.4	18.1	17.4	16.4	15.5	17.3
1095 to 1080	18.9	16.3	16.6	16.9	18.3	18.7	18.8	18.7	18.3	17.8	17.1	18.3
1080 to 1065	18.6	16.6	16.5	16.2	17.7	17.8	18.9	18.0	17.5	17.8	16.9	18.0
1065 to 1050	17.0	16.0	17.0	16.2	18.5	18.0	19.4	18.2	17.7	17.2	17.4	18.6
1050 to 1035	17.7	16.0	15.6	16.2	18.1	18.1	19.0	18.4	16.8	17.3	17.1	18.5
1035 to 1020	17.7	16.2	16.6	16.0	18.2	17.8	18.7	19.4	18.1	17.0	16.6	18.3
1020 to 1005	17.6	15.5	15.6	16.0	17.9	17.7	19.3	19.5	18.4	17.4	17.0	18.0
1005 to 990	16.4	15.5	16.0	16.5	18.3	17.6	19.0	20.1	19.1	18.8	17.6	19.1
990 to 975	17.4	15.4	16.1	16.2	18.3	18.1	19.0	21.0	18.7	19.3	19.7	21.1
975 to 960	17.3	16.7	19.3	16.7	19.2	17.8	20.0	20.1	19.4	18.9	21.8	21.4
960 to 945	18.5	14.2	19.2	17.3	19.5	18.8	19.4	20.8	20.5	17.4	19.9	21.2
945 to 930	18.3	14.4	19.5	17.6	19.5	19.3	19.7	20.8	20.6	18.3	20.1	21.8
930 to 915	17.8	15.4	19.2	18.4	21.0	20.9	20.8	22.3	22.1	19.5	20.5	22.8
915 to 900	18.0	16.1	20.0	19.6	21.6	21.2	21.8	23.2	21.9	19.4	20.9	22.1
900 to 885	20.3	17.8	20.2	20.9	21.5	21.1	21.7	24.3	22.0	19.3	21.9	22.6
885 to 870	22.0	18.3	22.0	23.8	21.6	22.5	21.4	25.9	23.6	18.8	22.2	24.0
870 to 855	26.0			26.0	21.0	22.0	26.3	24.3	26.0	26.7	24.0	22.0
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.1	16.7	17.7	17.5	18.4	18.1	18.4	18.8	18.1	17.6	17.7	17.5
1095 to 1080	16.7	17.1	17.8	17.7	18.3	18.4	18.8	18.9	18.3	18.5	17.6	17.6
1080 to 1065	16.9	17.0	17.7	18.0	18.4	18.4	18.7	19.1	18.4	18.5	17.7	17.5
1065 to 1050	16.8	16.9	17.5	17.9	18.4	18.5	18.8	18.8	18.2	18.5	17.6	17.5
1050 to 1035	17.0	16.8	17.6	17.9	18.4	18.4	18.7	18.7	18.0	18.3	17.7	17.7
1035 to 1020	16.8	16.9	17.7	17.9	18.3	18.2	18.5	18.8	17.9	18.3	17.5	17.5
1020 to 1005	16.6	16.9	17.7	17.9	18.1	17.9	18.1	18.4	17.6	18.4	17.4	17.3
1005 to 990	16.9	16.6	17.8	17.8	17.9	17.5	17.7	17.9	17.6	18.1	17.6	17.5
990 to 975	16.7	17.0	17.9	17.6	17.8	17.6	18.0	18.0	17.7	18.2	17.7	17.8
975 to 960	17.1	17.0	17.7	17.9	18.1	17.7	18.0	18.0	17.9	18.5	18.2	18.3
960 to 945	17.6	17.0	17.6	17.8	18.1	17.9	18.1	18.3	17.9	18.7	18.4	18.9
945 to 930	18.9	17.2	17.7	18.0	18.3	18.1	18.4	18.4	18.4	19.1	19.2	19.9
930 to 915	19.5	17.6	18.0	18.5	18.5	18.6	19.0	19.1	19.0	19.5	20.0	20.8
915 to 900	20.5	19.9	23.4	18.8	18.6	19.0	19.2	19.6	19.7	20.2	21.2	21.3
900 to 885	22.2	19.4	18.5	19.2	19.0	18.9	18.5	18.5	20.5	19.7	21.8	21.6
885 to 870	22.7	24.0	21.8	18.0	17.8	19.1	19.6	18.9	24.7	20.7	23.6	26.3
870 to 855	30.9	23.0	28.0	18.3		23.0	27.0	21.5		25.0		
< 855	*Minimum Reading 864.4 ft*											

Legend	15.0										25.0

Jocassee D_2_564.1: Monthly Averaged Conductivity (uS/cm) 1987 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	20.0	18.0	17.0	18.0	20.7	19.7	20.4	21.2	20.8	18.8	19.0	20.5
1095 to 1080	20.6	18.3	18.7	18.8	19.8	19.7	20.3	22.3	21.2	19.7	19.6	21.1
1080 to 1065	18.2	17.4	18.8	18.4	20.3	20.8	19.7	21.2	21.0	20.9	20.6	21.4
1065 to 1050	17.6	15.8	16.5	16.6	17.6	19.5	19.8	21.9	20.6	18.8	18.7	19.2
1050 to 1035	19.3	16.4	16.8	16.8	17.2	19.3	19.7	23.4	20.6	18.7	17.9	18.7
1035 to 1020	20.0	17.0	16.8	17.6	16.8	19.1	19.5	24.3	23.5	18.5	17.8	19.0
1020 to 1005	22.2	17.0	18.5	19.6	19.6	21.3	20.9	25.2	27.6	21.1	18.3	18.2
1005 to 990	21.0	17.2	20.3	21.0	22.1	23.7	24.7	28.5	31.9	33.8	18.1	18.5
990 to 975	20.8	17.6	20.2	21.9	22.0	24.3	26.3	29.0	31.1	51.1	23.6	18.5
975 to 960	22.2	18.7	26.0	25.5	22.5	25.3	28.3	31.3	34.4		28.0	18.5
960 to 945					23.0							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Averaged Conductivity (uS/cm) 1991 to 2017 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.1	16.4	17.4	17.5	18.2	18.2	18.4	18.8	18.4	17.4	17.8	17.2
1095 to 1080	16.5	16.7	17.5	17.2	17.9	18.2	18.7	18.7	18.3	18.2	17.6	17.3
1080 to 1065	16.7	16.7	17.5	17.6	18.3	18.3	18.7	18.5	18.3	18.4	17.7	17.2
1065 to 1050	16.5	16.3	17.5	17.4	18.4	18.4	18.4	17.7	18.0	18.2	17.6	17.1
1050 to 1035	16.6	16.3	17.4	17.7	18.4	18.4	18.8	17.9	18.0	18.3	17.5	17.2
1035 to 1020	16.3	16.2	17.5	17.7	18.5	18.3	18.6	17.9	18.2	18.2	17.2	17.0
1020 to 1005	16.3	16.4	17.3	17.8	18.5	18.5	18.9	17.7	17.9	18.3	17.3	16.9
1005 to 990	16.4	15.9	17.2	17.9	18.6	18.2	18.3	17.2	17.8	17.9	17.1	16.9
990 to 975	16.0	15.6	17.1	17.7	19.3	18.7	18.6	17.8	17.9	18.1	16.4	16.7
975 to 960	15.5	14.6	15.6	17.0	19.1	18.5	17.9	18.6	18.6	18.3	15.8	15.4
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Legend	15.0										25.0

Jocassee E_2_557.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	15.6	16.3	16.6	16.8	15.1	16.1	18.9	17.9	16.7	16.8	15.8	17.0
1095 to 1080	17.3	16.8	17.4	17.9	17.3	18.1	18.7	19.4	17.5	17.7	17.1	17.5
1080 to 1065	17.0	17.0	17.2	17.6	16.8	17.5	19.2	18.3	17.6	17.5	16.9	17.3
1065 to 1050	16.9	16.4	17.8	17.0	16.7	17.6	19.3	18.4	17.5	17.3	17.5	17.6
1050 to 1035	16.8	16.5	17.2	17.3	17.1	17.4	18.5	17.9	16.3	17.0	17.4	17.9
1035 to 1020	17.0	16.6	17.5	16.9	16.5	17.4	17.9	18.1	17.1	16.8	16.6	17.7
1020 to 1005	16.8	16.0	17.5	16.8	16.2	17.1	18.6	17.3	16.3	16.6	16.6	17.1
1005 to 990	16.6	16.2	16.9	16.3	16.8	16.6	17.3	17.0	16.4	15.8	16.1	17.9
990 to 975	16.9	16.0	16.9	17.1	16.5	17.2	17.5	18.5	15.9	15.8	16.1	17.6
975 to 960	17.2	18.3	19.3	18.2	17.2	17.3	18.5	18.4	19.6	16.5	16.9	18.0
960 to 945	18.0	16.3	19.0	17.7	19.5	18.9	20.2	19.5	20.2	16.7	19.4	19.6
945 to 930	17.8	16.7	18.4	17.7	18.8	18.2	19.5	20.3	17.9	16.5	18.5	19.7
930 to 915	17.8	15.8	18.8	17.2	19.1	18.7	20.1	19.8	20.4	16.7	18.3	20.6
915 to 900	19.3	16.3	16.9	17.5	17.2	17.2	18.1	18.5	18.2	16.7	19.1	20.3
900 to 885	17.5	14.7	18.5	16.6	19.0	18.2	18.9	20.6	20.0	16.5	18.3	19.9
885 to 870	20.3	15.0	17.4	17.3	19.0	18.8	18.8	19.5	20.1	16.5	19.6	21.1
870 to 855	25.5	16.2	18.0	17.0	19.8	18.8	18.9	19.1	20.1	18.5	19.5	20.9
< 855	30.3	16.1	18.0	17.7	20.5	19.1	18.7	19.3	20.4	19.8	19.0	22.3

Jocassee E_2_557.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.0	16.9	17.3	17.4	17.9	17.8	18.5	18.9	18.9	18.1	18.5	17.5
1095 to 1080	17.1	17.4	17.8	18.1	18.1	18.4	19.0	19.0	18.6	18.7	18.2	17.7
1080 to 1065	17.2	17.4	17.6	18.3	18.3	18.2	19.0	19.0	18.6	18.8	18.3	17.7
1065 to 1050	17.1	17.3	17.7	18.2	18.0	18.1	18.4	18.8	18.3	18.7	18.2	17.7
1050 to 1035	17.1	17.2	17.6	17.9	17.7	17.7	18.0	18.4	17.8	18.6	18.3	17.8
1035 to 1020	17.1	17.3	17.6	17.9	17.7	17.6	18.3	18.4	17.8	18.5	18.1	17.7
1020 to 1005	17.0	17.4	17.4	17.9	17.6	17.2	17.6	17.8	17.1	18.4	17.9	17.6
1005 to 990	17.0	17.1	17.4	17.7	17.5	16.9	17.2	17.4	17.0	17.8	17.6	17.5
990 to 975	16.7	17.2	17.5	17.4	17.3	17.1	17.6	17.4	17.1	17.9	17.5	17.2
975 to 960	16.6	17.0	17.2	17.6	17.5	17.1	17.5	17.4	17.0	17.9	17.9	17.4
960 to 945	17.3	16.9	17.2	17.4	17.5	17.1	17.4	17.5	17.0	17.8	17.7	17.9
945 to 930	17.9	16.8	17.0	17.3	17.4	16.9	17.4	17.4	17.1	17.9	18.1	18.2
930 to 915	18.3	16.8	17.1	17.5	17.5	17.4	17.7	17.8	17.2	18.1	18.2	18.6
915 to 900	18.8	16.9	17.0	17.6	17.6	17.3	17.6	17.9	17.6	18.1	18.5	19.0
900 to 885	18.8	17.0	17.0	17.4	17.7	17.4	17.6	17.9	17.7	18.0	18.5	18.9
885 to 870	19.3	17.5	17.3	17.8	17.6	17.7	18.0	18.2	17.9	18.3	18.6	19.0
870 to 855	19.9	18.1	17.3	18.1	18.3	17.9	18.2	18.6	18.5	18.7	19.3	19.9
< 855	22.2	18.3	17.8	17.7	18.1	18.2	18.5	18.5	17.9	19.6	20.5	21.1

Legend	15.0										25.0

Jocassee F_2_554.8: Monthly Averaged Conductivity (uS/cm) 1986 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.3	14.0	15.0	18.0	17.0	17.5	18.7	18.4	21.0	17.0		18.0
1095 to 1080	20.5	17.5	17.3	18.8	17.7	19.8	19.7	19.9	20.8	18.6	20.4	20.3
1080 to 1065	20.5	18.0	18.3	18.3	18.0	19.5	20.0	19.8	20.6	19.2	20.4	20.1
1065 to 1050	20.0	17.8	19.8	18.0	18.3	19.2	19.7	19.7	20.9	19.1	20.9	20.3
1050 to 1035	20.0	18.0	19.2	17.3	18.3	19.1	19.4	19.6	20.6	18.4	20.3	19.6
1035 to 1020	19.4	18.2	19.5	18.0	17.8	18.4	19.8	19.6	20.3	18.2	19.7	19.7
1020 to 1005	19.0	18.0	19.6	17.3	17.3	18.8	19.5	20.0	20.9	19.1	20.0	19.7
1005 to 990	19.0	16.5	19.3	18.0	18.0	17.6	19.2	19.8	21.9	19.0	18.7	19.0
990 to 975	18.2	15.4	18.6	18.7	18.7	19.3	19.0	20.6	22.5	19.8	21.2	18.7
975 to 960	17.3	15.4	18.8	18.6	20.4	20.1	21.5	23.3	27.9	28.1	29.0	19.6
960 to 945	16.8	12.0	19.0		17.5	23.0	21.5	35.0	33.8	38.4	40.7	33.0
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 946.5 ft*							
885 to 870												
870 to 855												
< 855												

Jocassee F_2_554.8: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	16.5	16.5	16.5	17.2	17.1	18.1	18.8	18.2	17.7	17.9	17.4
1095 to 1080	16.7	17.1	17.1	16.7	17.3	17.2	18.7	18.9	18.2	18.4	17.8	17.6
1080 to 1065	16.8	17.1	16.9	16.8	17.6	17.1	18.5	18.7	18.2	18.5	17.9	17.6
1065 to 1050	16.7	17.0	16.9	16.9	17.3	17.1	18.1	18.7	18.2	18.5	17.8	17.6
1050 to 1035	16.6	16.9	16.9	16.5	16.9	17.1	17.7	18.3	17.9	18.4	17.9	17.7
1035 to 1020	16.7	17.0	16.8	16.8	16.9	17.0	18.0	18.5	18.0	18.3	17.7	17.5
1020 to 1005	16.5	16.9	16.6	17.0	17.0	16.8	17.8	18.4	17.7	18.5	17.5	17.2
1005 to 990	16.5	16.5	16.4	17.0	17.3	16.7	17.7	18.2	18.1	19.1	17.9	17.3
990 to 975	16.4	16.5	16.8	17.2	17.5	17.5	18.8	19.1	19.4	20.8	19.9	17.7
975 to 960	16.3	16.3	16.5	17.8	18.7	19.8	20.7	22.1	23.5	26.6	30.4	22.5
960 to 945	15.7	16.8	16.5	17.7	20.4	20.0	23.3	24.5	29.2	32.9	37.0	26.6
945 to 930												
930 to 915												
915 to 900												
900 to 885					*Minimum Reading 945.3 ft*							
885 to 870												
870 to 855												
< 855												

Legend	15.0										25.0

Jocassee F_2_556.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1991 (Pre Bad Creek Operation)

Measurement Reading Range (ft, msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.0	15.1	14.9	15.8	14.3	15.7	16.2	15.7	16.9	16.0	15.2	17.3
1095 to 1080	17.7	16.3	16.8	18.0	16.5	17.5	16.8	16.8	17.3	16.7	16.9	18.2
1080 to 1065	18.0	16.7	16.7	17.2	16.1	16.6	17.3	16.2	17.5	17.0	16.6	18.0
1065 to 1050	18.0	16.3	17.1	16.9	16.3	17.1	16.5	16.2	16.9	17.4	17.4	18.3
1050 to 1035	17.5	15.8	16.3	16.8	16.4	17.1	16.2	16.0	15.9	16.4	16.8	18.2
1035 to 1020	17.7	16.9	16.9	17.0	15.2	16.6	16.1	16.1	17.4	16.5	16.3	18.3
1020 to 1005	17.0	16.2	17.0	16.3	15.6	16.6	16.8	15.7	18.8	16.9	16.5	17.7
1005 to 990	17.4	15.9	16.6	16.3	16.4	16.5	16.1	15.7	18.4	16.6	16.4	18.2
990 to 975	16.6	15.4	16.5	17.5	16.3	17.2	16.3	18.5	17.9	16.2	16.8	17.9
975 to 960	16.6	17.7	18.8	20.6	17.0	17.5	17.6	17.9	20.5	18.4	18.6	19.0
960 to 945	17.4	17.0	18.4	19.3	19.3	19.7	19.8	21.0	21.8	20.2	22.0	22.4
945 to 930	17.5	16.8	18.0	19.3	20.0	20.0	20.2	21.0	22.5	20.9	26.8	26.6
930 to 915	16.7	16.5		21.0	21.3	19.0	20.8	20.5	23.8	25.6	29.0	27.0
915 to 900					23.0							
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 914.1 ft

Jocassee F_2_556.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Operation)

Measurement Reading Range (ft, msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	16.6	16.9	16.9	17.4	17.5	18.3	18.9	18.2	18.0	18.2	17.4
1095 to 1080	16.9	17.2	17.4	17.6	17.9	17.9	18.9	18.9	18.3	18.6	17.9	17.5
1080 to 1065	17.0	17.1	17.4	17.8	18.1	18.0	18.7	18.8	18.3	18.6	17.9	17.6
1065 to 1050	17.0	17.1	17.4	17.6	17.6	17.4	18.0	18.4	18.2	18.6	17.8	17.6
1050 to 1035	16.9	17.0	17.3	17.1	17.1	17.1	17.6	18.1	17.7	18.5	17.9	17.8
1035 to 1020	16.9	17.1	17.3	17.3	17.1	17.1	18.0	18.2	17.7	18.3	17.7	17.6
1020 to 1005	16.7	17.1	16.9	17.3	17.2	16.9	17.6	17.8	17.2	18.5	17.5	17.4
1005 to 990	16.7	16.6	16.9	17.3	17.3	16.7	17.2	17.4	17.1	18.1	17.6	17.3
990 to 975	16.4	16.6	17.0	17.1	17.2	16.9	17.6	17.6	17.4	18.4	18.1	17.2
975 to 960	16.3	16.5	16.6	17.3	17.6	17.3	17.9	18.0	17.7	19.0	19.1	18.2
960 to 945	16.4	16.3	16.6	17.5	17.9	17.7	18.3	18.8	18.6	19.6	20.6	20.0
945 to 930	17.0	16.5	17.0	17.9	18.4	18.9	19.3	20.3	20.2	22.2	24.4	24.2
930 to 915	18.2	16.8	16.1	17.5	19.2	18.4	21.6	20.5	21.6	21.8	33.3	29.4
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 918.4 ft

Legend **15.0** **25.0**

Lake Jocassee

Surface Water Quality Data by Station

This page intentionally left blank.

Jocassee Monthly Averaged Surface Temperature (deg C) 1987 to 1991 (Pre Bad Creek Operation)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
558.7	10.3	9.7	11.3	14.5	20.1	23.9	25.6	26.2	24.8	21.4	17.7	13.3
558.0	10.4	8.8	10.2	13.7	19.2	23.5	26.1	25.9	24.9	21.5	17.5	13.4
559.0	10.5	9.7	11.2	15.2	19.7	24.9	25.8	26.8	25.0	21.5	17.9	13.6
560.0	10.4	9.0	10.6	14.4	19.4	24.3	26.6	26.4	25.1	21.6	17.7	13.5
562.0	10.4	10.0	11.3	14.9	20.1	25.7	26.8	27.3	25.5	21.9	17.9	13.4
565.4	10.6	10.0	11.1	16.3	21.1	26.2	26.8	27.3	25.3	21.7	17.7	13.8
551.0	5.6	5.9	9.1	11.6	14.8	18.9	21.1	21.1	18.4	13.7	9.8	6.5
564.0	10.4	9.1	10.7	14.9	19.1	24.8	26.8	26.9	25.4	21.7	17.6	13.4
564.1	10.7	10.4	11.8	15.1	19.8	24.3	26.4	27.4	25.6	21.7	17.9	13.4
557.0	10.3	8.9	10.8	14.4	19.4	24.0	26.3	26.2	24.9	21.5	17.6	13.4
554.8	10.3	9.8	12.4	16.4	22.3	25.5	27.8	27.5	25.1	21.6	17.2	13.5
556.0	10.4	8.7	11.3	15.1	20.0	24.9	26.7	26.4	24.9	21.5	17.4	13.1
	Legend	**8**										**25**

Jocassee Monthly Averaged SurfaceTemperature (deg C) 1991 to 2013 (Post Bad Creek Operation)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
558.7	10.7	10.0	11.4	15.4	20.0	24.5	26.2	26.6	25.1	21.6	17.5	13.9
558.0	10.7	9.9	11.6	15.0	20.1	24.4	26.0	26.6	25.4	21.7	17.6	13.9
559.0	10.8	10.0	11.7	15.6	20.5	25.0	26.7	27.0	25.2	21.6	17.6	13.9
560.0	10.9	10.1	11.8	15.6	20.6	25.2	26.6	26.9	25.3	21.7	17.7	14.0
562.0	10.8	10.2	12.4	16.1	21.1	25.8	27.2	27.4	25.5	21.8	17.7	14.0
565.4	10.6	10.7	11.4	16.5	21.2	25.1	27.0	26.4	25.3	20.5	17.1	13.5
551.0	3.3	6.2	8.9	15.0	20.6	20.2	20.8	22.5	20.1	12.3	16.6	4.0
564.0	10.9	10.4	12.0	15.8	20.8	25.1	26.7	26.9	25.4	21.8	17.9	14.1
564.1	10.9	10.3	11.4	15.1	20.1	23.7	25.6	26.5	25.2	21.7	18.0	14.1
557.0	10.8	10.1	11.9	16.2	21.0	25.3	26.6	27.1	25.3	21.6	17.5	13.9
554.8	10.6	10.0	12.2	16.7	21.5	25.9	27.4	27.3	25.3	21.6	17.3	13.7
556.0	10.7	10.0	12.1	16.6	21.3	25.7	27.1	27.2	25.3	21.5	17.3	13.8
	Legend	**8**										**25**

Jocassee Monthly Averaged Surface Do (mg/L) 1987 to 1991 (Pre Bad Creek Operation)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*558.7*	9.340	8.960	10.100	10.140	9.480	8.640	8.300	8.140	7.720	8.260	8.700	9.000
	558.0	9.350	9.144	9.838	10.167	9.508	8.655	8.343	7.994	8.100	8.120	8.738	8.636
	559.0	9.433	9.300	10.000	10.150	9.360	8.520	8.220	8.000	7.800	8.100	8.520	9.000
	560.0	9.480	9.459	10.077	10.456	9.683	8.625	8.464	8.300	8.236	8.158	8.507	8.982
	562.0	9.629	9.990	10.150	10.436	9.617	8.360	8.429	8.311	7.933	8.145	8.500	9.100
	565.4	9.680	9.375	10.150	10.325	9.500	8.175	8.175	8.125	7.840	7.875	8.400	9.150
	551.0	11.878	11.911	10.862	10.283	9.283	8.758	8.393	8.618	8.750	9.526	10.233	11.355
	564.0	9.457	9.787	10.364	10.407	9.778	8.573	8.454	7.825	8.300	8.171	8.609	8.933
	564.1	9.625	9.550	10.025	10.250	9.575	8.550	8.343	6.500	7.840	7.940	8.580	9.100
	557.0	9.750	9.750	10.369	10.339	9.825	8.717	8.507	8.376	8.315	8.083	8.607	9.009
	554.8	10.260	10.200	10.700	10.600	9.550	8.600	8.425	8.425	7.900	7.840	8.575	9.125
	556.0	10.044	9.769	10.718	10.118	9.955	8.700	8.692	8.562	8.392	8.108	8.554	9.040
		Legend	**6.0**										**10.0**

Jocassee Monthly Averaged Surface Do (mg/L) 1991 to 2013 (Post Bad Creek Operation)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*558.7*	9.255	9.300	9.902	9.799	8.932	8.335	8.070	7.794	7.590	7.859	8.392	8.813
	558.0	9.379	9.350	9.835	9.793	8.907	8.287	7.991	7.734	7.558	7.865	8.394	8.851
	559.0	9.234	9.292	9.968	9.855	8.896	8.229	8.044	7.791	7.700	7.769	8.348	8.731
	560.0	9.033	9.317	10.019	9.896	8.890	8.204	7.984	7.775	7.506	7.629	8.254	8.671
	562.0	9.363	9.721	10.060	9.904	9.034	8.324	8.258	7.951	7.719	7.854	8.360	8.784
	565.4	8.833	9.500	9.500	9.933	8.867	8.167	8.933	7.833	7.833	7.933	8.633	8.900
	551.0	13.100	11.505			8.617			7.660			8.110	
	564.0	8.959	9.359	9.883	9.754	8.858	8.196	8.075	7.791	7.459	7.592	8.219	8.669
	564.1	9.105	9.473	9.746	9.621	8.865	8.297	7.995	7.612	7.198	7.524	8.139	8.659
	557.0	9.465	9.710	10.159	9.794	8.930	8.271	8.110	7.900	7.722	7.840	8.473	8.873
	554.8	9.695	10.228	10.375	9.873	8.966	8.400	8.113	8.081	7.796	7.787	8.455	8.943
	556.0	9.663	10.055	10.279	9.836	8.938	8.340	8.185	8.005	7.713	7.767	8.457	8.933
		Legend	**6.0**										**10.0**

Jocassee Monthly Averaged Surface DO Saturation (%) 1987 to 1991 (Pre Bad Creek Operation)												
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	*DO Saturation Readings Began in 1998*											
	558.0												
	559.0												
	560.0												
	562.0												
	565.4												
	551.0												
	564.0												
	564.1												
	557.0												
	554.8												
	556.0												
		Legend	**0.0**	**10.00**	**20.00**	**30.00**	**40.00**	**50.00**	**60.00**	**70.00**	**80.00**	**90.00**	**100.00**

Jocassee Monthly Averaged Surface Do Saturation (%) 1991 to 2013 (Post Bad Creek Operation)												
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	85.1	85.1	93.3	98.9	98.4	102.1	99.4	99.0	94.5	92.0	90.3	87.5
	558.0	85.5	85.3	92.9	97.7	98.0	101.1	98.8	98.4	94.0	91.8	90.4	88.2
	559.0	84.3	85.1	95.0	99.7	99.4	101.6	99.7	100.0	95.6	90.9	90.2	87.1
	560.0	83.6	85.5	94.9	99.9	99.7	101.7	98.7	99.8	93.9	89.3	89.1	86.7
	562.0	86.3	88.8	97.3	102.2	102.2	105.4	103.1	103.7	96.7	92.2	89.7	87.7
	565.4												
	551.0		94.7			100.5			99.2			87.8	
	564.0	84.2	85.8	94.5	99.6	99.9	101.8	99.5	100.1	93.8	88.8	88.4	86.5
	564.1	85.5	86.6	92.1	96.9	98.1	99.8	96.0	96.7	90.3	87.7	87.5	86.4
	557.0	88.1	88.9	96.5	100.8	100.7	103.0	101.6	101.7	96.3	92.1	90.6	88.8
	554.8	89.5	93.1	99.6	102.6	102.2	105.8	104.1	104.9	97.0	86.1	90.3	89.2
	556.0	89.7	91.7	98.5	102.3	101.5	104.9	103.9	103.8	96.1	91.4	90.4	88.9
		Legend	**0.0**	**10.00**	**20.00**	**30.00**	**40.00**	**50.00**	**60.00**	**70.00**	**80.00**	**90.00**	**100.00**

Jocassee Monthly Surface pH (SI) 1987 to 1991 (Pre Bad Creek Operation)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
558.7	6.550	6.525	6.725	6.600	6.650	6.925	6.875	7.025	6.725	6.850	6.875	6.333
558.0	6.378	6.247	6.427	6.600	6.745	6.930	6.977	6.931	6.785	6.474	6.692	6.200
559.0	6.320	6.325	6.575	6.733	6.675	6.850	6.975	6.950	6.800	6.625	6.825	6.250
560.0	6.344	6.300	6.400	6.624	6.809	7.018	7.108	7.206	6.908	6.450	6.646	6.120
562.0	6.450	6.456	6.600	6.680	6.900	7.050	7.267	7.263	6.860	6.640	6.760	6.300
565.4	6.700	6.367	6.433	6.567	6.900	7.400	7.067	6.900	6.750	6.833	6.767	6.433
551.0	6.838	6.329	6.336	6.400	6.464	6.582	6.777	6.550	6.646	6.628	6.538	6.250
564.0	6.467	6.214	6.367	6.650	6.825	7.100	7.292	7.227	7.100	6.581	6.670	6.200
564.1	6.600	6.500	6.667	6.533	6.567	6.940	7.100	7.050	6.850	6.725	6.775	6.375
557.0	6.522	6.359	6.555	6.618	6.773	7.018	7.138	7.131	6.908	6.471	6.723	6.170
554.8	6.800	6.533	6.850	6.767	6.967	7.200	6.900	7.133	6.875	6.850	6.967	6.367
556.0	6.663	6.425	6.556	6.660	6.870	7.073	7.109	7.158	6.883	6.418	6.683	6.211

< Acidic					Neutral						Basic >	
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee Monthly Averaged Surface PH (SI) 1991 to 2020 (Post Bad Creek Operation)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
558.7	6.402	6.240	6.528	6.639	6.950	6.800	6.774	6.885	6.730	6.675	6.725	6.498
558.0	6.412	6.121	6.298	6.546	6.776	6.606	6.584	6.726	6.695	6.567	6.596	6.535
559.0	6.339	6.263	6.528	6.737	6.994	6.816	6.818	6.987	6.793	6.614	6.673	6.487
560.0	6.405	6.317	6.619	6.762	7.004	6.887	6.852	6.944	6.731	6.630	6.714	6.478
562.0	6.449	6.442	6.664	6.796	7.124	6.969	6.901	6.998	6.824	6.620	6.779	6.465
565.4	6.100	5.900	6.175	6.400	6.475	6.550	6.575	6.550	6.400	6.100	6.250	6.050
551.0	5.750	6.582	6.400	6.900	6.726	5.700	6.700	6.700	6.600	6.700	6.786	6.200
564.0	6.523	6.446	6.647	6.838	7.162	6.998	6.914	7.042	6.853	6.704	6.741	6.616
564.1	6.549	6.413	6.627	6.718	7.053	6.852	6.787	6.888	6.686	6.609	6.758	6.599
557.0	6.502	6.370	6.620	6.751	7.090	6.881	6.901	7.103	6.779	6.710	6.665	6.546
554.8	6.600	6.495	6.713	6.819	7.115	7.034	7.062	7.311	6.847	6.636	6.759	6.601
556.0	6.575	6.459	6.684	6.804	7.193	7.004	7.041	7.294	6.827	6.678	6.754	6.586

Jocassee Monthly Averaged Surface Phosphorus (mg/L) 1987 to 1991 (Pre Bad Creek Operation)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*558.7*	0.012	0.010	0.013	0.024	0.012	0.010	0.053	0.011	0.012	0.010	0.027	0.015
	558.0	0.012	0.009	0.011	0.015	0.011	0.011	0.011	0.055	0.011	0.012	0.022	0.008
	559.0	0.009	0.011	0.012	0.015	0.021	0.013	0.015	0.009	0.009	0.009	0.019	0.011
	560.0	0.014	0.011	0.011	0.012	0.014	0.009	0.011	0.017	0.009	0.010	0.012	0.007
	562.0	0.012	0.010	0.013	0.012	0.012	0.009	0.010	0.011	0.010	0.010	0.012	0.010
	565.4	0.017	0.016	0.012	0.019	0.009	0.010	0.010	0.034	0.011	0.011	0.010	0.010
	551.0	0.018	0.012	0.018	0.015	0.012	0.018	0.015	0.020	0.013	0.012	0.014	0.012
	564.0	0.010	0.009	0.010	0.013	0.009	0.006	0.009	0.011	0.008	0.008	0.008	0.013
	564.1	0.014	0.015	0.063	0.017	0.012	0.011	0.011	0.011	0.011	0.009	0.010	0.009
	557.0	0.025	0.010	0.013	0.015	0.013	0.010	0.016	0.014	0.009	0.008	0.013	0.007
	554.8	0.010	0.013	0.014	0.016	0.010	0.010	0.009	0.010	0.009	0.010	0.024	0.009
	556.0	0.012	0.009	0.013	0.018	0.012	0.008	0.012	0.009	0.010	0.010	0.013	0.007
		Legend	**0.000**										**0.020**

Jocassee Monthly Averaged Surface Phosphorus (mg/L) 1991 to 2013 (Post Bad Creek Operation)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*558.7*	0.004	0.006	0.006	0.006	0.006	0.004	0.005	0.005	0.004	0.005	0.006	0.008
	558.0	0.005	0.007	0.008	0.007	0.007	0.007	0.005	0.006	0.004	0.006	0.008	0.006
	559.0	0.006	0.007	0.007	0.008	0.006	0.008	0.003	0.005	0.004	0.005	0.005	0.008
	560.0	0.007	0.008	0.008	0.009	0.006	0.006	0.004	0.006	0.004	0.004	0.004	0.009
	562.0	0.007	0.007	0.009	0.009	0.007	0.007	0.005	0.005	0.004	0.005	0.004	0.010
	565.4	0.015	0.012	0.011	0.013	0.010	0.012	0.005	0.004	0.005	0.003	0.004	0.003
	551.0	0.034	0.010			0.009			0.005			0.006	
	564.0	0.012	0.010	0.010	0.009	0.008	0.008	0.005	0.004	0.005	0.010	0.004	0.004
	564.1	0.010	0.009	0.009	0.009	0.007	0.011	0.004	0.004	0.017	0.004	0.005	0.004
	557.0	0.007	0.006	0.013	0.007	0.007	0.007	0.005	0.006	0.004	0.005	0.005	0.010
	554.8	0.009	0.007	0.010	0.010	0.008	0.008	0.005	0.004	0.004	0.007	0.006	0.015
	556.0	0.007	0.006	0.008	0.008	0.008	0.008	0.004	0.005	0.004	0.008	0.005	0.012
		Legend	**0.000**										**0.020**

Jocassee Monthly Surface Total Nitrogen (mg/L) 1987 to 1991 (Pre Bad Creek Operation)													
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	0.229	0.205	0.222	0.253	0.198	0.186	0.204	0.365	0.215	0.208	0.187	0.211
	558.0	0.196	0.229	0.203	0.239	0.213	0.183	0.245	0.330	0.200	0.290	0.216	0.185
	559.0	0.209	0.225	0.503	0.228	0.209	0.174	0.168	0.313	0.229	0.489	0.222	0.190
	560.0	0.222	0.232	0.212	0.216	0.224	0.178	0.189	0.269	0.211	0.200	0.210	0.199
	562.0	0.238	0.265	0.314	0.222	0.204	0.185	0.221	0.270	0.182	0.400	0.253	0.212
	565.4	0.216	0.219	0.218	0.227	0.186	0.166	0.170	0.223	0.172	0.336	0.182	0.188
	551.0		0.160										
	564.0	0.233	0.242	0.374	0.219	0.206	0.189	0.212	0.258	0.179	0.261	0.215	0.195
	564.1	0.238	0.250	0.290	0.242	0.216	0.202	0.200	0.256	0.200	0.200	0.208	0.203
	557.0	0.300	0.215	0.195	0.204	0.200	0.182	0.179	0.234	0.202	0.205	0.217	0.177
	554.8	0.191	0.186	0.203	0.185	0.179	0.166	0.169	0.248	0.215	0.266	0.182	0.173
	556.0	0.183	0.245	0.185	0.189	0.188	0.170	0.192	0.266	0.216	0.226	0.196	0.171
		Legend	**0.00**										**0.35**

Jocassee Monthly Averaged Surface Total Nitrogen (mg/L) 1991 to 2010 (Post Bad Creek Operation)													
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7												
	558.0		0.248			0.240			0.233			0.200	
	559.0		0.293			0.172			0.319			0.200	
	560.0		0.229			0.169			0.220			0.210	
	562.0		0.230			0.290			0.218			0.200	
	565.4												
	551.0												
	564.0		0.223			0.156			0.200			0.200	
	564.1		0.224			0.188			0.200			0.239	
	557.0		0.228			0.170			0.200			0.200	
	554.8												
	556.0		0.224			0.198			0.200			0.200	
		Legend	**0.00**										**0.35**

Jocassee Monthly Surface Chlorophyll a (ug/L) 1987 to 1991 (Pre Bad Creek Operation)													
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	1.71	2.11	3.03	3.00	2.29	1.38	1.67	2.89	2.48	2.70	3.38	4.09
	558.0	1.52	2.63	2.29	2.43	2.17	1.31	1.61	1.92	2.23	3.53	3.60	4.21
	559.0	1.45	2.53	2.61	1.65	1.47	1.40	1.70	1.82	1.84	3.30	3.25	3.22
	560.0	1.63	1.51	2.43	2.60	2.16	1.43	1.70	1.60	1.64	3.05	3.42	3.01
	562.0	1.85	2.98	4.55	3.71	1.36	1.37	1.97	1.86	1.42	2.80	4.43	4.60
	565.4	1.87	2.84	3.68	3.53	2.12	1.25	1.47	1.34	1.43	2.99	3.20	3.62
	551.0												
	564.0	1.79	2.94	2.82	3.69	2.40	1.60	1.33	1.38	1.73	2.89	3.34	2.81
	564.1	1.62	2.47	2.68	2.36	2.27	1.71	1.22	2.07	1.76	2.71	3.48	3.44
	557.0	1.58	1.99	2.61	2.91	1.91	1.44	1.24	1.26	1.65	2.46	3.64	3.68
	554.8	2.19	3.68	3.49	2.36	2.92	1.46	1.37	1.33	1.72	3.29	4.71	5.13
	556.0	1.98	2.46	3.15	3.25	2.14	1.50	1.11	1.06	1.59	3.54	3.14	3.90
	Legend	**0.00**											**10.00**

Jocassee Monthly Surface Chlorophyll a (ug/L) 1991 to 2010 (Post Bad Creek Operation)													
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	1.74	1.40	1.82	2.54	2.15	1.11	0.97	1.33	2.02	2.60	2.45	2.41
	558.0	1.61	1.38	1.83	2.51	2.19	1.39	1.21	1.51	2.18	2.46	2.48	2.38
	559.0	1.85	1.48	1.85	2.36	1.91	1.14	0.93	1.19	1.82	2.53	2.43	2.18
	560.0	1.58	1.24	1.96	3.44	2.72	1.25	1.48	1.39	2.22	2.56	2.43	2.15
	562.0	2.72	2.37	2.59	3.26	4.06	1.98	2.11	1.82	2.42	3.02	3.64	3.02
	565.4	2.29	2.15	1.55	3.83	3.37	1.29	1.14	1.48	2.29	2.71	2.98	3.10
	551.0		0.30			1.16			1.86			1.43	
	564.0	1.69	1.69	1.68	2.64	2.65	1.13	1.33	1.43	2.16	2.55	2.43	2.22
	564.1	1.87	1.79	1.40	2.36	3.03	1.39	1.48	1.67	1.94	2.30	2.25	1.65
	557.0	2.08	1.73	2.12	2.76	2.13	1.14	0.80	1.15	1.70	2.46	2.59	2.51
	554.8	3.28	4.06	3.08	3.43	2.59	1.70	1.38	1.63	2.05	3.46	4.18	3.82
	556.0	2.78	2.58	3.01	3.81	2.65	1.24	1.08	1.18	2.15	3.15	3.08	3.07
	Legend	**0.00**											**10.00**

Jocassee Monthly Averaged Surface Conductivity (uS/cm) 1987 to 1991 (Pre Bad Creek Operation)												
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	18.0	19.0	20.0	20.3	20.0	20.3	20.5	20.5	21.0	20.0	21.3	21.7
	558.0	16.1	17.1	16.5	17.6	16.5	16.5	18.3	18.4	17.5	18.5	17.2	17.9
	559.0	17.7	19.0	19.5	21.0	21.0	20.8	20.5	20.0	21.0	20.3	20.0	21.3
	560.0	15.4	16.8	16.4	16.9	17.2	16.7	17.9	18.0	16.8	17.4	16.3	16.9
	562.0	17.3	18.3	19.3	18.1	19.8	20.3	21.2	21.6	21.0	19.7	20.0	21.5
	565.4	17.7	18.5	19.0	18.5	20.3	19.3	20.3	20.3	20.8	19.7	20.3	21.0
	551.0	8.3	9.3	7.8	9.5	9.5	10.6	10.5	13.3	9.8	10.4	9.8	9.8
	564.0	16.8	16.8	15.6	17.3	18.4	18.1	18.8	18.5	17.8	17.1	16.5	18.5
	564.1	21.0	18.5	19.5	19.7	21.3	21.6	20.8	21.8	21.3	20.0	20.0	21.3
	557.0	15.3	16.6	16.1	17.1	16.7	17.0	18.2	18.1	17.3	17.6	16.5	17.2
	554.8	17.3	16.0	18.0	19.0	18.5	19.0	19.7	19.7	21.3	18.8	20.7	20.3
	556.0	15.0	15.2	15.4	16.6	15.9	16.7	16.6	16.2	16.6	16.6	15.8	17.7
	Legend	**15.0**											**25.0**

Jocassee Monthly Averaged Surface Conductivity (uS/cm) 1991 to 2020 (Post Bad Creek Operation)												
Station		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	558.7	17.2	17.4	17.3	18.0	18.3	18.2	18.9	19.0	18.3	18.8	18.2	17.6
	558.0	17.4	17.8	18.0	18.1	18.4	18.5	19.1	19.4	19.3	19.2	18.6	17.5
	559.0	16.7	17.3	17.1	17.8	18.3	18.1	18.7	18.8	18.5	18.6	18.0	17.6
	560.0	16.7	16.9	17.3	17.8	18.2	18.2	18.6	18.7	18.3	18.4	17.8	17.3
	562.0	16.8	17.1	17.4	17.8	18.3	18.2	18.5	18.7	18.3	18.4	17.9	17.6
	565.4	16.8	15.3	17.8	16.3	18.0	16.8	17.3	17.8	17.3	16.8	16.5	15.8
	551.0	9.0	12.2	10.0	9.0	17.3	9.0	12.0	16.5	16.0	14.0	17.6	7.0
	564.0	16.9	17.0	17.8	18.0	18.5	18.4	18.7	19.0	18.4	18.4	17.6	17.7
	564.1	16.7	16.7	17.5	17.9	18.5	18.4	18.8	19.0	18.5	18.4	17.7	17.4
	557.0	17.1	17.4	17.6	17.9	18.0	18.1	18.8	19.1	18.9	18.7	18.2	17.8
	554.8	16.8	17.0	16.9	17.1	17.3	17.5	18.5	19.0	18.3	18.4	17.9	17.7
	556.0	16.9	17.1	17.3	17.5	17.5	17.7	18.6	19.0	18.4	18.6	18.0	17.7
	Legend	**15.0**											**25.0**

Jocassee Monthly Averaged Surface Turbidity (NTU) 1975 to 1986 (Pre Bad Creek Construction)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*560.0*	5.5	2.3	4.6	1.9	3.2	2.5	2.1	2.6	9.3	1.7	1.9	2.8
	564.0	2.0	1.9	11.0	2.5	2.5	2.0	2.2	3.6	6.4	2.2	1.8	2.0
	564.1	*Measurements began in 1988*											

Jocassee Monthly Averaged Surface Turbidity (NTU) 1986 to 1991 (Bad Creek Construction)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*560.0*	1.3	1.8	1.3	1.8	1.5	1.3	2.3	2.3	1.3	1.0	1.3	1.0
	564.0	1.6	1.8	1.8	2.0	1.5	1.7	1.6	3.8	2.2	1.3	1.3	1.0
	564.1	2.0	3.3	2.3	2.0	2.7	2.8	2.3	6.5	4.8	1.3	1.7	1.0

Jocassee Monthly Averaged Surface Turbidity (NTU) 1991 to 2015 (Post Bad Creek Construction)													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Station	*560.0*	0.8	3.1	1.4	1.0	0.6	0.8	0.5	0.8	0.9	0.7	1.2	0.7
	564.0	0.8	3.1	1.5	1.0	0.6	0.8	0.5	0.8	0.9	0.7	1.3	0.6
	564.1	0.9	1.2	1.2	1.6	0.6	0.7	0.6	1.0	1.2	0.7	0.7	1.2
	Legend	**0.0**											**10.0**

This page intentionally left blank.

Whitewater River Cove

Water Quality Data

This page intentionally left blank.

Whitewater River Cove

Temperature Data

This page intentionally left blank.

Jocassee C_2_560.0: Monthly Average Water Temperatures (deg C) 1975 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.1	8.7	9.7	13.4	18.5	23.7	26.7	26.3	25.2	21.5	18.1	13.2
1095 to 1080	10.1	8.5	9.1	12.4	17.4	21.4	24.2	24.7	25.3	21.5	17.6	13.4
1080 to 1065	10.1	8.1	8.5	11.2	14.4	17.9	21.2	22.9	24.5	21.4	17.6	13.5
1065 to 1050	10.0	8.2	8.2	10.5	12.5	15.3	19.5	21.4	23.3	21.1	17.5	13.3
1050 to 1035	10.1	8.0	7.8	9.5	10.4	11.9	16.8	19.0	21.5	20.4	17.4	13.4
1035 to 1020	10.0	7.9	7.7	9.0	9.8	10.0	12.9	14.5	15.9	17.2	16.0	13.0
1020 to 1005	10.0	7.9	7.3	8.6	8.7	8.3	10.9	10.5	10.7	12.5	12.3	11.4
1005 to 990	9.9	7.8	7.2	8.4	8.6	8.1	8.5	8.7	9.0	10.0	9.4	8.8
990 to 975	9.7	7.8	7.2	8.1	8.3	8.2	8.4	8.4	8.2	8.5	8.4	8.5
975 to 960	9.3	7.7		8.2	9.4	7.0	7.9	7.8	8.4	8.6	8.2	8.1
960 to 945		8.2	8.0	8.6			8.7	7.1		8.8		
945 to 930		7.9		8.2	8.1	7.3	8.6	8.3	7.3	7.8	7.0	
930 to 915				8.6			8.4			8.6		
915 to 900	8.3	7.5	7.0	7.9	8.1	7.8	8.0	7.9	7.9	8.2	7.6	7.9
900 to 885									8.3	8.4	8.2	
885 to 870				7.7						8.4		
870 to 855										8.3		
< 855	*Minimum Reading 854.4 ft*											

Jocassee C_2_560.0: Monthly Average Water Temperatures (deg C) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.6	10.1	11.2	16.3	21.3	26.0	25.8	26.2	24.9	21.6	18.6	13.5
1095 to 1080	10.5	9.6	11.3	14.2	17.9	22.4	24.9	26.1	24.8	21.7	17.9	13.3
1080 to 1065	10.5	9.5	10.6	13.1	16.4	20.7	23.3	25.3	24.8	21.5	17.7	13.4
1065 to 1050	10.4	9.5	10.2	12.2	15.5	19.5	22.4	24.6	24.8	21.7	17.8	13.4
1050 to 1035	10.4	9.5	9.9	11.5	14.7	18.7	21.6	24.1	24.6	21.5	17.8	13.6
1035 to 1020	10.4	9.3	9.8	11.1	13.8	17.5	20.6	22.9	23.8	21.4	17.7	13.4
1020 to 1005	10.4	9.4	9.7	10.7	12.6	15.4	17.6	19.3	20.5	20.5	17.6	13.4
1005 to 990	10.4	9.3	9.5	10.2	11.5	12.8	13.6	13.8	14.0	14.5	16.2	13.4
990 to 975	10.3	9.3	9.5	9.8	10.6	10.9	11.3	10.9	11.1	10.9	12.2	12.3
975 to 960	10.1	9.3	9.3	9.5	10.0	10.1	10.3	10.2	10.3	10.0	10.1	10.6
960 to 945	9.8	9.3	9.3	9.3	9.7	9.7	9.9	9.8	9.8	9.7	9.8	9.7
945 to 930	9.4	9.2	9.3	9.2	9.5	9.6	9.9	9.6	9.6	9.4	9.6	9.5
930 to 915	9.3	9.0	9.2	9.1	9.4	9.4	9.5	9.5	9.5	9.4	9.5	9.4
915 to 900	9.1	8.9	9.0	9.0	9.2	9.3	9.5	9.4	9.3	9.3	9.4	9.2
900 to 885	9.0	8.8	8.9	8.9	9.1	9.1	9.4	9.3	9.3	9.2	9.2	9.2
885 to 870	9.0	8.8	8.9	8.8	9.2	9.1	9.4	9.2	9.2	9.1	9.3	9.1
870 to 855	8.9	8.6	8.7	8.7	9.0	9.1	9.2	9.2	9.3	9.1	9.2	9.1
< 855	8.9	8.5	8.6	8.7	8.7	9.0	9.1	9.1	8.9	9.0	9.2	9.0

Jocassee C_2_560.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	9.9	11.5	15.2	20.3	24.6	26.3	26.4	25.1	21.4	17.9	14.2
1095 to 1080	10.8	9.9	11.3	14.5	18.2	22.3	24.9	26.4	25.2	21.6	17.6	13.9
1080 to 1065	10.8	9.7	10.7	13.4	16.7	20.6	23.7	25.7	25.0	21.6	17.6	14.1
1065 to 1050	10.8	9.7	10.4	12.4	15.5	19.1	22.4	24.5	24.8	21.6	17.7	14.0
1050 to 1035	10.8	9.6	10.1	11.4	13.8	17.5	20.8	23.3	23.7	21.5	17.5	13.9
1035 to 1020	10.7	9.6	9.9	11.0	12.9	15.7	18.7	21.2	22.3	20.8	17.4	14.0
1020 to 1005	10.8	9.6	9.7	10.4	11.6	13.3	15.1	16.6	18.0	18.9	16.9	13.9
1005 to 990	10.7	9.5	9.5	10.0	10.5	11.1	11.9	12.2	12.5	13.1	14.1	13.0
990 to 975	10.3	9.5	9.5	9.7	9.9	10.1	10.2	10.3	10.3	10.4	10.8	11.3
975 to 960	10.0	9.4	9.3	9.5	9.6	9.6	9.7	9.7	9.8	9.8	9.9	10.1
960 to 945	9.6	9.3	9.2	9.3	9.3	9.4	9.5	9.5	9.5	9.6	9.6	9.5
945 to 930	9.3	9.1	9.2	9.1	9.1	9.2	9.3	9.3	9.3	9.3	9.4	9.3
930 to 915	9.2	9.1	9.1	9.1	9.1	9.2	9.3	9.3	9.3	9.3	9.3	9.2
915 to 900	9.1	9.1	9.0	9.0	9.0	9.1	9.1	9.2	9.2	9.2	9.3	9.2
900 to 885	9.1	8.9	8.9	9.0	8.9	9.0	9.1	9.1	9.1	9.1	9.2	9.1
885 to 870	8.9	8.9	8.9	8.8	8.8	9.0	9.0	9.1	9.1	9.1	9.1	9.1
870 to 855	9.1	8.9	8.7	8.9	9.0	9.0	9.0	9.1	9.1	9.1	9.2	9.1
< 850	8.6	8.4	8.6	8.6	8.6	8.8	8.7	8.7	8.9	8.7	9.2	9.1

Legend	8											25

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1976 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.1	8.8	10.0	13.6	18.5	24.8	27.3	26.5	25.2	21.6	17.5	13.0
1095 to 1080	10.0	8.4	9.2	12.3	17.5	23.2	24.7	24.5	25.2	21.6	17.2	12.9
1080 to 1065	9.9	7.9	8.6	11.0	14.9	18.4	21.6	22.8	24.4	21.4	17.3	13.0
1065 to 1050	9.9	8.0	8.1	10.2	12.2	15.7	20.1	21.4	23.2	21.2	17.2	12.8
1050 to 1035	9.9	7.8	7.8	9.4	9.7	10.4	16.5	19.2	21.5	20.7	17.2	13.2
1035 to 1020	9.9	7.8	7.7	9.1	8.7	8.2	12.4	14.9	16.0	17.9	15.6	12.5
1020 to 1005	9.9	7.7	7.4	8.7	7.9	7.5	11.2	11.0	10.6	12.9	12.5	10.8
1005 to 990	9.7	7.6	7.4	8.4	7.8	7.4	8.4	8.9	9.2	10.1	9.4	8.0
990 to 975	9.6	7.6	7.5	8.2	7.7	7.5	9.1	8.4	8.2	8.5	7.8	7.4
975 to 960	9.5	7.1		8.5	8.5	7.4	8.3	7.8	8.4	9.2	7.8	7.4
960 to 945		8.2	8.2	8.8			9.5			9.0		
945 to 930		8.2		8.8						8.4		
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855	*Minimum Reading 937.5 ft*											

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.6	10.2	11.4	16.8	20.9	24.8	25.8	26.5	25.4	21.7	18.0	13.6
1095 to 1080	10.5	9.7	11.2	14.5	17.9	21.8	24.3	26.0	25.1	21.7	17.8	13.4
1080 to 1065	10.4	9.5	10.7	13.0	16.3	20.1	23.1	25.0	25.1	21.5	17.6	13.5
1065 to 1050	10.4	9.5	10.3	12.1	15.5	19.0	22.0	24.4	24.8	21.7	17.7	13.4
1050 to 1035	10.4	9.5	10.0	11.5	14.7	17.9	21.3	23.9	24.6	21.5	17.7	13.6
1035 to 1020	10.4	9.3	9.8	11.2	13.8	16.7	19.8	22.6	23.8	21.4	17.7	13.4
1020 to 1005	10.3	9.4	9.7	10.7	12.8	14.6	16.6	18.8	20.8	20.4	17.5	13.4
1005 to 990	10.3	9.3	9.5	10.2	11.6	12.2	13.1	13.5	14.3	14.6	16.2	13.3
990 to 975	10.3	9.3	9.5	9.8	10.7	10.8	11.2	11.1	11.3	10.9	12.2	12.4
975 to 960	10.0	9.4	9.3	9.5	10.0	10.2	10.4	10.4	10.5	10.1	10.1	10.7
960 to 945	9.7	9.2	9.3	9.4	9.6	9.9	10.1	10.0	10.0	9.8	9.8	9.8
945 to 930	9.4	9.2	9.2	9.2	9.4	9.8	10.0	9.7	9.9	9.5	9.6	9.6
930 to 915	9.3	9.0	9.1	9.2	9.3	9.6	9.7	9.7	9.8	9.5	9.5	9.4
915 to 900	9.1	8.9	9.0	9.1	9.2	9.5	9.7	9.6	9.6	9.4	9.4	9.2
900 to 885	9.1	8.8	8.9	9.0	9.1	9.4	9.6	9.6	9.5	9.3	9.2	9.3
885 to 870	9.1	8.8	8.9	8.8	9.1	9.1	9.5	9.6	9.6	9.2	9.3	9.1
870 to 855	9.4		8.6	8.5	9.0	9.2	9.7	9.2	9.9	9.4	9.8	8.9
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Average Water Temperatures (deg C) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.4	11.7	15.6	20.4	24.6	26.3	26.2	25.1	21.4	18.2	14.3
1095 to 1080	10.8	10.1	11.4	14.4	18.2	22.6	25.1	26.5	25.2	21.7	17.8	14.0
1080 to 1065	10.9	10.0	10.8	13.5	16.9	20.9	24.0	26.0	25.0	21.7	17.8	14.1
1065 to 1050	10.8	10.0	10.6	12.7	16.0	19.7	22.9	24.9	24.9	21.6	17.8	14.1
1050 to 1035	10.8	9.9	10.3	12.0	14.3	17.9	21.3	23.7	23.8	21.5	17.7	14.0
1035 to 1020	10.7	9.9	10.1	11.4	13.2	15.9	18.9	21.7	22.5	20.8	17.5	14.0
1020 to 1005	10.8	9.8	9.9	10.6	12.0	13.6	15.5	17.1	18.6	19.3	17.0	13.8
1005 to 990	10.8	9.7	9.7	10.2	10.6	11.5	12.4	12.7	13.3	13.6	14.6	13.1
990 to 975	10.5	9.7	9.7	10.0	10.1	10.5	10.5	10.6	10.6	10.8	11.1	11.7
975 to 960	10.2	9.6	9.5	9.7	9.7	9.9	9.9	10.0	10.0	10.0	10.0	10.3
960 to 945	9.9	9.5	9.4	9.6	9.5	9.7	9.7	9.7	9.7	9.8	9.8	9.7
945 to 930	9.6	9.4	9.3	9.5	9.3	9.5	9.5	9.6	9.5	9.6	9.6	9.6
930 to 915	9.4	9.3	9.3	9.4	9.2	9.4	9.4	9.5	9.5	9.5	9.5	9.4
915 to 900	9.4	9.2	9.2	9.3	9.0	9.3	9.3	9.4	9.4	9.5	9.4	9.4
900 to 885	9.3	9.1	9.0	9.1	9.2	9.2	9.1	9.3	9.3	9.3	9.4	9.2
885 to 870	9.1	8.9	9.1	9.0	9.2	9.4	9.2	9.4	9.5	9.2	9.5	9.3
870 to 855	9.2	8.2	9.5	8.9		10.0	9.1	9.3		9.0	10.3	
< 850	*Minimum Reading 864.4 ft*											

Legend	8										25

Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1987 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Temperature Readings Began During Bad Creek Construction (1987)

Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.9	11.6	12.6	16.0	20.8	24.2	26.1	26.8	25.8	21.6	18.2	13.5
1095 to 1080	10.6	10.2	11.2	14.2	18.3	21.8	24.6	26.0	25.4	21.8	17.9	13.4
1080 to 1065	9.8	9.2	10.8	13.3	16.9	20.3	23.1	25.2	25.1	21.3	17.6	13.1
1065 to 1050	8.8	8.2	9.4	11.9	15.3	18.0	21.5	24.0	23.9	20.3	16.1	11.4
1050 to 1035	8.4	8.2	8.4	10.1	12.6	14.5	18.2	21.5	23.1	19.9	15.6	11.3
1035 to 1020	8.4	8.0	8.1	9.0	10.4	11.1	13.5	16.8	20.6	19.5	15.5	10.8
1020 to 1005	8.3	7.9	7.6	8.1	8.8	10.0	12.6	15.2	17.5	19.2	15.3	11.0
1005 to 990	8.3	8.0	7.5	7.8	8.3	8.9	9.9	12.2	14.8	16.9	15.3	11.1
990 to 975	8.3	8.2	7.5	7.9	8.6	8.9	9.5	11.3	13.7	14.7	14.7	11.0
975 to 960	8.2	7.8	6.7	7.2	8.6	8.9	9.6	11.0	13.2	13.0	13.1	9.9
960 to 945					8.6							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Average Water Temperatures (deg C) 1991 to 2017 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	11.1	10.3	11.3	14.8	20.1	23.5	25.4	26.1	24.9	21.3	18.2	14.3
1095 to 1080	10.7	10.1	11.0	14.0	18.4	22.4	24.7	26.2	25.2	21.5	17.8	13.9
1080 to 1065	10.7	10.0	10.9	13.7	17.2	21.3	24.3	25.7	25.1	21.7	17.8	13.9
1065 to 1050	10.5	9.8	10.7	13.3	16.4	20.8	23.8	24.9	25.0	21.5	17.7	13.8
1050 to 1035	10.6	9.7	10.8	13.2	15.9	20.3	23.5	25.0	24.9	21.6	17.6	13.7
1035 to 1020	10.4	9.6	10.8	13.1	16.0	19.9	23.3	24.8	24.8	21.5	17.4	13.7
1020 to 1005	10.3	9.7	10.8	13.0	15.9	19.8	23.1	24.7	24.8	21.5	17.6	13.6
1005 to 990	10.4	9.5	10.4	12.7	15.2	19.0	22.4	24.3	24.5	21.3	17.3	13.6
990 to 975	10.0	9.5	10.5	12.3	15.4	19.0	22.2	24.0	24.3	20.9	17.0	13.4
975 to 960	10.2	9.4	9.9	12.1	14.5	17.8	21.5	22.4	23.7	20.0	16.8	13.2
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 850												

Minimum Reading 963 ft

Legend 8 — 25

This page intentionally left blank.

Whitewater River Cove

Dissolved Oxygen

This page intentionally left blank.

Jocassee C_2_560.0: Monthly Averaged Dissolved Oxygen (mg/l) 1975 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.7	10.5	10.7	9.9	9.2	8.8	8.5	8.6	8.3	8.7	8.9
1095 to 1080	9.1	9.7	10.2	10.9	10.5	9.6	10.0	9.0	8.7	8.3	8.6	9.0
1080 to 1065	9.1	9.4	10.2	10.7	10.1	10.3	10.4	9.1	8.6	8.2	8.6	9.0
1065 to 1050	9.1	9.3	10.1	10.5	9.9	10.0	10.1	8.8	7.8	8.0	8.7	9.1
1050 to 1035	9.0	9.0	9.6	10.0	9.6	9.7	9.6	8.6	7.4	7.6	8.9	9.0
1035 to 1020	9.0	9.0	9.6	9.4	8.9	9.0	9.0	8.3	7.6	6.8	8.7	9.1
1020 to 1005	8.8	8.8	9.1	9.1	8.2	8.1	8.3	7.7	7.3	6.5	6.4	8.1
1005 to 990	8.5	8.8	8.9	8.7	7.6	7.1	7.6	7.0	6.4	5.7	5.5	5.8
990 to 975	5.5	8.9	8.3	8.7	7.0	6.3	6.8	6.1	5.9	5.9	4.6	5.1
975 to 960	2.2	7.6		7.9	5.5	7.9	6.9	6.6	4.7	4.8	4.7	4.6
960 to 945		8.2	5.6	7.5			6.4	5.8		4.7		
945 to 930		6.6		7.5	4.0	6.0	4.4	5.2	5.6	5.1	7.1	
930 to 915				6.1			3.0			4.6		
915 to 900	0.7	6.2	7.4	6.8	5.2	6.2	3.7	4.0	4.3	3.7	4.6	3.4
900 to 885									1.6	0.6	1.2	
885 to 870										0.0		
870 to 855										0.0		
< 855	*Minimum Reading 856.1 ft*											

Jocassee C_2_560.0: Monthly Averaged Dissolved Oxygen (mg/l) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	9.7	9.8	10.3	9.3	8.2	8.5	8.2	7.9	8.2	8.4	9.1
1095 to 1080	9.6	9.2	9.9	10.3	9.7	9.1	8.8	8.2	7.8	7.9	8.4	9.0
1080 to 1065	9.5	9.0	9.8	10.1	9.7	9.4	8.9	8.1	7.8	7.9	8.5	9.0
1065 to 1050	9.4	9.1	9.6	9.9	9.6	9.2	8.8	7.6	7.5	7.9	8.3	9.0
1050 to 1035	9.4	9.0	9.3	9.7	9.5	9.1	8.6	7.4	7.0	7.8	8.4	9.0
1035 to 1020	9.4	8.7	9.2	9.5	9.3	9.0	8.2	7.0	6.4	7.5	8.4	8.9
1020 to 1005	9.4	8.8	9.1	9.4	9.1	8.6	7.8	6.4	5.4	6.6	8.2	9.0
1005 to 990	9.4	8.7	8.9	9.3	9.1	8.3	7.6	6.2	6.0	4.7	7.1	8.8
990 to 975	9.4	8.7	8.7	9.0	8.8	8.2	7.7	6.6	6.5	5.4	5.7	7.4
975 to 960	8.9	8.4	8.4	8.7	8.4	7.8	7.3	6.5	6.2	5.8	5.6	5.5
960 to 945	6.8	8.2	8.5	8.4	7.9	7.2	6.7	6.0	5.9	5.5	5.3	4.6
945 to 930	5.3	7.3	8.3	8.0	7.5	6.9	6.3	5.6	5.5	5.1	4.8	4.0
930 to 915	4.4	6.6	8.2	7.1	7.0	6.2	5.9	5.1	5.0	4.2	4.3	3.6
915 to 900	2.0	5.3	7.4	6.4	6.5	5.5	5.1	4.4	4.5	3.7	3.8	3.3
900 to 885	1.6	4.6	6.7	6.0	6.1	5.1	4.6	3.6	3.9	2.7	3.2	2.7
885 to 870	1.1	3.8	5.5	4.9	4.8	4.5	3.9	3.2	3.2	2.1	2.4	1.9
870 to 855	1.4	5.3	5.4	4.3	4.4	3.9	3.6	2.8	2.1	1.3	1.7	1.4
< 855	0.9	5.2	5.1	4.0	5.6	3.5	3.4	2.4	2.5	0.7	1.2	1.4

Jocassee C_2_560.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.3	10.0	9.9	9.0	8.3	8.1	7.9	7.7	7.6	8.1	8.7
1095 to 1080	9.0	9.2	9.9	9.9	9.1	8.5	8.1	7.7	7.5	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.9	9.8	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.7	9.7	9.2	8.7	8.2	7.6	7.2	7.6	8.1	8.6
1050 to 1035	8.9	9.0	9.6	9.5	9.1	8.7	8.1	7.2	6.8	7.5	8.1	8.5
1035 to 1020	8.8	8.9	9.4	9.4	9.0	8.5	7.9	6.9	6.3	7.2	8.0	8.5
1020 to 1005	8.8	8.7	9.3	9.3	8.9	8.5	7.9	7.0	6.1	6.1	7.6	8.4
1005 to 990	8.8	8.7	9.1	9.0	8.7	8.3	7.9	7.2	6.5	5.8	6.1	7.5
990 to 975	8.0	8.6	8.8	8.6	8.2	7.7	7.2	6.7	6.3	5.8	5.4	5.5
975 to 960	6.7	8.1	8.4	8.1	7.6	6.9	6.4	5.9	5.5	5.0	4.6	4.2
960 to 945	4.8	7.2	7.7	7.4	7.0	6.1	5.7	5.3	5.0	4.4	4.1	3.6
945 to 930	3.6	6.2	7.1	6.6	6.4	5.5	5.3	4.8	4.7	4.0	3.8	3.0
930 to 915	2.8	5.6	6.2	5.7	5.9	5.1	4.7	4.2	4.1	3.7	3.5	2.6
915 to 900	2.2	5.1	5.4	5.4	5.6	4.7	4.5	4.0	3.9	3.3	3.0	2.4
900 to 885	2.0	4.5	5.1	5.0	5.5	4.3	4.2	3.8	3.5	2.8	2.8	2.7
885 to 870	2.4	4.6	4.6	4.6	4.8	4.4	4.2	3.3	3.4	2.8	2.8	1.9
870 to 855	1.8	4.9	5.1	4.6	4.1	3.9	3.6	3.2	3.0	2.1	2.0	1.9
< 855	2.2	4.8	5.3	4.2	4.3	4.1	4.0	3.7	2.8	2.5	2.5	1.7

Legend 6.0 ... 10.0

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1976 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.8	10.2	10.6	10.8	10.3	9.1	8.6	8.8	8.8	8.4	8.7	9.0
1095 to 1080	9.8	10.0	10.3	10.9	10.8	9.5	8.8	9.0	8.8	8.4	8.6	8.9
1080 to 1065	9.8	9.8	10.2	10.9	10.8	10.4	9.4	8.7	9.0	8.3	8.7	9.0
1065 to 1050	9.8	9.7	10.2	10.9	10.4	9.8	9.1	8.2	8.3	8.3	8.8	9.1
1050 to 1035	9.8	9.6	10.1	10.6	9.2	9.0	8.5	7.7	7.0	8.2	9.1	9.1
1035 to 1020	9.8	9.6	9.9	10.3	8.3	7.8	6.7	6.4	5.5	7.3	8.2	9.3
1020 to 1005	9.8	9.5	9.7	9.8	7.2	6.0	5.5	4.0	2.4	3.3	6.1	8.7
1005 to 990	9.9	9.6	9.7	9.2	6.2	4.9	4.6	1.5	0.6	1.3	1.8	5.0
990 to 975	10.0	9.9	9.6	8.7	5.8	4.5	5.1	1.0	0.6	0.8	0.1	1.4
975 to 960	10.0	10.2		8.6	5.3	4.5	3.9	1.2	0.5	1.0	0.1	1.2
960 to 945		9.5	9.5	9.2			6.1			1.0		
945 to 930		9.4		9.0						1.6		
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855	*Minimum Reading 937.5 ft*											

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.7	9.7	9.9	10.1	9.4	8.5	8.7	6.7	8.0	8.2	8.4	9.1
1095 to 1080	9.6	9.2	10.0	10.2	9.7	9.2	9.1	7.3	7.8	7.9	8.5	9.0
1080 to 1065	9.4	9.1	9.8	10.1	9.8	9.5	9.1	6.7	7.7	7.9	8.5	9.0
1065 to 1050	9.4	9.1	9.8	9.8	9.8	9.3	8.9	6.6	7.4	7.9	8.3	9.0
1050 to 1035	9.4	9.0	9.5	9.7	9.6	9.0	8.7	6.6	7.3	7.7	8.4	9.0
1035 to 1020	9.4	8.7	9.3	9.6	9.3	8.8	8.2	5.9	6.7	7.6	8.3	9.0
1020 to 1005	9.4	8.9	9.2	9.5	9.1	8.5	7.6	5.3	5.4	6.8	8.2	9.0
1005 to 990	9.4	8.9	9.0	9.3	9.0	8.2	7.5	4.7	5.6	4.3	7.4	8.9
990 to 975	9.4	9.1	8.9	9.1	8.8	8.0	7.4	4.8	5.8	4.5	5.0	7.8
975 to 960	9.5	8.9	8.6	8.7	8.3	7.5	6.9	4.5	5.5	4.5	4.3	5.4
960 to 945	8.8	9.2	8.6	8.2	7.8	7.0	6.3	4.1	4.9	4.2	3.5	3.4
945 to 930	6.7	9.3	8.5	7.9	7.2	6.2	5.7	3.7	4.2	3.2	2.4	2.2
930 to 915	5.5	8.0	8.3	7.0	6.4	4.9	4.6	2.9	2.9	2.1	1.8	1.5
915 to 900	4.7	5.7	7.4	6.6	5.6	3.8	3.3	2.1	2.1	1.6	1.5	1.1
900 to 885	4.0	4.9	7.4	5.9	5.2	3.2	2.5	1.2	1.5	0.9	1.1	0.6
885 to 870	3.3	4.3	6.1	4.0	3.8	3.1	2.3	0.8	0.7	0.4	0.6	0.7
870 to 855	0.0		7.9	7.2	4.6	1.5	1.7	2.2	0.0	0.0	0.0	0.7
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.1	9.3	9.9	9.8	9.0	8.2	8.2	7.9	7.7	7.6	8.1	8.8
1095 to 1080	8.9	9.2	9.8	9.8	9.1	8.5	8.1	7.7	7.4	7.6	8.2	8.6
1080 to 1065	8.9	9.1	9.7	9.6	9.1	8.7	8.2	7.6	7.3	7.6	8.2	8.6
1065 to 1050	8.9	9.0	9.6	9.5	9.1	8.7	8.2	7.6	7.1	7.5	8.1	8.6
1050 to 1035	8.8	9.0	9.5	9.4	9.0	8.6	8.1	7.3	6.9	7.5	8.1	8.6
1035 to 1020	8.8	8.9	9.3	9.3	9.0	8.5	7.8	7.0	6.4	7.3	8.0	8.6
1020 to 1005	8.8	8.8	9.1	9.1	8.9	8.4	7.8	6.9	5.9	6.4	7.6	8.4
1005 to 990	8.8	8.8	8.9	8.8	8.6	8.1	7.6	6.7	5.8	5.3	6.1	7.6
990 to 975	8.3	8.7	8.7	8.4	8.1	7.6	6.8	6.1	5.4	5.0	4.6	5.5
975 to 960	6.8	8.2	8.3	7.9	7.5	6.7	6.0	5.4	4.7	4.1	3.8	3.7
960 to 945	5.7	7.6	7.8	7.3	6.8	5.8	5.3	4.9	4.1	3.3	3.0	2.9
945 to 930	3.6	6.8	7.2	6.5	6.3	5.1	4.8	4.2	3.6	2.7	2.3	2.1
930 to 915	2.7	6.0	6.4	5.3	5.6	4.5	4.0	3.5	2.8	2.3	1.9	1.8
915 to 900	2.1	5.7	5.3	5.0	5.4	4.0	3.9	3.1	2.7	1.9	1.6	1.7
900 to 885	1.7	5.3	4.8	4.1	3.7	2.8	3.4	2.6	2.1	1.5	1.2	1.9
885 to 870	2.3	3.9	3.3	4.4	2.9	2.7	3.0	2.2	2.0	2.2	1.0	1.4
870 to 855	0.1	4.3	3.1	5.2		0.0	0.4	2.8		2.3	0.0	
< 855	*Minimum Reading 864.4 ft*											

Legend	6.0										10.0

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Readings Began During Bad Creek Construction (1987)

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1987 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	10.0	10.6	9.8	10.2	9.3	8.7	8.6	5.4	7.9	8.2	8.3	9.2
1095 to 1080	9.8	9.5	10.0	10.2	9.5	8.9	8.7	6.3	7.7	8.0	8.5	9.2
1080 to 1065	10.0	9.7	10.0	10.1	9.5	9.0	8.6	5.9	7.6	8.1	8.6	9.2
1065 to 1050	10.6	10.6	10.2	10.3	9.4	8.5	8.2	5.5	7.5	8.0	8.7	9.7
1050 to 1035	10.7	10.4	10.1	10.3	9.2	7.7	6.8	4.7	7.0	7.8	8.6	9.8
1035 to 1020	10.7	10.2	10.0	9.8	8.7	6.2	5.3	2.7	4.6	7.7	8.5	9.9
1020 to 1005	10.6	10.4	9.8	9.1	7.7	5.1	3.8	2.2	1.0	6.2	8.4	9.8
1005 to 990	10.6	10.2	9.3	8.0	5.8	2.9	1.5	0.9	0.1	1.7	8.1	9.7
990 to 975	10.6	10.0	9.0	7.3	4.1	2.1	0.3	0.3	0.0	0.0	5.4	9.7
975 to 960	10.5	9.9	9.5	8.7	2.8	1.5	0.0	0.4	0.0	0.0	1.9	10.1
960 to 945					2.7							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

Jocassee D_2_564.1: Monthly Averaged Dissolved Oxygen (mg/l) 1991 to 2017 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	9.2	9.5	9.7	9.7	8.9	8.3	8.2	7.8	7.3	7.5	8.1	8.8
1095 to 1080	9.0	9.4	9.7	9.7	9.0	8.4	8.1	7.6	7.2	7.5	8.1	8.6
1080 to 1065	9.1	9.3	9.6	9.6	9.0	8.5	8.2	7.6	7.2	7.5	8.1	8.6
1065 to 1050	9.1	9.4	9.6	9.6	9.0	8.5	8.3	7.6	7.1	7.5	8.1	8.7
1050 to 1035	9.1	9.4	9.6	9.5	9.0	8.6	8.2	7.5	7.1	7.4	8.1	8.6
1035 to 1020	9.2	9.4	9.6	9.5	9.0	8.6	8.1	7.6	7.1	7.4	8.1	8.7
1020 to 1005	9.1	9.3	9.6	9.4	8.9	8.6	8.1	7.6	7.1	7.4	8.0	8.7
1005 to 990	9.2	9.4	9.6	9.4	8.9	8.6	8.4	7.6	7.1	7.4	8.1	8.7
990 to 975	9.1	9.5	9.6	9.4	8.7	8.6	8.1	7.6	6.9	7.4	8.2	8.7
975 to 960	9.3	9.4	9.8	9.5	8.8	8.3	8.4	7.1	6.8	7.5	8.2	8.9
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Legend 6.0 ... 10.0

This page intentionally left blank.

Whitewater River Cove

Dissolved Oxygen Saturation

This page intentionally left blank.

Jocassee C_2_560.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1998

Jocassee C_2_560.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1095 to 1110												
1080 to 1095												
1065 to 1080												
1050 to 1065												
1035 to 1050												
1020 to 1035												
1005 to 1020												
990 to 1005												
975 to 990												
960 to 975												
945 to 960												
930 to 945												
915 to 930												
900 to 915												
885 to 900												
870 to 885												
855 to 870												
< 855												

DO Saturation Readings Began in 1998

Jocassee C_2_560.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1998 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	85.8	84.8	94.3	98.7	99.4	101.7	98.5	100.6	95.8	87.4	89.2	88.0
1095 to 1080	83.3	84.3	92.9	97.4	96.2	100.1	96.2	98.7	92.9	88.8	88.4	85.7
1080 to 1065	82.8	82.1	90.9	94.8	94.5	99.0	95.6	95.8	90.9	88.3	87.8	85.7
1065 to 1050	83.1	81.6	88.6	92.2	92.2	96.8	93.4	93.3	89.0	88.3	87.5	85.2
1050 to 1035	82.0	80.9	86.7	88.9	88.8	94.2	90.1	88.5	86.3	87.6	87.3	84.9
1035 to 1020	82.1	80.1	84.0	87.5	87.5	90.1	84.2	81.0	78.3	84.6	86.9	84.9
1020 to 1005	81.9	77.9	82.3	84.6	84.1	84.8	78.3	74.8	66.1	72.1	83.1	83.7
1005 to 990	81.7	76.6	80.3	81.0	80.0	78.3	72.0	69.5	61.8	56.1	62.8	76.3
990 to 975	73.2	76.4	78.0	76.1	74.3	70.9	63.9	61.9	57.2	53.4	49.8	54.5
975 to 960	58.6	69.8	74.5	71.8	69.1	62.3	55.6	54.2	50.0	45.8	43.1	40.0
960 to 945	40.4	61.3	68.5	66.5	63.4	55.5	49.0	48.9	45.7	40.5	39.2	32.6
945 to 930	30.1	54.3	64.4	61.4	60.4	50.8	46.9	45.6	44.0	37.5	37.5	29.4
930 to 915	23.3	50.8	58.1	52.3	56.3	47.2	39.7	39.5	39.3	34.2	33.9	24.9
915 to 900	18.8	47.5	51.0	51.1	54.3	44.1	39.1	38.6	37.2	30.6	29.7	22.4
900 to 885	18.2	41.5	49.8	49.2	53.9	42.3	37.9	38.4	33.2	27.4	29.4	25.0
885 to 870	22.7	39.7	42.8	40.5	50.9	42.7	39.2	34.7	33.2	26.4	28.3	19.9
870 to 855	17.9	43.3	46.4	41.7	42.9	38.3	33.1	33.3	27.7	19.7	20.3	18.1
< 855	14.4	57.1	72.7	54.1	55.8	45.6	36.3	43.6	35.7	19.2	24.3	15.3

Legend **0.0** **100.00**

Jocassee D_2_564.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

DO Saturation Readings Began in 1999

Jocassee D_2_564.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1095 to 1110												
1080 to 1095												
1065 to 1080												
1050 to 1065												
1035 to 1050												
1020 to 1035												
1005 to 1020												
990 to 1005												
975 to 990												
960 to 975												
945 to 960												
930 to 945												
915 to 930												
900 to 915												
885 to 900												
870 to 885												
855 to 870												
< 855												

DO Saturation Readings Began in 1999

Jocassee D_2_564.0: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1999 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	87.0	86.4	94.6	99.0	99.8	101.8	98.9	101.0	95.8	87.5	88.7	88.7
1095 to 1080	83.8	84.2	92.3	96.8	96.1	100.4	96.5	98.2	92.4	88.4	87.8	85.9
1080 to 1065	83.3	82.3	89.8	94.4	94.5	99.2	95.1	95.9	90.7	88.1	87.5	85.9
1065 to 1050	83.3	82.2	88.3	92.0	92.7	97.2	93.7	93.7	88.9	87.8	87.0	85.5
1050 to 1035	82.5	81.2	86.7	89.5	89.3	94.3	90.3	89.2	87.1	86.9	87.0	85.1
1035 to 1020	82.4	80.5	83.9	87.2	87.4	89.7	83.2	81.7	78.8	84.8	86.5	85.3
1020 to 1005	82.2	79.3	81.9	83.4	83.6	83.6	77.1	73.3	65.3	72.9	82.7	83.6
1005 to 990	82.4	78.6	79.5	79.5	78.9	76.6	69.0	64.4	56.9	50.9	63.0	78.1
990 to 975	74.7	77.6	77.1	74.6	72.9	69.8	59.3	55.8	50.2	45.6	42.8	55.2
975 to 960	55.3	71.9	73.6	69.7	67.7	60.0	50.7	48.9	42.1	36.0	34.0	34.6
960 to 945	44.7	65.2	67.8	63.8	60.8	51.1	44.3	43.8	36.1	28.4	26.7	26.0
945 to 930	31.2	57.2	61.7	56.7	56.8	45.2	40.0	38.0	32.0	22.7	20.4	18.2
930 to 915	25.6	49.9	55.2	45.7	51.8	39.6	32.1	31.2	25.5	18.8	17.0	15.2
915 to 900	21.4	47.8	46.9	44.2	50.0	35.6	31.9	27.4	25.1	15.5	13.8	14.4
900 to 885	19.7	35.7	38.9	32.8	20.4	20.0	7.3	22.1	11.2	4.1	1.0	11.1
885 to 870	20.9	31.2	7.9	44.5	21.1	52.4	6.6	25.3	3.8	2.0	0.6	5.8
870 to 855	1.2	0.0					3.1					
< 855	*Minimum Reading 868.8 ft*											

Legend	**0.0**										**100.00**

Jocassee D_2_564.1: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	*DO Saturation Readings Began in 1999*											
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Jocassee D_2_564.1: Montly Averaged Dissolved Oxygen Percent Saturation (%) (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1095 to 1110	*DO Saturation Readings Began in 1999*											
1080 to 1095												
1065 to 1080												
1050 to 1065												
1035 to 1050												
1020 to 1035												
1005 to 1020												
990 to 1005												
975 to 990												
960 to 975												
945 to 960												
930 to 945												
915 to 930												
900 to 915												
885 to 900												
870 to 885												
855 to 870												
< 855												

Jocassee D_2_564.1: Montly Averaged Dissolved Oxygen Percent Saturation (%) 1999 to 2017 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	88.1	88.0	92.0	96.7	98.2	99.7	96.3	98.0	90.4	85.5	88.6	88.9
1095 to 1080	84.9	85.0	90.2	95.1	95.3	98.9	94.5	96.3	89.7	87.2	86.9	85.8
1080 to 1065	84.9	84.1	89.3	93.6	93.9	98.2	95.2	94.7	89.5	87.2	86.5	86.0
1065 to 1050	85.2	83.8	89.1	92.8	92.7	98.0	94.5	93.4	88.5	87.0	86.0	85.8
1050 to 1035	84.6	83.7	88.9	91.4	91.1	97.8	92.4	92.8	88.4	86.4	85.4	85.2
1035 to 1020	84.8	83.7	88.2	90.9	91.4	97.6	90.9	93.1	88.3	86.2	85.7	85.5
1020 to 1005	84.2	83.0	88.5	89.5	90.7	96.8	90.9	92.9	87.7	86.2	85.4	85.7
1005 to 990	84.5	83.1	88.1	88.9	89.4	96.2	90.2	92.2	87.6	85.8	85.0	84.8
990 to 975	83.6	84.2	88.2	87.4	87.4	97.0	86.8	93.9	87.4	86.0	85.9	84.2
975 to 960	86.0	77.6	89.1	86.3	92.4	93.7	92.3	86.3	92.3	86.4	86.8	85.8
960 to 945	*Minimum Reading 964.9 ft*											
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Legend **0.0** **100.00**

This page intentionally left blank.

Whitewater River Cove

pH Concentration

This page intentionally left blank.

Jocassee C_2_560.0: Monthly pH (SI) 1975 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	5.8	6.1	6.3	6.5	6.7	7.1	7.2	7.2	7.0	6.3	6.6	6.1
1095 to 1080	5.8	6.0	6.4	6.5	6.5	7.0	7.4	6.8	7.0	6.3	6.5	6.0
1080 to 1065	5.8	5.9	6.3	6.4	6.3	6.9	7.1	6.5	6.6	6.2	6.5	6.0
1065 to 1050	5.8	5.8	6.2	6.3	6.2	6.5	6.6	6.3	6.2	6.1	6.3	6.0
1050 to 1035	5.8	5.7	6.2	6.2	6.1	6.2	6.3	6.1	6.1	6.0	6.4	6.0
1035 to 1020	5.8	5.7	6.2	6.1	6.0	6.1	6.1	6.0	6.1	5.8	6.1	5.9
1020 to 1005	5.8	5.7	6.1	6.0	5.9	6.1	6.1	5.9	6.2	5.8	5.8	5.7
1005 to 990	5.6	5.6	6.0	6.0	5.9	6.0	6.0	5.9	6.2	5.7	5.7	5.5
990 to 975	5.5	5.6	6.0	6.0	5.9	6.0	5.9	5.8	6.2	5.7	5.7	5.4
975 to 960	5.3	5.6		6.0	5.9	6.0	5.8	5.9	6.1	5.6	6.0	5.4
960 to 945		5.9	5.9	5.7			5.6	6.0		5.6		
945 to 930		5.6		5.7	5.1	6.0	5.2	5.8	6.2	5.6	6.4	
930 to 915				5.6			5.2			5.4		
915 to 900	6.0	5.7	6.3	6.0	6.0	6.3	6.1	6.0	6.5	5.9	6.2	5.5
900 to 885									6.0	5.3	6.4	
885 to 870				6.2						5.3		
870 to 855										5.3		
< 855	*Minimum Reading 856.1 ft*											

Jocassee C_2_560.0: Monthly pH (SI) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.4	6.5	6.2	6.8	7.1	7.0	7.4	7.4	6.8	6.6	6.6	6.2
1095 to 1080	6.5	6.5	6.6	6.8	6.8	7.1	7.2	7.3	6.9	6.7	6.7	6.3
1080 to 1065	6.5	6.5	6.5	6.8	6.8	7.1	7.1	7.0	6.8	6.7	6.7	6.3
1065 to 1050	6.4	6.5	6.6	6.7	6.8	7.0	6.9	6.7	6.7	6.7	6.6	6.3
1050 to 1035	6.4	6.4	6.4	6.6	6.6	6.9	6.8	6.6	6.5	6.6	6.6	6.3
1035 to 1020	6.3	6.4	6.4	6.6	6.6	6.8	6.6	6.4	6.3	6.6	6.6	6.3
1020 to 1005	6.4	6.4	6.4	6.5	6.5	6.8	6.5	6.2	6.1	6.4	6.5	6.3
1005 to 990	6.4	6.3	6.4	6.5	6.5	6.8	6.5	6.3	6.2	6.1	6.3	6.3
990 to 975	6.3	6.3	6.3	6.4	6.4	6.7	6.6	6.2	6.3	6.2	6.0	6.1
975 to 960	6.3	6.2	6.2	6.4	6.4	6.6	6.5	6.2	6.1	6.1	6.0	5.8
960 to 945	6.0	6.1	6.3	6.3	6.3	6.5	6.4	6.1	6.2	6.1	5.9	5.7
945 to 930	5.9	6.0	6.2	6.2	6.2	6.4	6.3	6.1	6.2	6.0	5.8	5.6
930 to 915	5.7	6.0	6.1	6.2	6.2	6.4	6.3	6.1	6.1	6.0	5.8	5.5
915 to 900	5.7	5.9	6.1	6.1	6.1	6.3	6.3	6.0	6.1	6.0	5.8	5.6
900 to 885	5.6	5.8	6.0	6.1	6.1	6.2	6.3	6.0	6.1	6.0	5.8	5.5
885 to 870	5.6	5.8	5.9	6.0	6.0	6.2	6.2	5.9	6.1	6.0	5.7	5.5
870 to 855	5.8	6.0	5.9	6.0	6.0	6.2	6.2	5.9	5.9	6.0	5.7	5.5
< 855	5.7	5.9	6.0	6.0	6.2	6.2	6.2	6.0	6.2	6.2	5.7	5.6

Jocassee C_2_560.0: Monthly pH (SI) 19912015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.3	6.2	6.6	6.7	7.0	6.8	6.8	6.8	6.6	6.3	6.6	6.4
1095 to 1080	6.4	6.3	6.6	6.8	6.9	6.8	6.7	6.9	6.7	6.6	6.7	6.5
1080 to 1065	6.4	6.3	6.5	6.7	6.8	6.7	6.6	6.8	6.7	6.7	6.7	6.5
1065 to 1050	6.4	6.3	6.5	6.6	6.7	6.6	6.5	6.6	6.6	6.6	6.7	6.5
1050 to 1035	6.4	6.2	6.4	6.5	6.6	6.5	6.4	6.5	6.4	6.6	6.7	6.5
1035 to 1020	6.3	6.3	6.4	6.4	6.5	6.4	6.3	6.3	6.3	6.5	6.7	6.5
1020 to 1005	6.3	6.2	6.4	6.4	6.4	6.3	6.2	6.2	6.1	6.3	6.6	6.5
1005 to 990	6.4	6.2	6.3	6.3	6.3	6.2	6.1	6.2	6.0	6.0	6.2	6.3
990 to 975	6.2	6.2	6.3	6.2	6.2	6.1	6.0	6.1	6.0	5.9	6.0	5.9
975 to 960	6.1	6.2	6.2	6.1	6.1	6.0	5.9	6.0	5.9	5.9	6.0	5.8
960 to 945	5.9	6.1	6.2	6.0	6.1	5.9	5.8	5.9	5.8	5.8	5.9	5.7
945 to 930	5.8	6.0	6.1	5.9	6.0	5.8	5.8	5.9	5.8	5.8	5.9	5.7
930 to 915	5.7	5.9	6.1	5.9	6.0	5.8	5.8	5.9	5.8	5.8	5.9	5.7
915 to 900	5.7	5.9	6.0	5.9	6.0	5.8	5.7	5.8	5.8	5.8	5.9	5.7
900 to 885	5.7	5.8	5.9	5.8	6.0	5.8	5.7	5.8	5.8	5.7	5.9	5.7
885 to 870	5.7	5.9	6.0	5.8	5.9	5.8	5.7	5.8	5.8	5.7	5.9	5.7
870 to 855	5.7	5.9	6.0	5.9	5.8	5.8	5.7	5.8	5.8	5.8	5.9	5.7
< 855	5.5	5.7	5.8	5.6	5.6	5.6	5.7	5.8	5.7	5.6	6.0	5.9

< Acidic **Neutral** **Basic >**

1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee D_2_564.0: Monthly pH (SI) 1976 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	5.9	6.1	6.2	6.5	6.9	7.2	7.5	7.3	7.1	6.5	6.7	6.1
1095 to 1080	5.9	6.0	6.3	6.4	6.6	7.1	6.8	6.7	7.1	6.5	6.6	6.0
1080 to 1065	5.9	5.9	6.3	6.3	6.2	6.6	6.6	6.4	6.6	6.3	6.6	6.1
1065 to 1050	5.9	5.9	6.2	6.2	6.0	6.3	6.2	6.0	6.1	6.3	6.5	6.0
1050 to 1035	5.9	5.8	6.2	6.1	6.0	6.1	6.0	6.0	5.9	6.1	6.5	6.0
1035 to 1020	5.9	5.8	6.1	6.0	5.8	5.9	5.8	5.8	5.9	5.9	6.2	6.0
1020 to 1005	5.9	5.8	6.1	6.0	5.8	5.8	5.7	5.7	5.9	5.7	6.0	5.8
1005 to 990	5.9	5.8	6.0	6.0	5.8	5.7	5.7	5.7	5.9	5.6	5.8	5.5
990 to 975	5.9	5.8	6.1	5.9	5.7	5.7	5.7	5.7	5.9	5.6	5.8	5.5
975 to 960	5.9	5.9		5.9	5.4	5.7	5.8	5.6	6.0	5.6	6.3	5.5
960 to 945		6.0	6.6	5.7			5.5			5.5		
945 to 930		5.9		5.7						5.5		
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855	*Minimum Reading 937.5 ft*											

Jocassee D_2_564.0: Monthly pH (SI) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.4	6.4	6.2	6.9	7.0	7.0	7.4	7.2	6.9	6.7	6.3	6.2
1095 to 1080	6.5	6.5	6.6	6.8	6.9	7.2	7.5	7.4	6.9	6.8	6.7	6.3
1080 to 1065	6.6	6.5	6.5	6.8	6.9	7.2	7.2	7.1	6.8	6.7	6.7	6.3
1065 to 1050	6.5	6.4	6.5	6.7	6.8	7.0	6.9	6.8	6.7	6.7	6.6	6.3
1050 to 1035	6.5	6.3	6.4	6.6	6.7	6.9	6.8	6.7	6.6	6.6	6.6	6.3
1035 to 1020	6.4	6.3	6.3	6.6	6.7	6.8	6.6	6.4	6.4	6.6	6.6	6.3
1020 to 1005	6.5	6.3	6.4	6.5	6.6	6.7	6.5	6.3	6.1	6.4	6.6	6.3
1005 to 990	6.5	6.2	6.3	6.5	6.6	6.7	6.5	6.3	6.2	6.2	6.4	6.2
990 to 975	6.4	6.2	6.2	6.4	6.5	6.6	6.5	6.2	6.3	6.2	6.0	6.1
975 to 960	6.5	6.2	6.2	6.4	6.4	6.5	6.4	6.2	6.2	6.1	6.1	5.9
960 to 945	6.3	6.2	6.2	6.3	6.3	6.4	6.3	6.2	6.2	6.0	5.9	5.7
945 to 930	6.2	6.2	6.1	6.2	6.2	6.3	6.3	6.1	6.1	6.1	5.9	5.6
930 to 915	6.1	6.1	6.1	6.2	6.2	6.3	6.3	6.1	6.0	6.0	5.8	5.5
915 to 900	6.1	5.8	6.1	6.1	6.1	6.2	6.2	6.0	6.0	6.0	5.8	5.6
900 to 885	6.1	5.8	6.1	6.1	6.2	6.1	6.1	5.9	6.0	6.0	5.8	5.5
885 to 870	6.0	5.8	6.0	6.2	6.0	6.3	6.1	5.9	5.9	6.1	5.7	5.6
870 to 855	5.4		5.9	6.4	6.1	6.0	6.1	6.2	5.6	5.9	5.5	5.6
< 855	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly pH (SI) 19912015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.4	6.3	6.6	6.8	7.1	6.9	6.9	7.0	6.8	6.5	6.6	6.6
1095 to 1080	6.5	6.5	6.6	6.8	7.0	6.9	6.8	7.0	6.8	6.7	6.8	6.6
1080 to 1065	6.4	6.4	6.6	6.7	6.9	6.8	6.7	6.9	6.7	6.7	6.8	6.6
1065 to 1050	6.5	6.4	6.5	6.6	6.8	6.7	6.6	6.7	6.7	6.7	6.7	6.6
1050 to 1035	6.5	6.4	6.5	6.6	6.7	6.6	6.5	6.6	6.6	6.6	6.8	6.6
1035 to 1020	6.4	6.4	6.5	6.5	6.6	6.5	6.4	6.5	6.4	6.6	6.7	6.6
1020 to 1005	6.4	6.4	6.4	6.4	6.5	6.4	6.3	6.3	6.2	6.4	6.6	6.6
1005 to 990	6.5	6.3	6.4	6.3	6.4	6.2	6.1	6.2	6.1	6.0	6.3	6.4
990 to 975	6.4	6.4	6.4	6.3	6.3	6.1	6.0	6.0	6.0	5.9	6.0	6.1
975 to 960	6.2	6.3	6.3	6.2	6.2	6.0	5.9	6.0	5.9	5.9	5.9	5.9
960 to 945	6.1	6.2	6.3	6.1	6.2	5.9	5.8	6.0	5.8	5.8	5.9	5.8
945 to 930	5.9	6.1	6.2	6.0	6.1	5.9	5.8	5.9	5.9	5.8	5.9	5.8
930 to 915	5.8	6.1	6.2	6.0	6.0	5.9	5.8	5.9	5.8	5.8	5.9	5.8
915 to 900	5.9	6.1	6.1	6.0	6.1	5.8	5.8	5.9	5.8	5.8	5.9	5.8
900 to 885	5.7	5.8	6.0	5.8	5.8	5.8	5.7	5.9	5.7	5.7	5.7	5.5
885 to 870	5.7	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.9	5.7
870 to 855	5.6	5.7	5.7	5.6		5.8	6.3	6.0		5.7	6.1	
< 855	*Minimum Reading 864.4 ft*											

< Acidic						Neutral						Basic >		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Jocassee D_2_564.1: Monthly pH (SI) (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095												
1095 to 1080												
1080 to 1065												
1065 to 1050												
1050 to 1035												
1035 to 1020												
1020 to 1005												
1005 to 990												
990 to 975												
975 to 960												
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

pH Readings Began During Bad Creek Construction (1987)

Jocassee D_2_564.1: Monthly pH (SI) 1987 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.3	6.2	6.3	6.3	6.3	6.8	7.4	7.2	6.9	6.5	6.5	6.3
1095 to 1080	6.5	6.5	6.6	6.6	6.6	6.8	7.2	7.3	6.8	6.7	6.7	6.4
1080 to 1065	6.6	6.5	6.7	6.6	6.7	6.8	6.9	6.9	6.7	6.8	6.8	6.4
1065 to 1050	6.5	6.4	6.6	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6	6.4
1050 to 1035	6.7	6.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.6	6.4	6.3
1035 to 1020	6.7	6.3	6.4	6.4	6.3	6.3	6.3	6.3	6.2	6.4	6.4	6.3
1020 to 1005	7.1	6.3	6.4	6.4	6.4	6.4	6.2	6.1	6.0	6.3	6.3	6.3
1005 to 990	6.9	6.3	6.4	6.2	6.2	6.3	6.2	6.1	6.1	6.3	6.3	6.1
990 to 975	6.9	6.3	6.4	6.2	5.9	6.1	6.2	6.0	6.0	6.5	6.2	6.1
975 to 960	7.3	6.4	7.0	6.6	5.7	6.1	6.2	6.1	6.1	7.0	6.2	6.2
960 to 945					5.8							
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly pH (SI) 1991 to 2017 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	6.5	6.3	6.6	6.6	7.0	6.8	6.8	6.9	6.6	6.4	6.7	6.5
1095 to 1080	6.5	6.4	6.6	6.6	6.9	6.8	6.7	6.9	6.7	6.6	6.7	6.6
1080 to 1065	6.5	6.4	6.6	6.6	6.8	6.7	6.7	6.8	6.7	6.7	6.7	6.6
1065 to 1050	6.5	6.3	6.5	6.6	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.5
1050 to 1035	6.5	6.4	6.5	6.5	6.7	6.6	6.6	6.6	6.6	6.6	6.7	6.6
1035 to 1020	6.4	6.3	6.6	6.5	6.7	6.6	6.6	6.6	6.6	6.6	6.7	6.6
1020 to 1005	6.5	6.4	6.6	6.5	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.6
1005 to 990	6.4	6.3	6.5	6.4	6.7	6.5	6.5	6.6	6.6	6.5	6.7	6.6
990 to 975	6.4	6.3	6.6	6.4	6.7	6.6	6.5	6.5	6.5	6.5	6.7	6.5
975 to 960	6.2	6.0	6.4	6.3	6.4	6.4	6.3	6.1	6.2	6.3	6.5	6.3
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855												

Minimum Reading 963 ft

< Acidic					Neutral						Basic >		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

This page intentionally left blank.

Whitewater River Cove

Conductivity

This page intentionally left blank.

Jocassee C_2_560.0: Monthly Averaged Conductivity (uS/cm) 1975 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	13.6	16.3	16.3	16.2	14.7	14.4	17.5	15.7	13.9	16.2	14.0	14.1
1080 to 1095	13.4	16.3	16.4	16.5	13.9	14.3	16.3	16.1	14.7	16.3	14.9	14.7
1065 to 1080	13.5	17.1	15.9	17.0	14.6	15.0	17.1	15.9	14.1	16.6	14.4	14.6
1050 to 1065	13.6	16.0	16.0	16.0	14.1	14.8	17.4	16.5	14.3	16.4	14.8	14.5
1035 to 1050	13.3	16.6	15.5	16.5	14.4	14.1	16.4	15.8	13.5	16.4	15.0	15.9
1020 to 1035	13.0	16.6	16.0	16.2	13.8	14.1	15.8	15.7	13.6	15.8	14.1	14.3
1005 to 1020	13.0	16.5	15.6	16.6	14.1	14.3	16.7	15.0	12.1	15.5	13.8	14.1
990 to 1005	13.0	16.4	15.1	16.0	14.5	14.4	15.5	14.3	13.1	15.5	13.8	15.4
975 to 990	13.3	16.1	15.3	17.0	14.4	14.4	15.8	15.6	12.4	16.0	13.5	15.1
960 to 975	13.5	18.7		19.0	13.0	14.4	16.0	14.8	14.2	16.0	13.6	15.8
945 to 960			18.0	18.0			20.0	12.0		16.0		
930 to 945		21.0		17.3	18.0	15.0	22.0	21.0	14.0	17.8	12.0	
915 to 930				19.0			22.0					
900 to 915	22.5	17.8	15.0	18.2	17.5	15.0	16.4	18.1	14.5	17.0	15.2	20.3
885 to 900											16.0	
870 to 885				15.0								
855 to 870												
< 855					*Minimum Reading 873.3 ft*							

Jocassee C_2_560.0: Monthly Averaged Conductivity (uS/cm) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	18.0	16.7	18.0	17.6	20.5	18.0	19.6	21.1	20.5	17.9	19.8	20.0
1095 to 1080	20.5	17.0	19.5	18.8	20.9	19.9	20.1	22.4	21.2	19.4	19.8	21.0
1080 to 1065	20.6	16.7	19.8	18.0	21.0	19.9	19.5	21.5	20.7	19.2	20.7	20.9
1065 to 1050	20.3	16.6	20.2	17.8	20.9	19.6	20.0	21.6	20.7	18.6	20.1	20.9
1050 to 1035	20.0	16.8	20.0	18.1	20.5	19.8	20.0	20.8	20.5	18.4	20.0	20.8
1035 to 1020	19.8	16.4	19.8	17.8	20.2	19.6	19.5	21.4	20.5	18.3	20.3	20.9
1020 to 1005	19.4	15.6	20.0	16.9	19.9	19.2	20.2	21.4	20.8	18.7	20.3	20.7
1005 to 990	19.3	16.0	20.2	17.3	20.1	18.9	20.1	22.7	21.5	18.0	19.4	20.1
990 to 975	19.2	15.7	19.8	17.1	19.7	19.0	19.3	21.6	20.2	16.6	19.2	20.6
975 to 960	18.4	17.5	19.8	17.9	19.5	18.9	19.5	20.3	19.9	17.1	19.2	19.9
960 to 945	18.8	16.0	19.8	17.3	19.5	18.6	19.5	20.1	19.6	16.7	18.2	19.8
945 to 930	18.5	16.0	19.3	17.6	19.4	18.9	19.6	20.1	19.9	16.9	18.2	19.9
930 to 915	19.2	16.4	19.2	18.0	19.6	18.8	19.9	20.3	20.2	16.6	18.5	20.9
915 to 900	19.6	16.5	19.5	17.8	19.6	19.3	20.0	20.5	20.0	17.0	19.1	20.0
900 to 885	19.8	17.0	20.0	18.2	19.6	19.1	20.0	20.6	20.3	16.5	18.2	20.0
885 to 870	20.0	17.7	20.6	18.5	20.2	19.4	20.1	20.3	20.8	16.5	19.3	20.9
870 to 855	19.6	16.8	21.0	19.1	20.5	19.6	20.4	20.0	20.9	18.7	20.1	21.1
< 850	24.5	15.7	21.0	21.3	19.1	19.9	21.1	26.4	21.3	17.8	20.0	21.1

Jocassee C_2_560.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	16.7	16.5	17.0	17.3	18.1	17.9	18.2	18.5	18.1	17.8	17.9	17.2
1095 to 1080	16.5	16.9	17.4	17.7	18.1	18.2	18.5	18.7	18.2	18.3	17.7	17.2
1080 to 1065	16.7	16.9	17.2	17.8	18.1	18.2	18.5	18.8	18.3	18.4	17.6	17.4
1065 to 1050	16.7	16.7	17.2	17.7	18.1	18.2	18.5	18.8	18.1	18.4	17.7	17.5
1050 to 1035	16.6	16.6	17.1	17.6	18.0	18.2	18.5	18.6	17.9	18.3	17.7	17.5
1035 to 1020	16.6	16.8	17.4	17.7	18.0	18.0	18.3	18.6	17.9	18.3	17.6	17.5
1020 to 1005	16.6	16.8	17.1	17.6	17.8	17.5	17.8	18.1	17.4	18.2	17.4	17.4
1005 to 990	16.8	16.5	17.2	17.6	17.6	17.1	17.3	17.4	17.1	17.7	17.4	17.4
990 to 975	16.5	16.8	17.5	17.4	17.4	17.3	17.5	17.4	17.1	17.7	17.3	17.5
975 to 960	16.8	16.8	17.1	17.5	17.5	17.3	17.4	17.5	17.1	17.9	17.4	17.8
960 to 945	17.5	16.8	17.2	17.4	17.5	17.4	17.4	17.6	17.0	17.9	17.6	18.1
945 to 930	18.2	17.2	17.3	17.5	17.7	17.6	17.5	17.5	17.1	17.9	17.7	18.3
930 to 915	18.5	17.6	17.7	17.8	18.0	17.8	17.7	17.9	17.6	18.1	18.0	18.4
915 to 900	19.0	17.8	17.8	18.0	17.9	18.0	17.8	18.2	18.0	18.3	18.4	19.1
900 to 885	19.3	18.3	17.9	18.1	18.1	18.0	17.8	18.1	18.0	18.3	18.6	18.9
885 to 870	19.1	18.9	18.7	18.2	18.2	18.3	18.1	18.5	18.5	18.6	18.6	19.4
870 to 855	20.0	19.3	18.8	18.7	18.8	18.8	18.9	18.8	20.3	19.6	20.2	21.1
< 850	19.6	20.5	19.5	23.3	17.7	17.9	17.5	18.7	18.6	20.1	18.4	26.8
Legend	**15.0**											**25.0**

Jocassee D_2_564.0: Monthly Averaged Conductivity (uS/cm) 1976 to 1985 (Pre Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	14.0	16.4	15.3	16.3	15.2	15.4	19.2	15.4	13.3	15.8	13.6	14.7
1095 to 1080	14.0	16.8	15.0	15.3	14.4	14.5	16.8	14.2	14.3	16.5	14.8	15.0
1080 to 1065	13.5	17.2	15.2	15.5	14.4	14.2	18.0	14.4	12.7	16.3	14.3	15.0
1065 to 1050	13.0	16.8	14.7	15.0	14.4	14.3	18.9	15.3	12.7	16.0	14.5	14.7
1050 to 1035	13.0	16.2	14.0	14.9	14.8	14.0	17.9	15.7	12.0	16.4	14.6	16.0
1035 to 1020	13.0	17.0	14.6	14.5	15.3	14.0	17.4	16.5	13.8	15.9	14.4	14.5
1020 to 1005	13.0	16.7	13.7	15.4	15.4	15.1	18.8	16.7	13.6	16.1	14.1	14.0
1005 to 990	13.0	16.4	13.6	15.1	15.3	14.8	17.8	17.0	15.4	18.6	16.0	17.6
990 to 975	13.0	16.7	14.3	15.7	16.0	15.0	19.0	19.2	14.4	20.9	20.3	22.2
975 to 960	13.0	19.3		15.4	16.0	14.8	21.7	17.5	16.8	24.3	25.8	23.3
960 to 945			16.0				20.0			18.0		
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 855	*Minimum Reading 937.5 ft*											

Jocassee D_2_564.0: Monthly Averaged Conductivity (uS/cm) 1985 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	18.0	16.1	18.0	17.0	21.0	18.7	19.6	21.3	20.6	17.8	19.0	20.0
1095 to 1080	20.5	15.9	19.5	18.3	20.8	19.7	19.9	22.5	21.2	19.3	19.5	21.0
1080 to 1065	20.6	15.9	19.5	17.2	21.0	19.6	19.5	20.9	20.8	19.6	20.4	21.0
1065 to 1050	20.0	15.5	20.2	17.5	21.0	19.5	19.8	21.1	20.9	18.4	19.9	21.0
1050 to 1035	20.0	15.9	20.0	17.8	20.5	19.4	19.7	21.0	21.1	18.5	19.6	20.8
1035 to 1020	19.6	15.6	19.8	17.5	20.4	19.4	19.4	21.4	20.6	18.3	19.3	20.9
1020 to 1005	19.4	14.3	20.0	16.7	20.0	19.1	19.8	22.2	21.9	19.1	19.8	20.8
1005 to 990	19.0	14.5	19.8	17.8	20.1	18.6	20.0	23.4	21.7	18.9	19.1	20.0
990 to 975	19.2	14.4	18.6	16.8	19.7	18.9	19.1	22.5	21.5	17.2	19.2	20.6
975 to 960	18.2	15.4	19.3	17.5	19.6	19.1	19.4	20.8	20.2	17.7	20.0	20.6
960 to 945	18.5	14.2	19.8	17.3	19.5	18.8	19.3	20.8	20.5	17.4	19.9	21.2
945 to 930	18.3	14.4	19.5	17.6	19.5	19.3	19.7	20.8	20.6	18.0	20.1	21.8
930 to 915	17.8	15.4	19.2	18.4	21.0	20.9	20.8	22.3	22.1	19.5	20.5	22.8
915 to 900	18.0	16.1	20.0	19.6	21.6	21.2	21.8	23.2	21.9	19.4	20.9	22.1
900 to 885	20.3	17.8	20.2	20.9	21.5	21.1	21.7	24.3	22.0	19.3	21.9	22.6
885 to 870	22.0	18.3	22.0	23.8	21.6	22.5	21.4	25.9	23.6	18.8	22.2	24.0
870 to 855	26.0			26.0	21.0	22.0	26.3	24.3	26.0	26.7	24.0	22.0
< 850	*Minimum Reading 864.7 ft*											

Jocassee D_2_564.0: Monthly Averaged Conductivity (uS/cm) 1991 to 2015 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.1	16.7	17.7	17.5	18.4	18.1	18.4	18.8	18.1	17.6	17.7	17.5
1095 to 1080	16.7	17.1	17.8	17.7	18.3	18.4	18.8	18.9	18.3	18.5	17.6	17.6
1080 to 1065	16.9	17.0	17.7	18.0	18.4	18.4	18.7	19.1	18.4	18.5	17.7	17.5
1065 to 1050	16.8	16.9	17.5	17.9	18.4	18.5	18.8	18.8	18.2	18.5	17.6	17.5
1050 to 1035	17.0	16.8	17.6	17.9	18.4	18.4	18.7	18.7	18.0	18.3	17.7	17.7
1035 to 1020	16.8	16.9	17.7	17.9	18.3	18.2	18.5	18.8	17.9	18.3	17.5	17.5
1020 to 1005	16.6	16.9	17.7	17.9	18.1	17.9	18.1	18.4	17.6	18.4	17.4	17.3
1005 to 990	16.9	16.6	17.8	17.8	17.9	17.5	17.7	17.9	17.6	18.1	17.6	17.5
990 to 975	16.7	17.0	17.9	17.6	17.8	17.6	18.0	18.0	17.7	18.2	17.7	17.8
975 to 960	17.1	17.0	17.7	17.9	18.1	17.7	18.0	18.0	17.9	18.5	18.2	18.3
960 to 945	17.6	17.0	17.6	17.8	18.1	17.9	18.1	18.3	17.9	18.7	18.4	18.9
945 to 930	18.9	17.2	17.7	18.0	18.3	18.1	18.4	18.4	18.4	19.1	19.2	19.9
930 to 915	19.5	17.6	18.0	18.5	18.5	18.6	19.0	19.1	19.0	19.5	20.0	20.8
915 to 900	20.5	17.8	18.4	18.8	18.6	19.0	19.2	19.6	19.7	20.2	21.2	21.3
900 to 885	22.2	19.4	18.5	19.2	19.0	18.9	18.5	18.5	20.5	19.7	21.8	21.6
885 to 870	22.7	24.0	21.8	18.0	17.8	19.1	19.6	18.9	24.7	20.7	23.6	26.3
870 to 855	30.9	23.0	28.0	18.3		23.0	27.0	21.5		25.0	28.0	
< 850	*Minimum Reading 864.4 ft*											

Legend **15.0** **25.0**

Data Collection at D_2_564.1 Began in 1987

Jocassee D_2_564.1: Monthly Averaged Conductivity (uS/cm) 1987 to 1991 (Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1095 to 1110	20.0	18.0	17.0	18.0	20.7	19.7	20.4	21.2	20.8	18.8	19.0	20.5
1080 to 1095	20.6	18.3	18.7	18.8	19.8	19.7	20.3	22.3	21.2	19.7	19.6	21.1
1065 to 1080	18.2	17.4	18.8	18.4	20.3	20.8	19.7	21.2	21.0	20.9	20.6	21.4
1050 to 1065	17.6	15.8	16.5	16.6	17.6	19.5	19.8	21.9	20.6	18.8	18.7	19.2
1035 to 1050	19.3	16.4	16.8	16.8	17.2	19.3	19.7	23.4	20.6	18.7	17.9	18.7
1020 to 1035	20.0	17.0	16.8	17.6	16.8	19.1	19.5	24.3	23.5	18.5	17.8	19.0
1005 to 1020	22.2	17.0	18.5	19.6	19.6	21.3	20.9	25.2	27.6	21.1	18.3	18.2
990 to 1005	21.0	17.2	20.3	21.0	22.1	23.7	24.7	28.5	31.9	25.8	18.1	18.5
975 to 990	20.8	17.6	20.2	21.9	22.0	24.3	26.3	29.0	31.1	35.6	25.8	18.5
960 to 975	22.2	18.7	26.0	25.5	22.5	25.3	28.3	31.3	34.4		34.8	18.5
945 to 960					23.0							
930 to 945												
915 to 930												
900 to 915												
885 to 900												
870 to 885												
855 to 870												
< 850												

Minimum Reading 959.9 ft

Jocassee D_2_564.1: Monthly Averaged Conductivity (uS/cm) 1985 to 1991 (Post Bad Creek Construction)

Measurement Reading Range (ft msl)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1110 to 1095	17.1	16.4	17.4	17.5	18.2	18.2	18.4	18.8	18.4	17.4	17.8	17.2
1095 to 1080	16.5	16.7	17.5	17.2	17.9	18.2	18.7	18.7	18.3	18.2	17.6	17.3
1080 to 1065	16.7	16.7	17.5	17.6	18.3	18.3	18.7	18.5	18.3	18.4	17.7	17.2
1065 to 1050	16.5	16.3	17.5	17.4	18.4	18.4	18.4	17.7	18.0	18.2	17.6	17.1
1050 to 1035	16.6	16.3	17.4	17.7	18.4	18.4	18.8	17.9	18.0	18.3	17.5	17.2
1035 to 1020	16.3	16.2	17.5	17.7	18.5	18.3	18.6	17.9	18.2	18.2	17.2	17.0
1020 to 1005	16.3	16.4	17.3	17.8	18.5	18.5	18.9	17.7	17.9	18.3	17.3	16.9
1005 to 990	16.4	15.9	17.2	17.9	18.6	18.2	18.3	17.2	17.8	17.9	17.1	16.9
990 to 975	16.0	15.6	17.1	17.7	19.3	18.7	18.6	17.8	17.9	18.1	16.4	16.7
975 to 960	15.5	14.6	15.6	17.0	19.1	18.5	17.9	18.6	18.6	18.3	15.8	15.4
960 to 945												
945 to 930												
930 to 915												
915 to 900												
900 to 885												
885 to 870												
870 to 855												
< 850												

Minimum Reading 963 ft

Legend **15.0** **25.0**

This page intentionally left blank

Appendix C

Appendix C – Turbidity in Whitewater River Cove

This page intentionally left blank.

Station 564.1

Construction [1988-1991]

This page intentionally left blank.

Monitoring Location 564.1 - Construction Turbidity

Measurement Elevation (ft msl)

1,125
1,100
1,075
1,050
1,025
1,000
975
950

1988
1989
1990
1991
1992

Turbidity Range (NTU): 0-10 10-20 20-30 30-40 40-50 50-60 60-70 70-80 80-90 90-100 100-150 150-200 200-250 250-300 >300

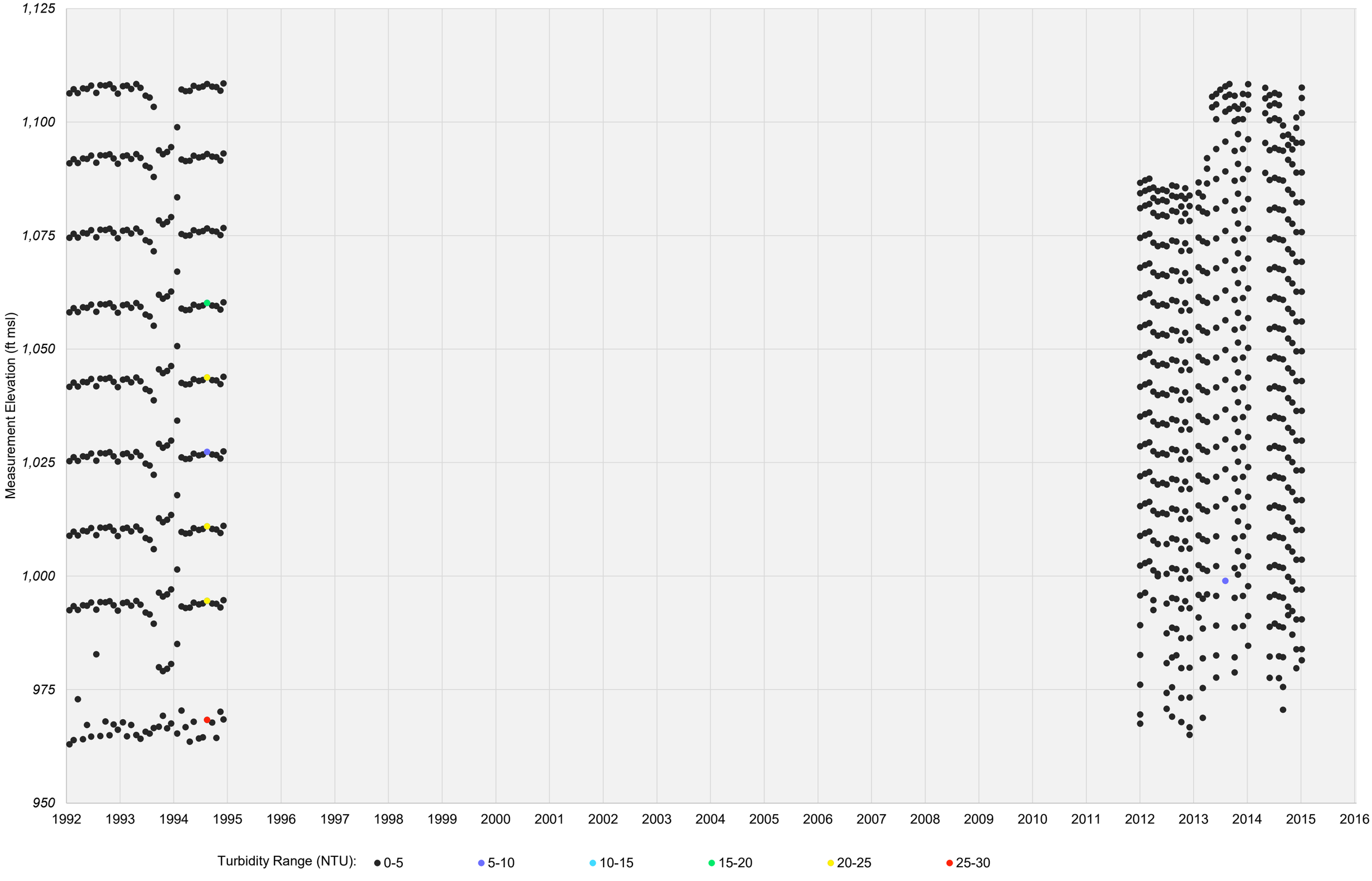
This page intentionally left blank.

Station 564.1

Post Construction
[1992-2015]

This page intentionally left blank.

Monitoring Location 564.1 - Post Construction Turbidity



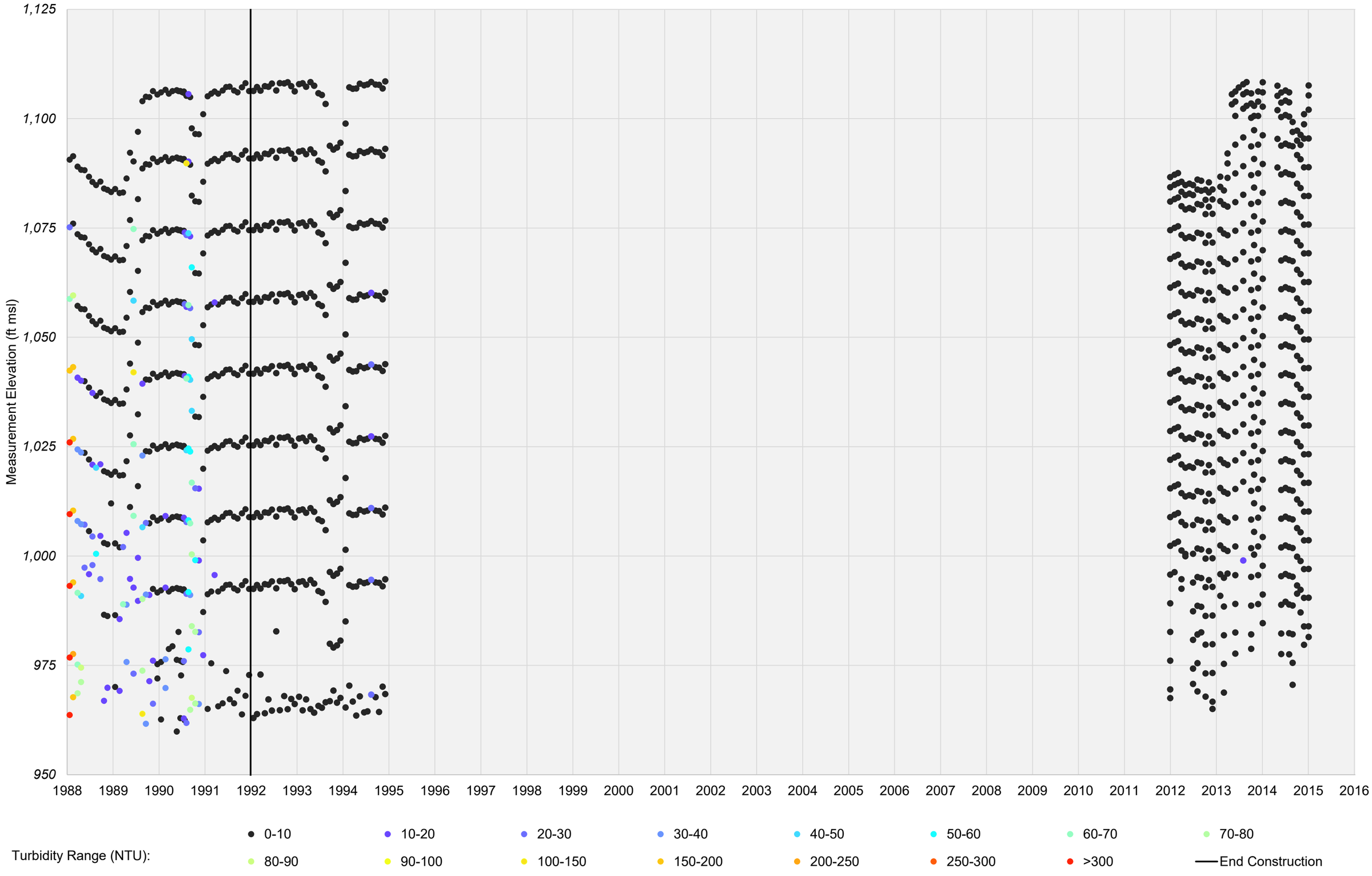
This page intentionally left blank.

Station 564.1

Full Dataset

This page intentionally left blank.

Monitoring Location 564.1 - Turbidity

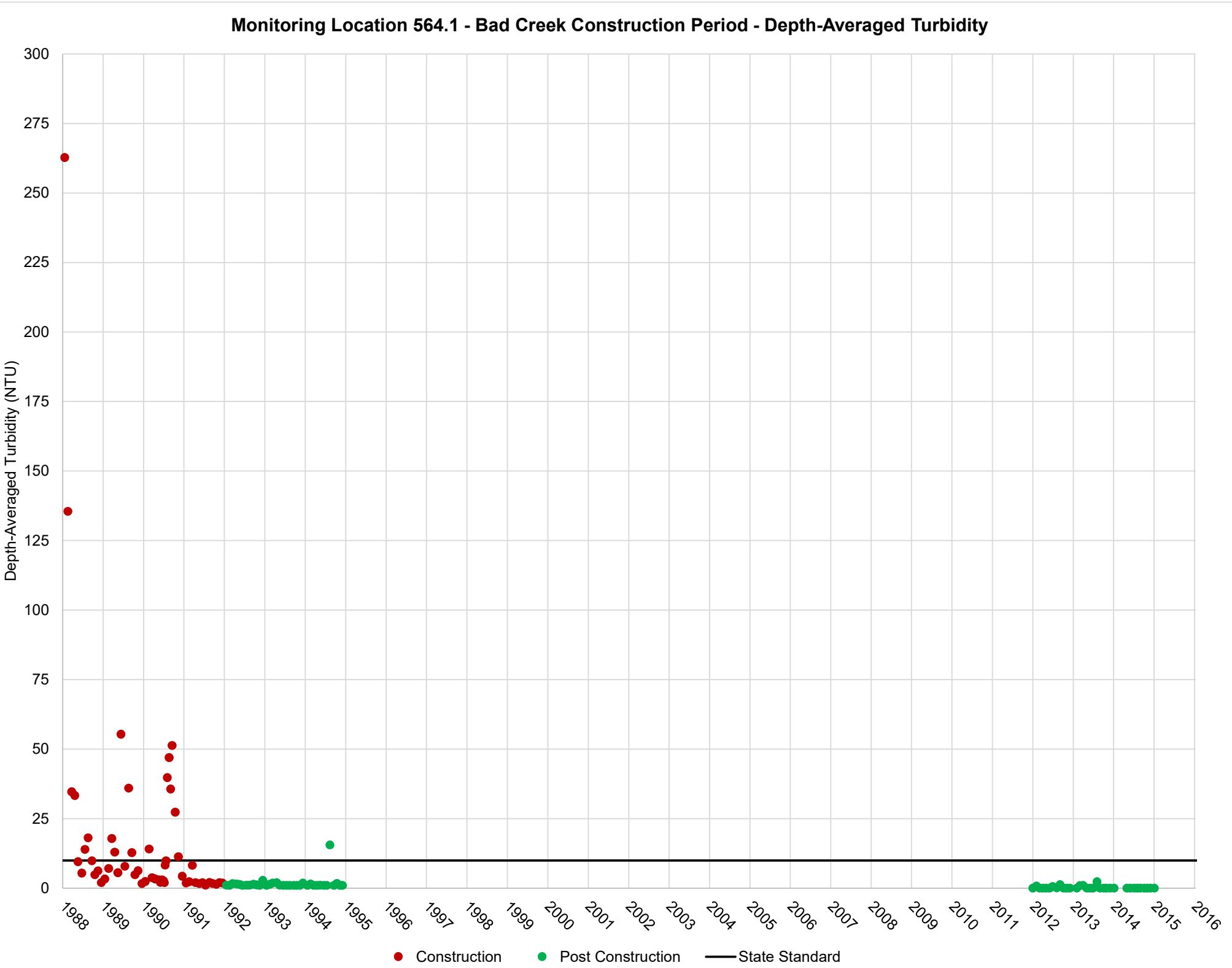


This page intentionally left blank.

Station 564.1

Depth-Averaged with SC State Standard

This page intentionally left blank.


Monitoring Location 564.1 - Bad Creek Construction Period - Depth-Averaged Turbidity
Depth-Averaged Turbidity (NTU)
300
275
250
225
200
175
150
125
100
75
50
25
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Construction
Post Construction
State Standard

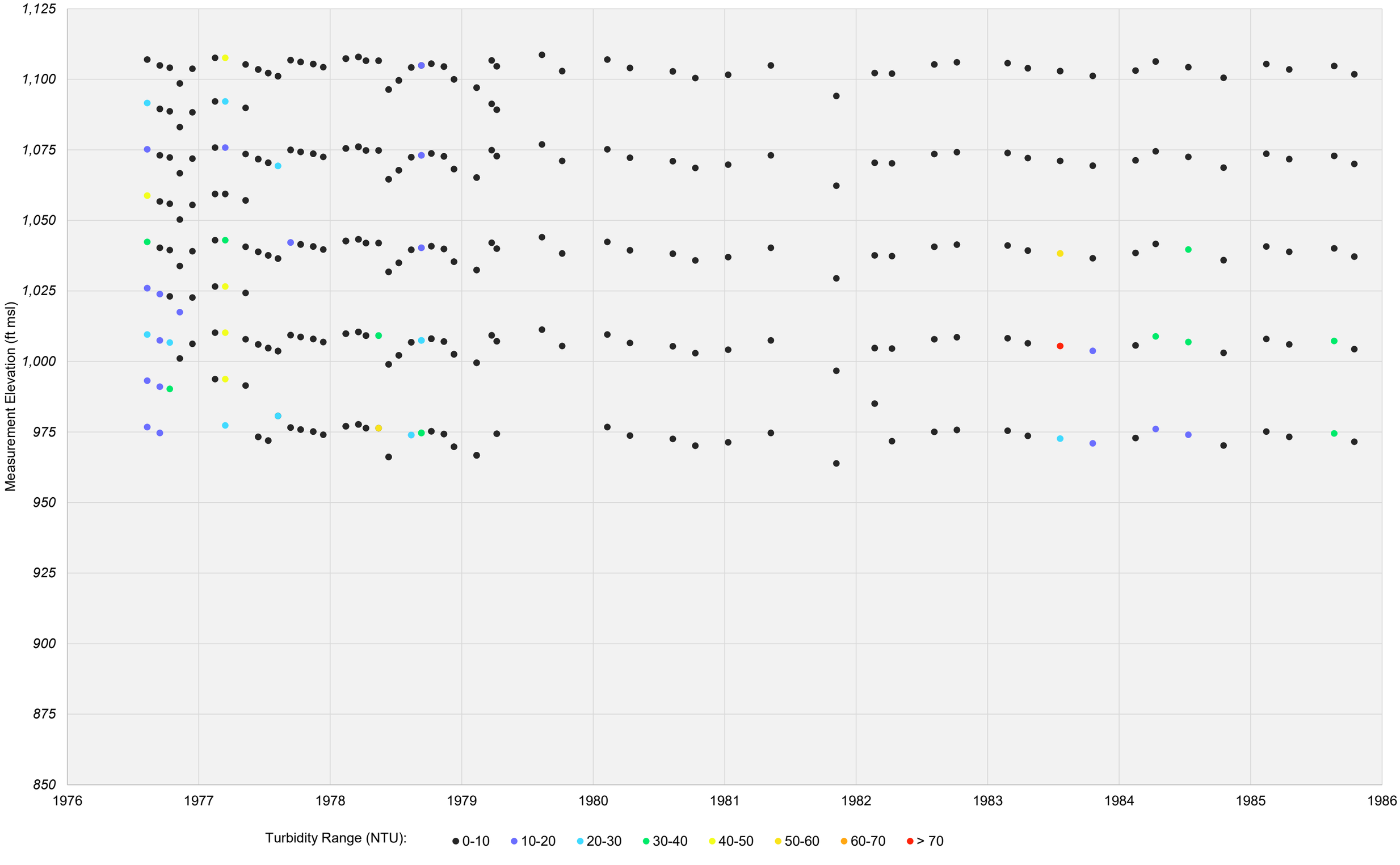
This page intentionally left blank.

Station 564.0

Pre Construction
[<1985]

This page intentionally left blank.

Monitoring Location 564.0 - Pre Construction Turbidity



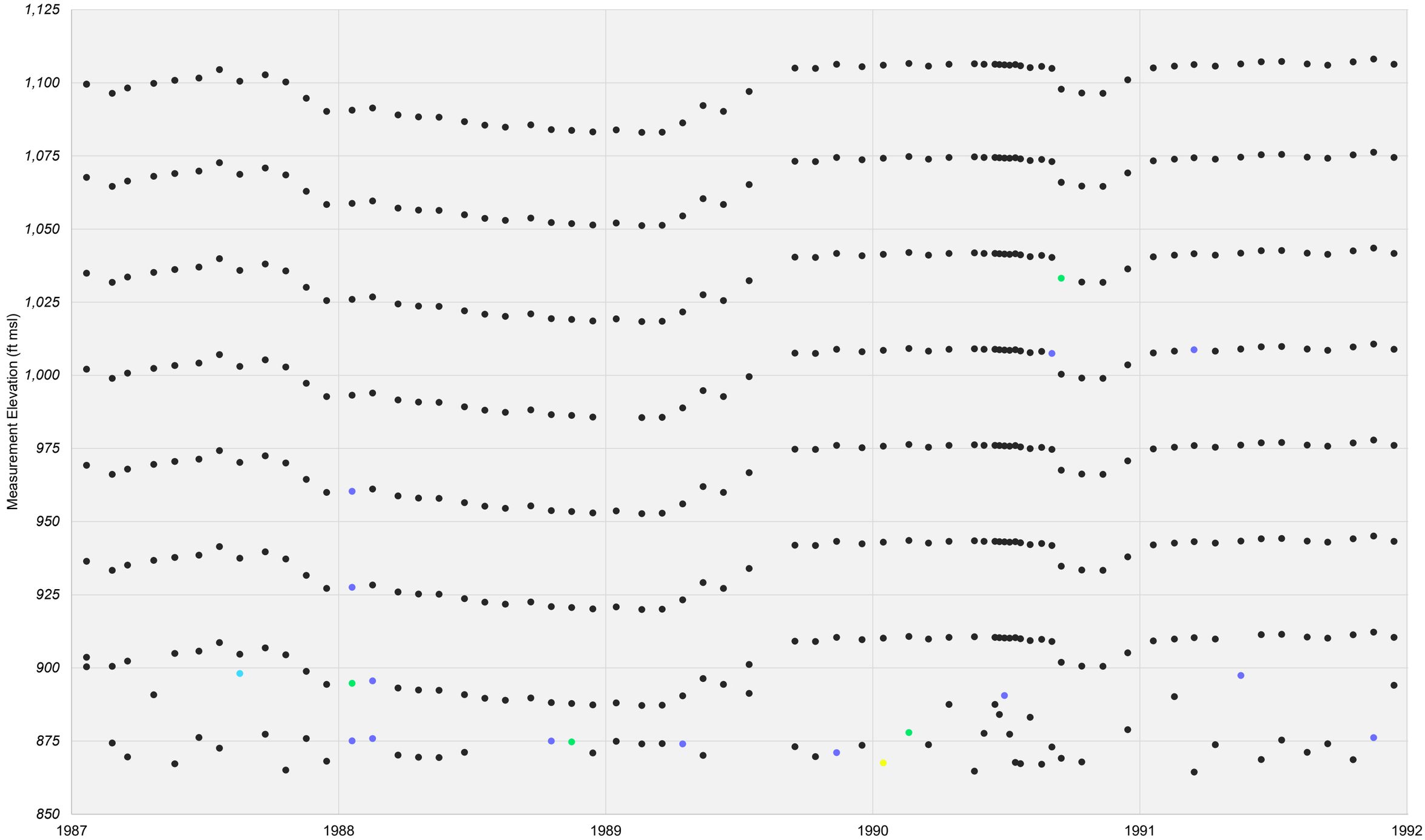
This page intentionally left blank.

Station 564.0

Construction
[1986-1991]

This page intentionally left blank.

Monitoring Location 564.0 - Construction Turbidity



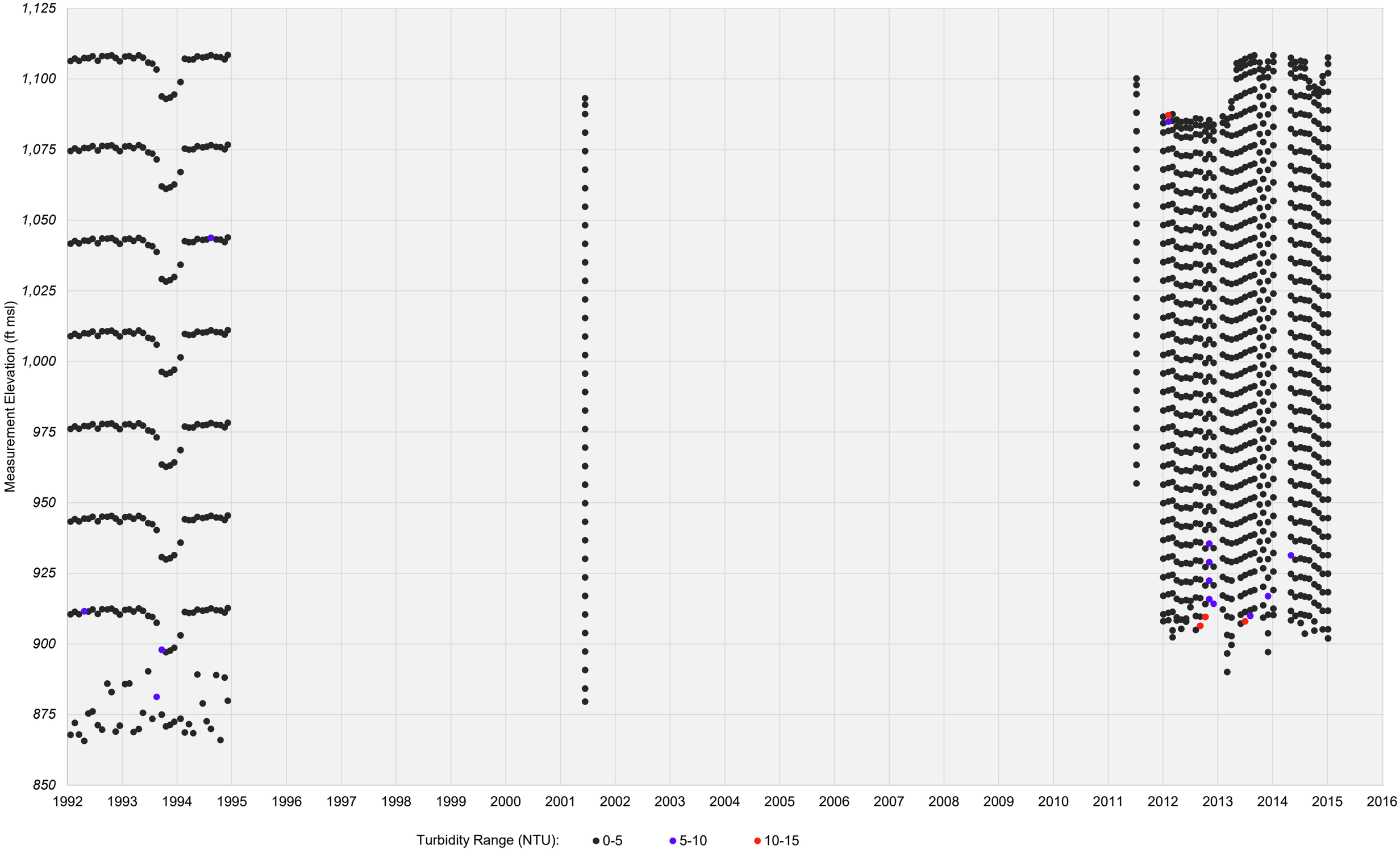
This page intentionally left blank.

Station 564.0

Post Construction
[1992-2015]

This page intentionally left blank.

Monitoring Location 564.0 - Post Construction Turbidity



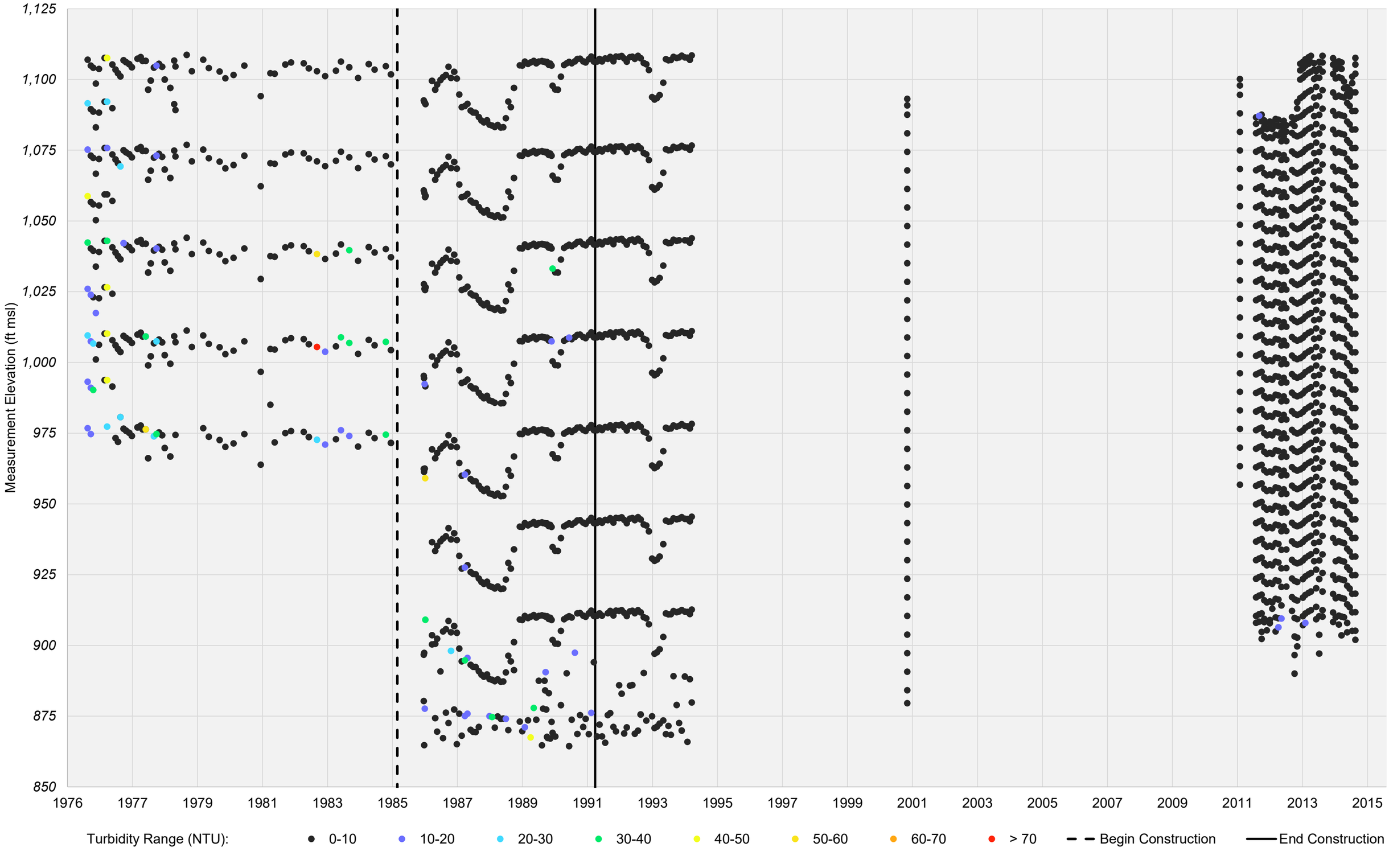
This page intentionally left blank.

Station 564.0

Full Dataset

This page intentionally left blank.

Monitoring Location 564.0 -Turbidity

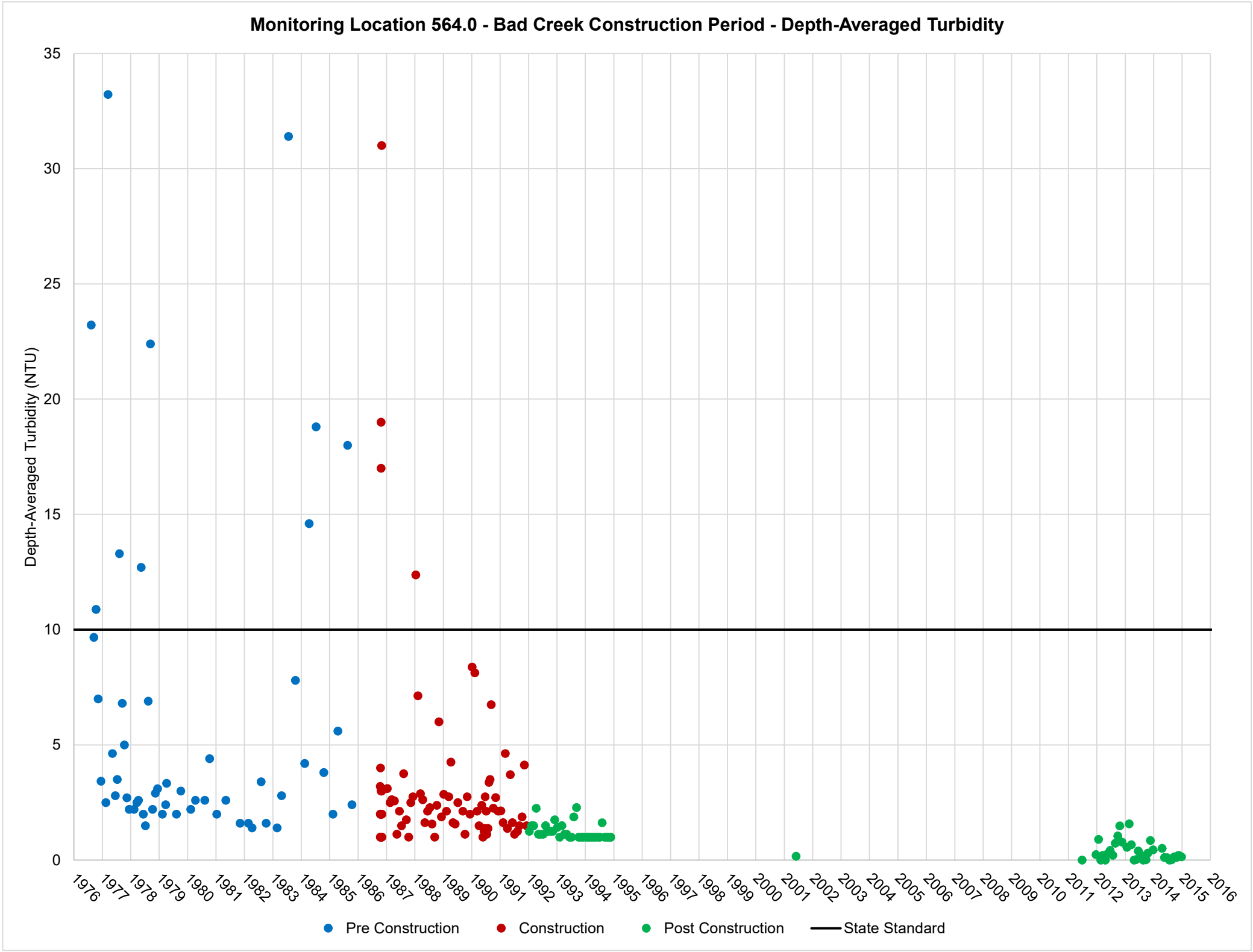


This page intentionally left blank.

Station 564.0

Depth-Averaged with SC State Standard

This page intentionally left blank.


Monitoring Location 564.0 - Bad Creek Construction Period - Depth-Averaged Turbidity
Depth-Averaged Turbidity (NTU)
35
30
25
20
15
10
5
0
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Pre Construction
Construction
Post Construction
State Standard

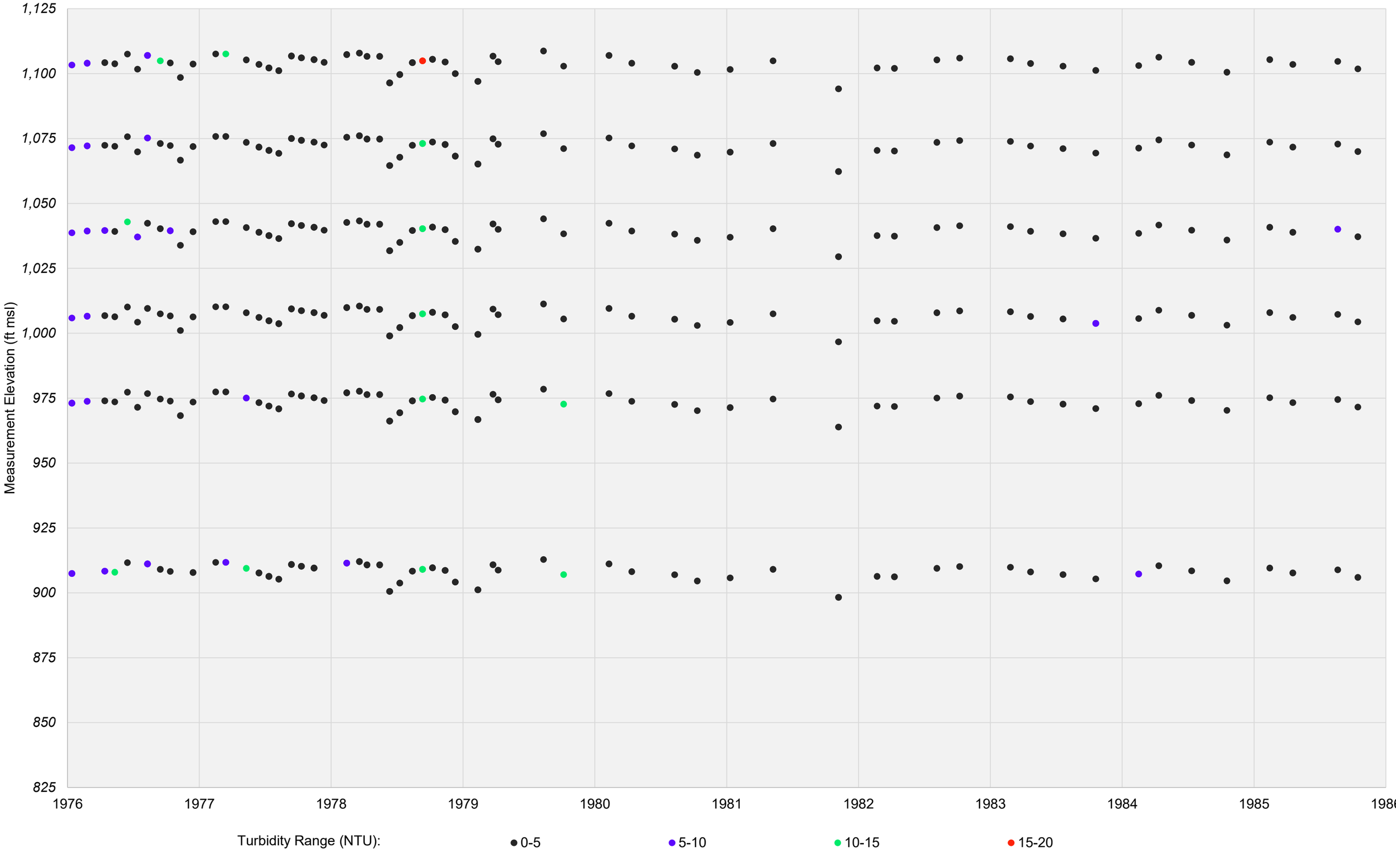
This page intentionally left blank.

Station 560.0

Pre Construction [<1985]

This page intentionally left blank.

Monitoring Location 560.0 - Pre Construction Turbidity



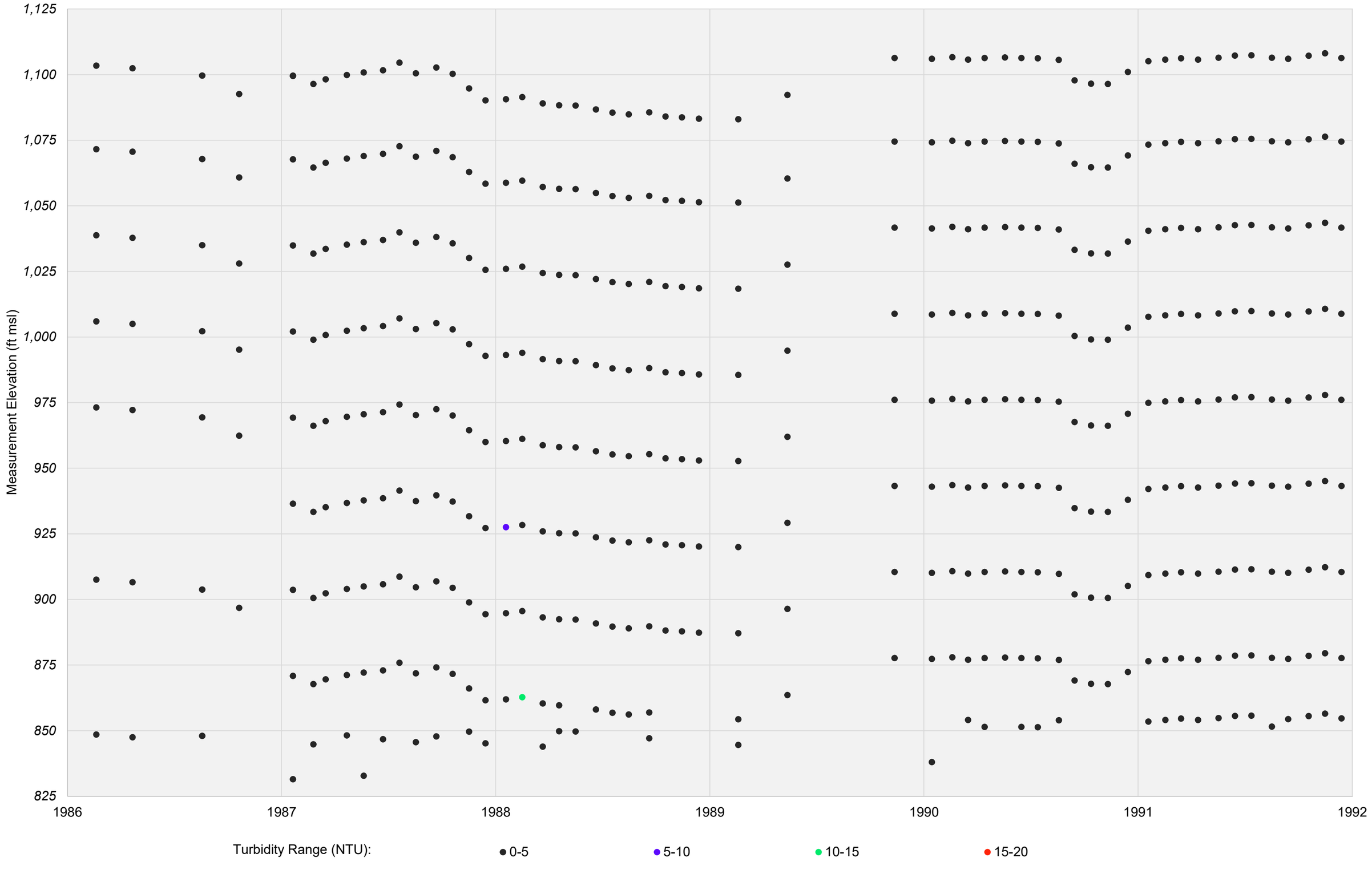
This page intentionally left blank.

Station 560.0

Construction [1986-1991]

This page intentionally left blank.

Monitoring Location 560.0 - Construction Turbidity



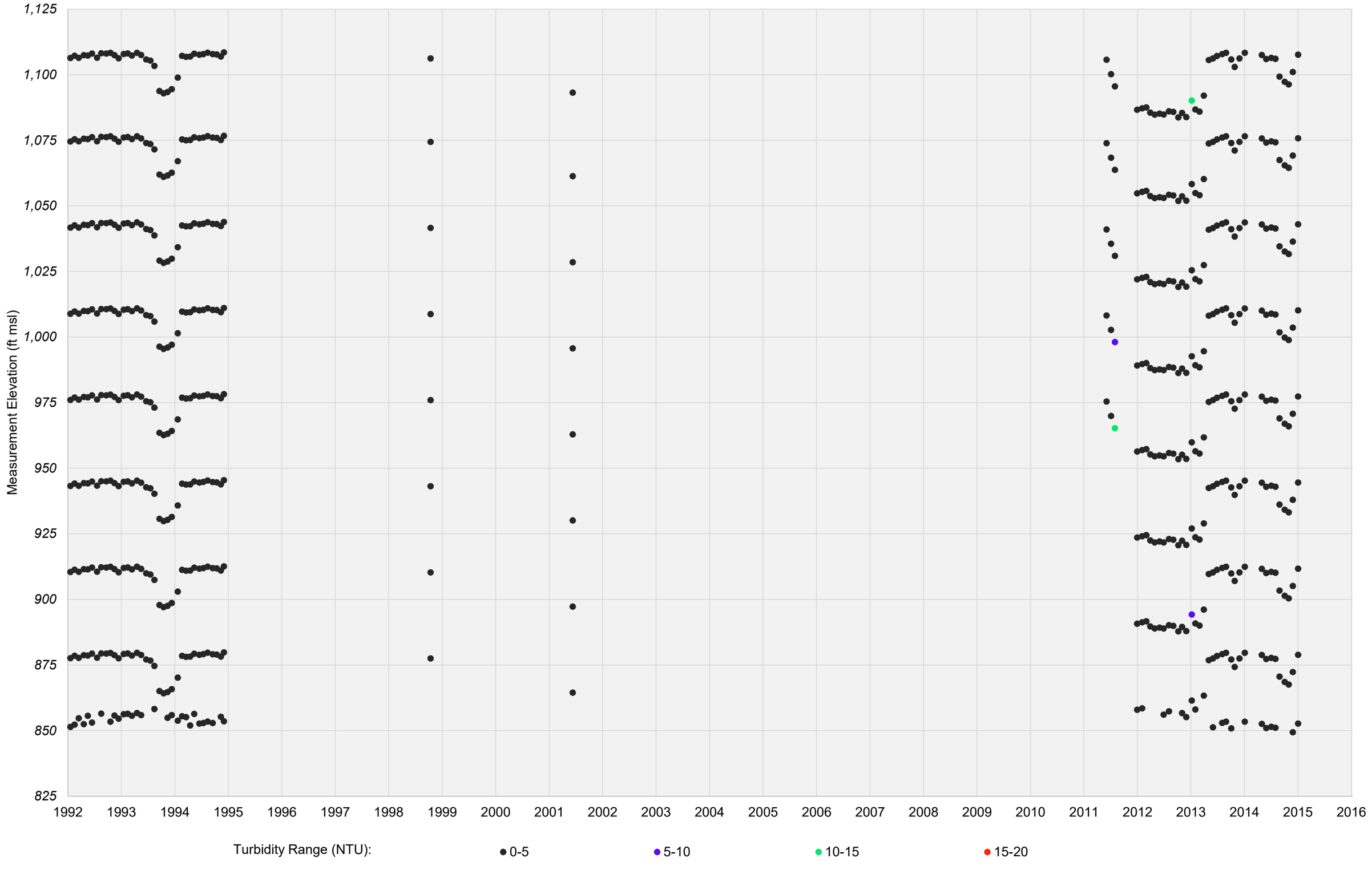
This page intentionally left blank.

Station 560.0

Post Construction [1992-2015]

This page intentionally left blank.

Monitoring Location 560.0 - Post Construction Turbidity



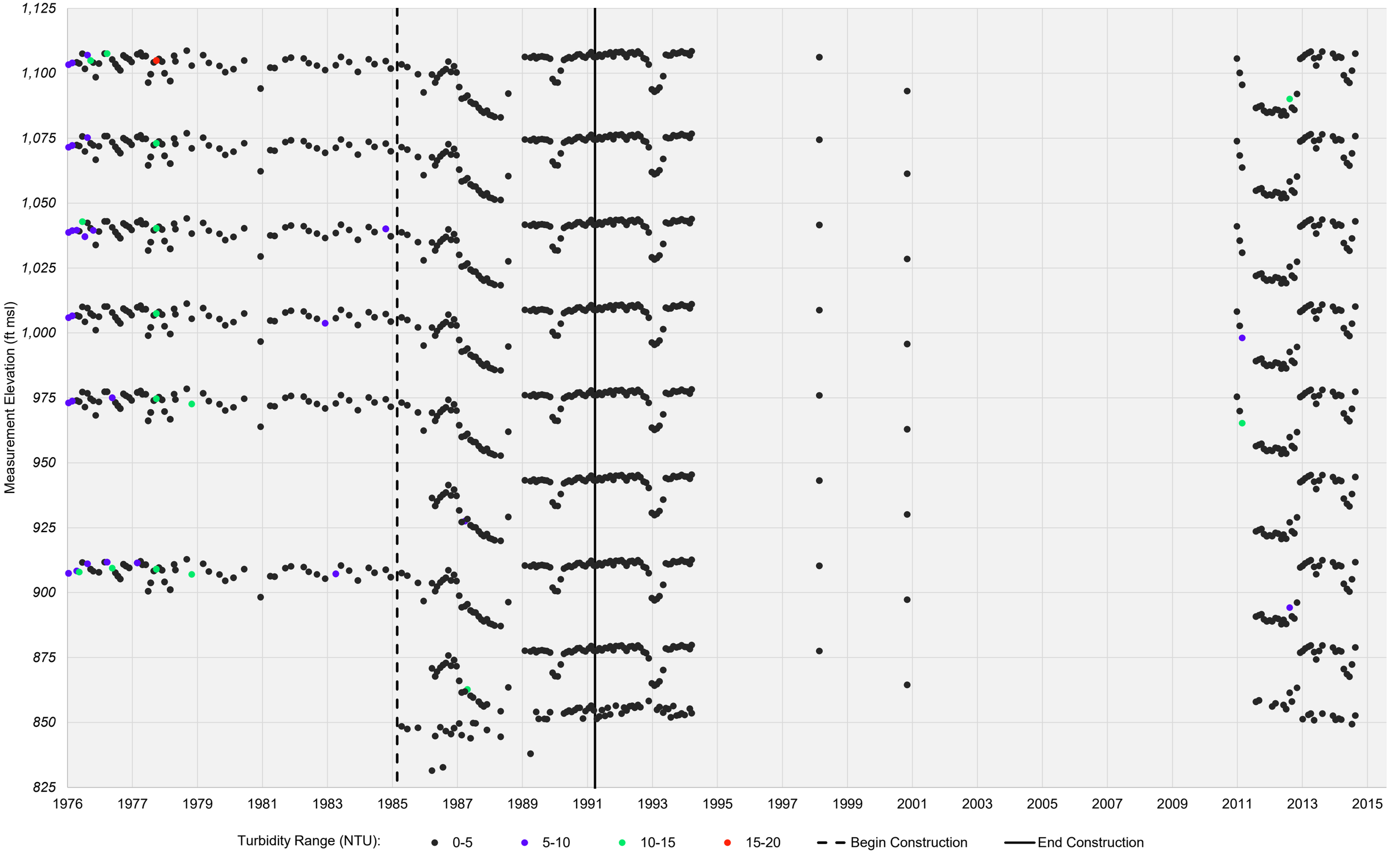
This page intentionally left blank.

Station 560.0

Full Dataset

This page intentionally left blank.

Monitoring Location 560.0 -Turbidity

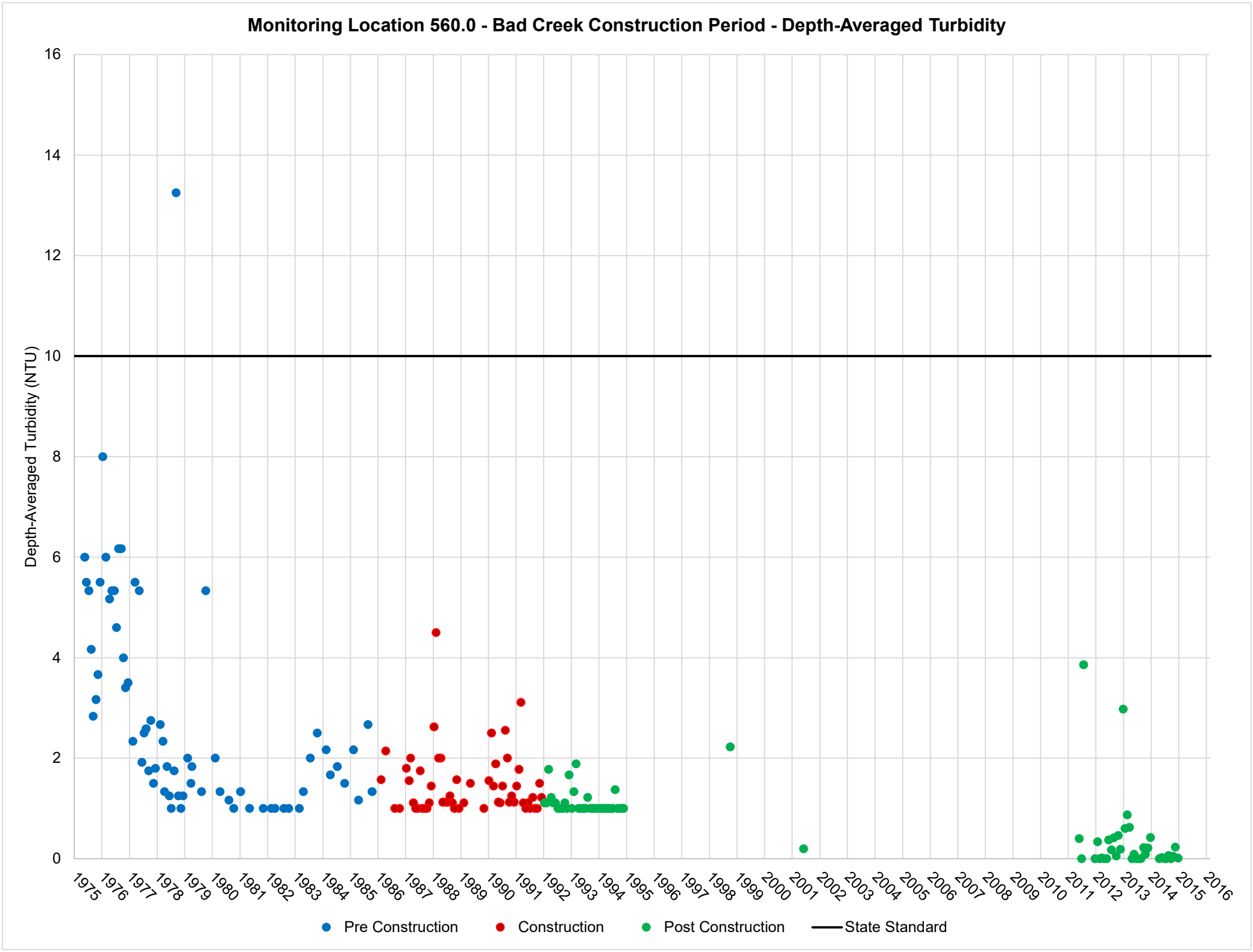


This page intentionally left blank.

Station 560.0

Depth-Averaged with SC State Standard

This page intentionally left blank.


Monitoring Location 560.0 - Bad Creek Construction Period - Depth-Averaged Turbidity
Depth-Averaged Turbidity (NTU)
16
14
12
10
8
6
4
2
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Pre Construction
Construction
Post Construction
State Standard

Attachment B: Stream Assessment Methodology

This page intentionally left blank.

Memo

Date:	Wednesday, July 26, 2023
Project:	Bad Creek Pumped Storage Project Relicensing
To:	South Carolina Department of Natural Resources
From:	HDR Engineering of the Carolinas, Inc.
Subject:	Aquatic Resources Study Approach to Stream Surveys – Revised Post-Consultation

Project Understanding

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the owner and operator of the 1,400-megawatt Bad Creek Pumped Storage Project (Project) (Federal Energy Regulatory Commission [FERC] Project No. 2740) located in Oconee County, South Carolina. Duke Energy is pursuing a new license for the Project and in accordance with 18 Code of Federal Regulations §5.11, developed a Revised Study Plan (RSP) which proposed six studies for Project relicensing, including an Aquatic Resources Study. The goal of the Aquatic Resources Study is to evaluate potential impacts to fish and aquatic life populations, communities, and habitats due to the potential construction and operation of an additional power complex (Bad Creek II Power Complex [Bad Creek II Complex]) adjacent to the existing Project. The Aquatic Resources Study is ongoing.

As additional information, Duke Energy is proposing the development of an access road to provide an alternate route to the Fisher Knob community, for use during Bad Creek II construction. The access road is not presently included in the proposed expanded FERC Project Boundary and was not yet planned at the time of preparation of the RSP. Consistent with the objective of the Aquatic Resources Study to "evaluate the aquatic resources (streams, wetlands, and Lake Jocassee) that may experience direct impacts from spoil placement or other construction activities", Duke Energy plans to evaluate surface waters that may be crossed by the access road in addition to waters within potential spoil locations as described in the RSP.

Approach to Streams within Potential Spoil Locations

According to preliminary studies and estimates for proposed material removed from underground excavations for the Bad Creek II Complex, approximately 4 million cubic yards of overburden material for the project infrastructure will need to be deposited at upland spoil locations or along the submerged weir in Lake Jocassee (Attachment 1). An additional spoil area related to the construction of a proposed transformer yard, potential spoil location J, adds an approximately 0.4 million cubic yards to the overburden amount, for a total of 4.4 million cubic yards. Nine potential streams are present within the proposed on-site spoil locations (see Table 1 and Attachment 1). Surface waters (including wetlands) in these locations were evaluated in the field during the Natural Resources Assessment completed by HDR in September 2021 (HDR 2021; Appendix E of the Pre-Application Document filed with FERC on February 23, 2022).

Consistent with the RSP, Duke Energy will complete U.S. Environmental Protection Agency (USEPA) Rapid Bioassessment Protocol (USEPA RBP; Barbour et al. 1999) stream habitat assessments for all streams within potential spoil locations. During the Joint Resource

Committee Meeting on February 22, 2023, and the Aquatic Resources Study Resource Committee Meeting held on April 6, 2023, committee members expressed interest in biological assessments. In follow-up correspondence with the Aquatic Resources Committee, Duke Energy proposed to complete stream assessments using the North Carolina Stream Assessment Method (NCSAM; N.C. Stream Functional Assessment Team 2013) in addition to the USEPA RBP.

The South Carolina Department of Natural Resources (SCDNR) also requested that Duke Energy use the SCDNR Stream Quantification Tool (SQT)[1] (South Carolina Steering Committee 2022) for stream assessments. Duke Energy consulted with the SCDNR on May 24 and June 21, 2023, to discuss the applicability and methodology of the SQT. Duke Energy, HDR, and SCDNR also participated in a site visit to Bad Creek on July 12, 2023. The site visit included Alan Stuart (Duke Energy), Allan Boggs (Duke Energy), Nick Wahl (Duke Energy), Eric Mularski (HDR), Erin Settevendemio (HDR), and Lorianne Riggin (SCDNR). The group visited spoil locations B and D (see figures in Attachment 1), which were considered locations with representative conditions of stream and riparian habitat. During the site visit, SCDNR and Duke Energy agreed that the streams within spoil locations are generally high functioning with limited (if any) anthropogenically caused degradation, and that field data collection to support SQT analysis for streams within spoil locations was not likely to produce significantly different results (i.e., lower functionality scores) than an assumption of fully functional. Therefore, field surveys of the streams within potential spoil locations applying the SQT methodology are not required.

Approach to Streams Crossed by the Access Road to the Fisher Knob Community

The potential access road would require crossings at three named streams (Limber Pole Creek, Howard Creek, and Devils Fork) and potentially other unidentified streams (see figures provided in Attachment 2). Currently, two access road routes are being considered, however only one would be developed. The routes diverge just west of Howard Creek, where Option 1 crosses Howard Creek and heads north across a ridge. Option 2 crosses Howard Creek and heads south along the left bank of Howard Creek before directing northeast. The road options converge east of the transmission line corridor west of Devils Fork. It is anticipated that Option 1 would result in fewer riparian buffer impacts and therefore this is the preferred route.

Based on review of two-foot topography contour maps, an additional three streams may be present along the access road, though the flow of these streams is currently unknown. A surface waters delineation is scheduled for mid-late August to identify stream conditions/flow of these unnamed features. If Duke Energy develops the access road, streams and creeks along the alignment will likely be spanned by [temporary] bridges. Duke Energy will conduct field assessments using the SCDNR SQT to evaluate stream function as a baseline prior to construction activities to document any changes that may occur, though none are anticipated.

Streams crossed by the access road will be assessed with the USEPA RBP and NCSAM. Stream assessments will be conducted upstream and downstream of each road crossing. The intent is to document a baseline, existing condition of the stream before the construction of the access road. When and if the road is decommissioned, the streams would be re-assessed to compare to the baseline condition. Additionally, evaluating the streams at upstream and downstream locations

[1] SCDNR Stream Quantification Tool

allows an opportunity to document changes that may have happened elsewhere (i.e., upstream) in the watershed or as a result of other factors, such as storm events.

Proposed Field Methods

Numerous methods for stream habitat and biological assessments will be used for evaluating streams in the vicinity of the Project. Field methods to be implemented at each stream are based on consultation with the Aquatic Resources Study Resource Committee (RC) and SCDNR, as discussed above. The following summary provides an overview of planned field methods for streams within spoil locations and those crossed by the potential access road.

USEPA Rapid Bioassessment Protocol

In accordance with the RSP, the USEPA RBP stream habitat assessment will be completed at all streams within spoil locations. Barbour et al. (1999) states, "an evaluation of habitat quality is critical to any assessment of ecological integrity". Stream habitat assessments are defined as the "evaluation of the structure of the surrounding physical habitat that influences the quality of the water resource and the condition of the resident aquatic community" (Barbour et al. 1999). These assessments provide information regarding stream functionality and condition, which in turn can indicate the value of aquatic habitat to aquatic and terrestrial life, and ecosystem services such as nutrient reduction and support of watershed health. The USEPA RBP includes an evaluation of the variety and quality of (1) stream substrate, (2) channel morphology, (3) bank structure, and (4) riparian vegetation. Ten parameters within the four categories are rated on a numerical scale for each sampled reach.

NC Stream Assessment Method

The NCSAM provides "an accurate, reproducible, rapid, observational, and science-based field method to determine the level of stream function relative to a reference condition" (N.C. Stream Functional Assessment Team 2013). While the NCSAM was developed for use in North Carolina, the Project is just a few miles from the North-South Carolina border and stream categories identified for the method include those in the Blue Ridge ecoregion, where the Project is located. Similarities between topography and streams in the Carolinas allow this method to provide valuable information regarding the overall function of streams with a simple and efficient tool.

The NCSAM rates streams for three Class 1 functions: hydrology, water quality, and habitat. Within each Class 1 function, streams are rated for up to eight Class 2 functions, which may include Class 3 and Class 4 functions. The functions provided by a stream are a product of the hydrologic, geologic, morphologic, and vegetational setting of the stream and its drainage area (Gordon et al. 1992 as cited by N.C. Stream Functional Assessment Team 2013). Alterations and/or stressors can contribute to the degradation of a stream, either naturally or anthropogenically, including storm damage, excessive vegetation, beaver impoundment, stream migration, and sedimentation, which can lead to lower stream function. Parameters evaluated with NCSAM protocol include flow restrictions; streambank erosion; buffer size and type; water quality stressors; substrate composition; in-stream habitat; visual and dip netting assessments for aquatic life; presence of wetlands; shade; and others.

SCDNR Stream Quantification Tool Approach

As stated above, six or more streams could be crossed by the access road and Duke Energy proposes to use the SQT field methodology for stream assessments in this area. The SCDNR SQT was developed in a collaborative effort between federal and state representatives to provide a tool for assessing and quantifying functional lift and loss of streams in South Carolina. The SQT can be used to determine the functional condition of a stream, with the SQT Debit Calculator as a means of calculating credits or debits resulting from reach-scale activities typically encountered in the Clean Water Act 404 program.

The SQT requires the assessment of five functional categories: hydrology, hydraulics, geomorphology, physiochemical, and biology (South Carolina Steering Committee 2022). Depending on the anticipated type of impacts or lift, physiochemical and biology categories are optional. Guidance from the SQT suggests physiochemical parameters be measured for stream projects with "goals or objectives related to physiochemical functions or where watershed conditions suggest that uplift is possible." Work would be conducted from upland locations and no in-water work would occur. Best management practices to prevent sedimentation such as silt fencing would be installed to prevent water quality impacts at stream crossings. The future Water Quality Management Plan (developed under the Water Resources Study) will also consider water quality in the areas of the new access road. Given that impacts to water quality are not anticipated and appropriate protection measures will be taken, Duke Energy is not proposing physiochemical monitoring.

At prior meetings with Duke Energy, Aquatic Resources RC members have expressed interest in the biological community of streams in the vicinity of the proposed Bad Creek II Complex. Duke Energy therefore proposes to conduct fish and macroinvertebrate sampling supporting the SQT assessment.

Hydrology, Hydraulics, and Geomorphology

Duke Energy will survey all streams crossed by both access road options using the first three functional categories of the SQT, which comprise hydrology, hydraulics, and geomorphology, using the Rapid Method outlined in the SQT Data Collection and Analysis Manual (South Carolina Steering Committee 2022). Parameters evaluated under these categories include reach runoff, floodplain connectivity, flow dynamics, large woody debris, lateral migration, riparian vegetation, and bed form diversity. Up to 17 metrics will be taken for the parameters evaluated; metrics selection, instruction, and applicability is provided in the SQT Data Collection and Analysis Manual (South Carolina Steering Committee 2022).

Fish Surveys

Fish surveys for use with the SQT are only applicable to perennial streams with drainage areas between 1.5 and 63 square miles (South Carolina Steering Committee 2022), which includes Limber Pole Creek and Howard Creek. As outlined by the SQT Data Collection and Analysis Manual, fish surveys will follow Fish Collection Protocols for Streams as described in the SCDNR Fish Sampling Guidance[2] (SCDNR 2022). For streams in the Blue Ridge ecoregion, sample reaches will be 30 times the average wetted width, or a minimum 100 meters with one electrofishing pass. Surveys will be completed upstream and downstream of the road crossings

[2] SCDNR Fish Sampling Guidance

three times between July and October 2023. A calibrated multiparameter water quality data sonde will be used to record existing water quality conditions during sampling events, including temperature, dissolved oxygen, conductivity, pH, salinity, and turbidity.

Macroinvertebrate Surveys

Macroinvertebrate surveys under the SQT are limited to perennial streams with a minimum three-square mile drainage area (South Carolina Steering Committee 2022), which includes Limber Pole Creek and Howard Creek. As outlined in the SQT Data Collection and Analysis Manual, macroinvertebrate surveys will be completed following the Standard Operating and Quality Control Procedures for Macroinvertebrate Sampling[3] (SCDHEC 2017). This method uses a qualitative multiple habitat sampling protocol with kick nets, D-shaped dip nets, and sieves to collect as many different macroinvertebrate taxa as possible during a specified amount of time. One survey per stream reach will be conducted during the recommended index period (June 15, 2023 to September 15, 2023 for the Blue Ridge ecoregion). Stream reach lengths will be determined on a site-by-site basis consistent with guidance provided in SCDHEC (2017), which is typically 100 meters of stream. Water quality conditions at the time of sampling will be recorded with a multiparameter data sonde. Collected samples will be preserved in 85 percent ethanol and labeled with the station number and collection date. Samples will be transported to a qualified laboratory for identification and analysis under chain-of-custody. Identified taxa and relative abundance will be used to calculate biotic indices to assess stream conditions.

Mussel Surveys

Consistent with the RSP, Duke Energy biologists surveyed upland spoil locations for mussel habitat and determined that no supportive habitat is present for mussel assemblages. SCDNR concurred with this assessment during the July 12, 2023 site visit to two representative spoil locations with streams characteristics of those throughout the Aquatic Resources study area.

Mussel surveys of Limber Pole Creek and Howard Creek will be conducted in late July 2023 following methods adapted from the USEPA Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-specific Water Quality Criteria for Ammonia (USEPA 2013). The survey will include visual and tactile collection of mussels, identification to species, and enumeration. Habitat conditions will be documented, including substrate and water quality, through stream habitat assessments and fish surveys.

Summary of Proposed Field Methods

Field surveys of streams within spoil locations were proposed in the RSP. Since the proposed access road was not planned at the time of the filing of the RSP, the stream crossings were not included in Aquatic Resources Study; however, for completeness, field surveys will also be performed at potential stream crossing locations. The field methods proposed for each stream were developed in consultation with the Aquatic Resources RC and SCDNR. A summary of the proposed field methods is provided in Table 1, with brief descriptions of methods provided in Table 2.

[3] SCDHEC Standard Operating and Quality Control Procedures for Macroinvertebrate Sampling

Results and Conclusions

An overview of results of field studies will be discussed in a future meeting to be scheduled for late October or early November 2023. Results and conclusions of the stream habitat assessments and SQT will be summarized in a draft report, which will be provided to the Aquatic Resources RC in November 2023 for comment and in the Initial Study Report (to be filed with FERC by January 4, 2024).

Table 1. Proposed Field Survey Approach for Streams within Potential Spoil Locations and Road Crossings

Potential Impact	Stream Name/No.	Flow	Drainage Area (sq. mi)	Stream Habitat Assessment	Fish Survey	Macroinvertebrate Survey	Mussel Survey[1]
Potential Spoil Locations							
B	20	Perennial	0.05	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
B	21	Perennial	0.05	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
C	17	Perennial	0.05	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
D	13	Intermittent	0.04	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	N/A
D	14	Perennial	0.04	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
G	4	Intermittent	0.06	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	N/A
G	4a	Perennial	0.06	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
J	11	Perennial	0.11	USEPA RBP & NCSAM	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey
Potential Access Road Crossings							
1	Limber Pole Creek	Perennial	1.8	USEPA RBP, NCSAM, & SCDNR SQT	SCDNR Fish Collection Protocol	SCDHEC Standard Operating and Quality Control Procedures	USEPA qualitative presence survey
2	UT Howard Creek	Unknown[2]	0.03	USEPA RBP & NCSAM	Unknown[2]	Unknown[2]	Unknown[2]
3a/b	Howard Creek	Perennial	4.16	USEPA RBP, NCSAM, & SCDNR SQT	SCDNR Fish Collection Protocol	SCDHEC Standard Operating and Quality Control Procedures	USEPA qualitative presence survey
4	UT Howard Creek	Unknown[2]	0.01	USEPA RBP & NCSAM	Unknown[2]	Unknown[2]	Unknown[2]
5	UT Devils Fork	Unknown[2]	0.03	USEPA RBP & NCSAM	Unknown[2]	Unknown[2]	Unknown[2]
6	Devils Fork (Stream 19)	Perennial	0.09	USEPA RBP, NCSAM, & SCDNR SQT	NCSAM visual/dipnet assessment	NCSAM presence/absence assessment	USEPA qualitative presence survey

UT: unnamed tributary
[1]Mussel surveys will only be completed in waters determined to provide supportive mussel habitat.
[2]Aquatic life surveys would only be conducted in intermittent or perennial streams.

Table 2. Descriptions of Field Survey Protocols

Survey Type	Survey Method	Brief Summary of Methods
Stream Habitat Assessment	USEPA Rapid Bioassessment Protocol Stream Assessment	Scored condition parameters including epifaunal substrate/available cover, substrate embeddedness, velocity/depth regime, sediment deposition, channel flow status, channel alteration, frequency of riffles or bends, bank stability, vegetative protection, and riparian vegetative zone width.
	NC Stream Assessment Method (NCSAM)	Documentation of in-stream habitat types including aquatic macrophytes and mosses; sticks, leaf packs, or emergent vegetation; snags and logs; undercut banks and root mats; and bedform and substrate types. Observations of stream instability or stressors.
	SCDNR Stream Quantification Tool (SQT)	Hydrology, hydraulics, and geomorphology will be assessed across seven functional parameters, including reach runoff, floodplain connectivity, flow dynamics, large woody debris, lateral migration, riparian vegetation, and bed form diversity. Metrics will be taken applying the Rapid Method, using tapes and stadia rods.
Fish Surveys	NC Stream Assessment Method (NCSAM)	Visual assessment for fish and semi-aquatic life such as reptiles and amphibians.
	SCDNR Stream Quantification Tool (SQT)/ SCDNR Fish Collection Protocols for Streams	Fish surveys completed for the SCDNR SQT will follow the SCDNR Fish Collection Protocols for Streams. For streams in the Blue Ridge Ecoregion, the survey reach will encompass 30 times the average wetted width of the stream or a minimum of 100 meters with one survey pass. Two to three electrofishers, two netters, and one to two buckets will be used. Water quality parameters and photo vouchers will be taken.
Macroinvertebrate Surveys	NC Stream Assessment Method (NCSAM)	Presence/absence survey of macroinvertebrates in all available habitats, including riffles, pools, snags and logs, leaf packs, macrophytes, root mats, hard substrates, and banks. Macroinvertebrates sampled via dipnet with mesh size between 0.5-0.8 mm.
	SCDNR Stream Quantification Tool (SQT)/ SCDHEC Standard Operating and Quality Control Procedures	Macroinvertebrate surveys completed for the SCDNR SQT will follow the SCDHEC Standard Operating and Quality Control Procedures. This includes a qualitative, multiple habitat sampling protocol with kick nets, D-shaped dip nets, and sieves to collect as many different macroinvertebrate taxa as possible during a specified amount of time. Stream reach lengths are typically 100 meters. Collected samples will be preserved in 85 percent ethanol and labeled with the station number and collection date. Samples will be transported to a qualified laboratory for identification and analysis under chain-of-custody. Macroinvertebrate surveys under the SQT are limited to waters with a minimum 3-square-mile drainage area.
Mussel Surveys	Adapted from USEPA Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys	Visual sampling approach to determine mussel presence, richness, and relative density. Mussels collected visually and tactilely (grubbing) during timed searches within well-defined areas.

References

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

North Carolina Stream Functional Assessment Team. 2013. N.C. Stream Assessment Method (NC SAM) Draft User Manual. Accessed June 2023. [URL]: https://www.saw.usace.army.mil/Portals/59/docs/regulatory/publicnotices/2013/NCSAM_Draft_User_Manual_130318.pdf

South Carolina Department of Health and Environmental Control. 2017. Standard Operating and Quality Control Procedures for Macroinvertebrate Sampling. Technical Report No. 0914-17. Bureau of Water. Columbia, South Carolina.

South Carolina Department of Natural Resources. 2022. Fish Sampling Guidance: Fish Collection Protocols for Streams. Accessed July 2023. [URL]: https://www.dnr.sc.gov/environmental/SCDNRSamplingProcedureFishes.pdf.

South Carolina Steering Committee. 2022. South Carolina Stream Quantification Tool: Data Collection and Analysis Manual, SC SQT v1.1. South Carolina Department of Natural Resources, Columbia, SC.

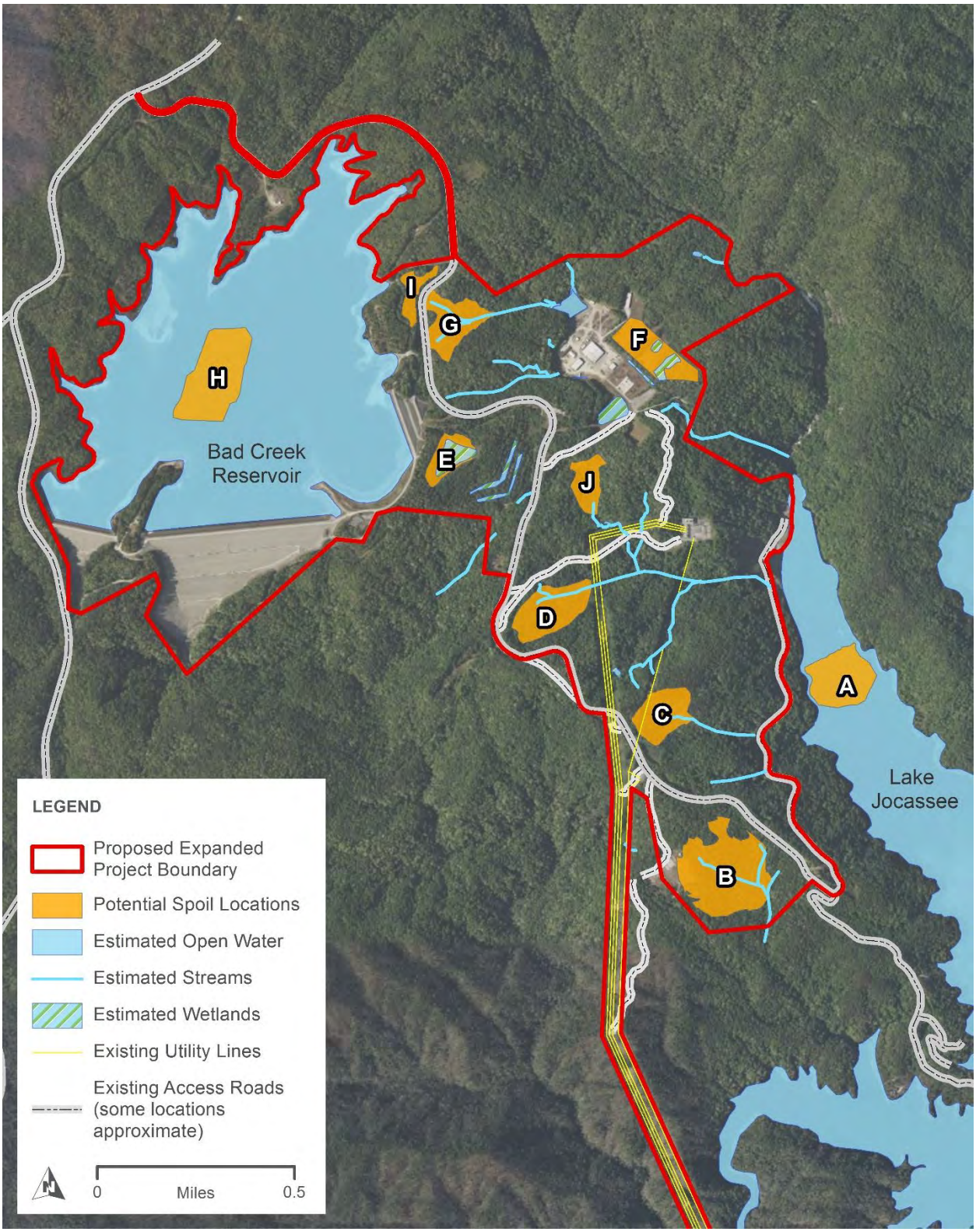
U.S. Environmental Protection Agency (USEPA). 2013. Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-specific Water Quality Criteria for Ammonia. EPA 800-R-13-003. Office of Water. Washington, DC. Accessed June 2023. [URL]: https://www.epa.gov/sites/default/files/2015-08/documents/tsd_for_conducting_and_reviewing_freshwater_mussel_occurrence_surveys_for_the_development_of_site-specific_wqc_for_ammonia.pdf.

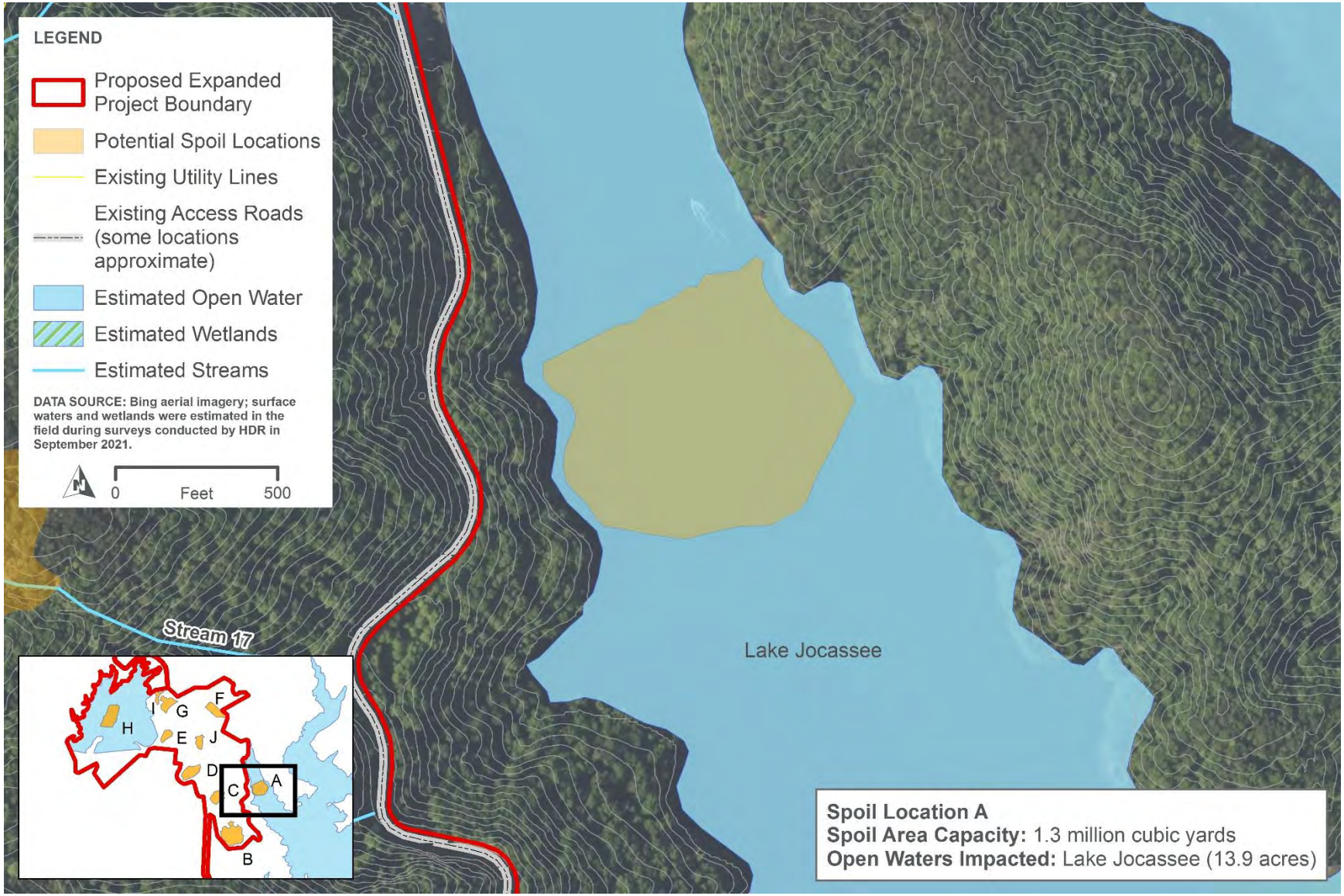
This page intentionally left blank.

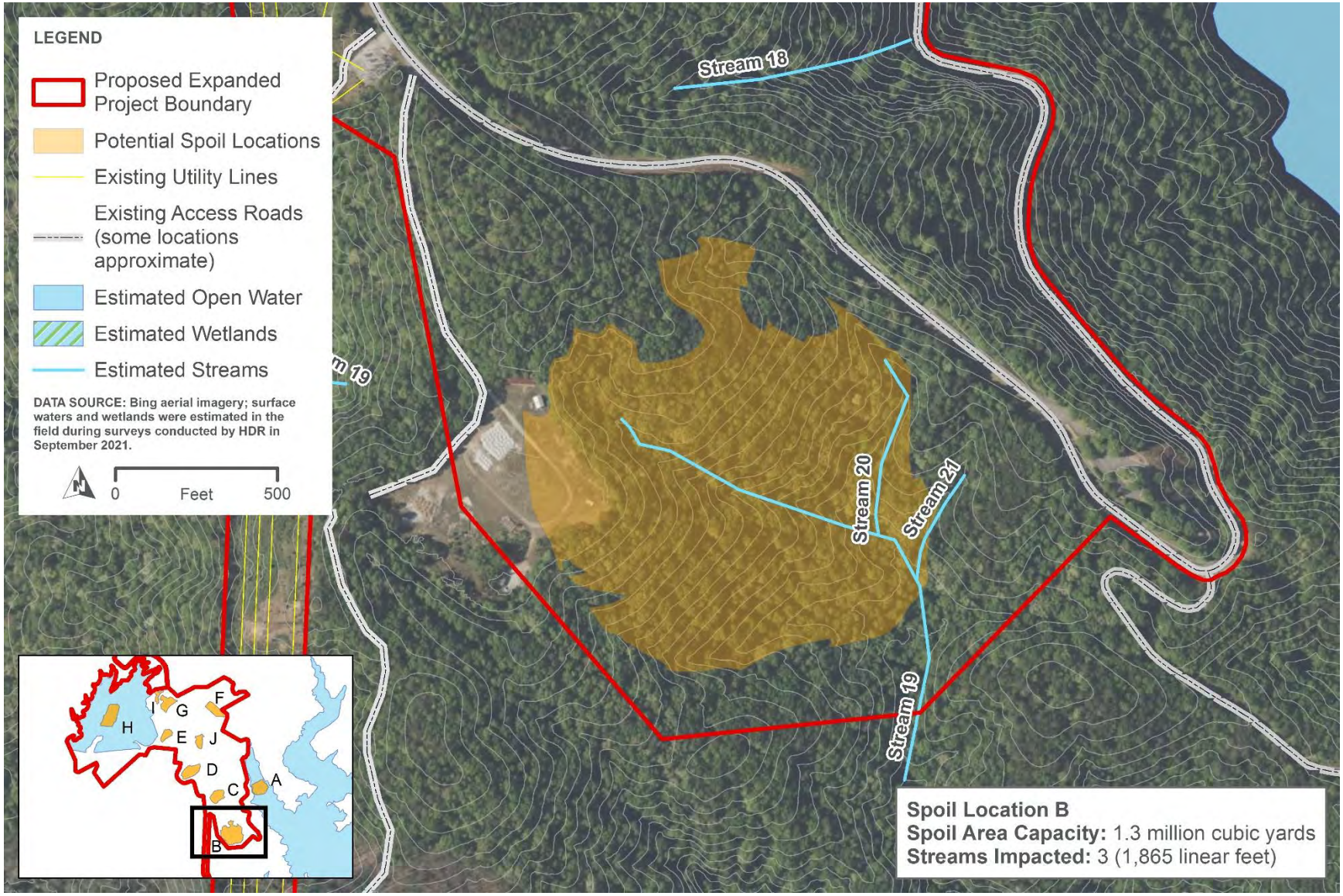
Attachment 1

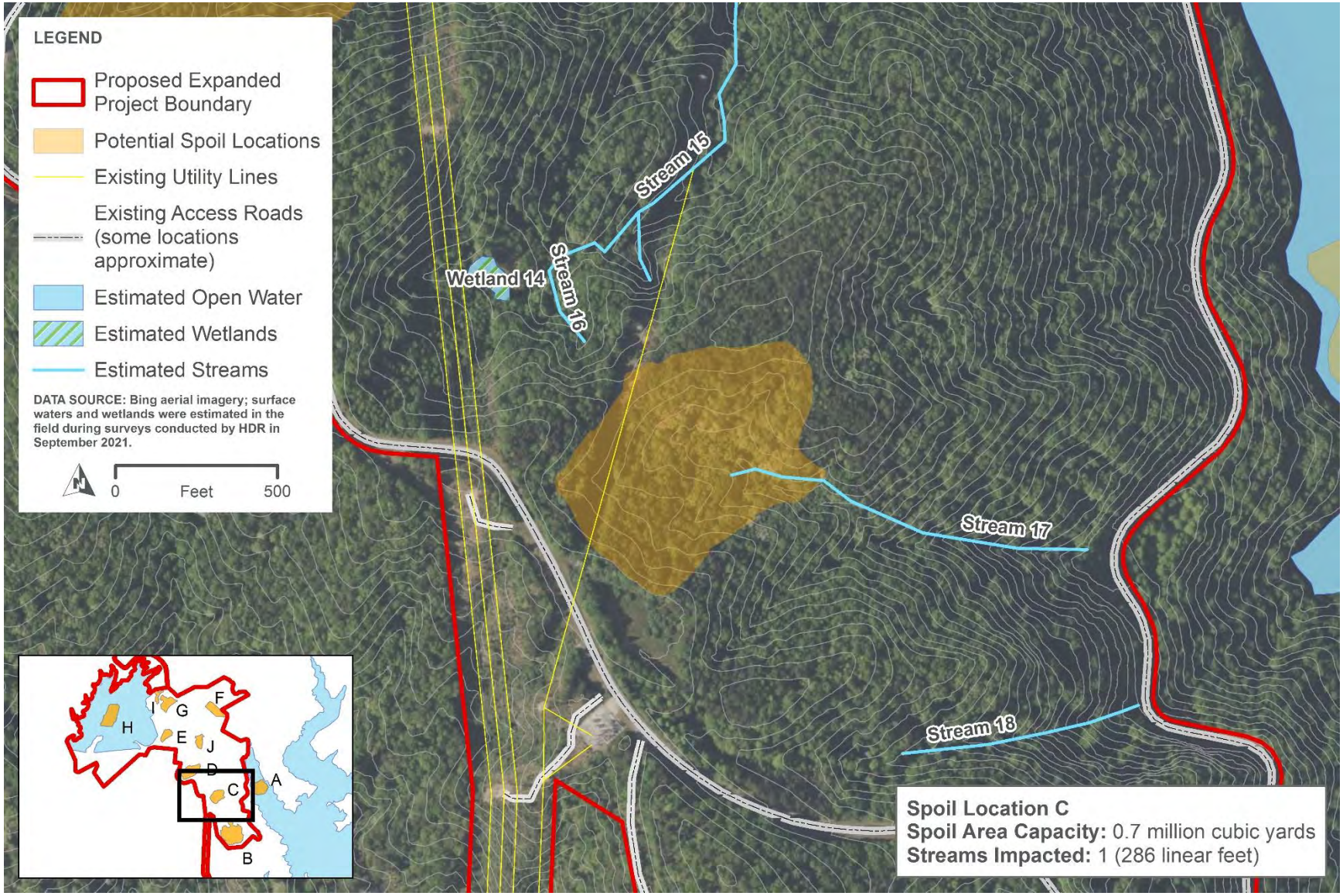
Attachment 1 – Streams and Wetlands within Potential Spoil Locations

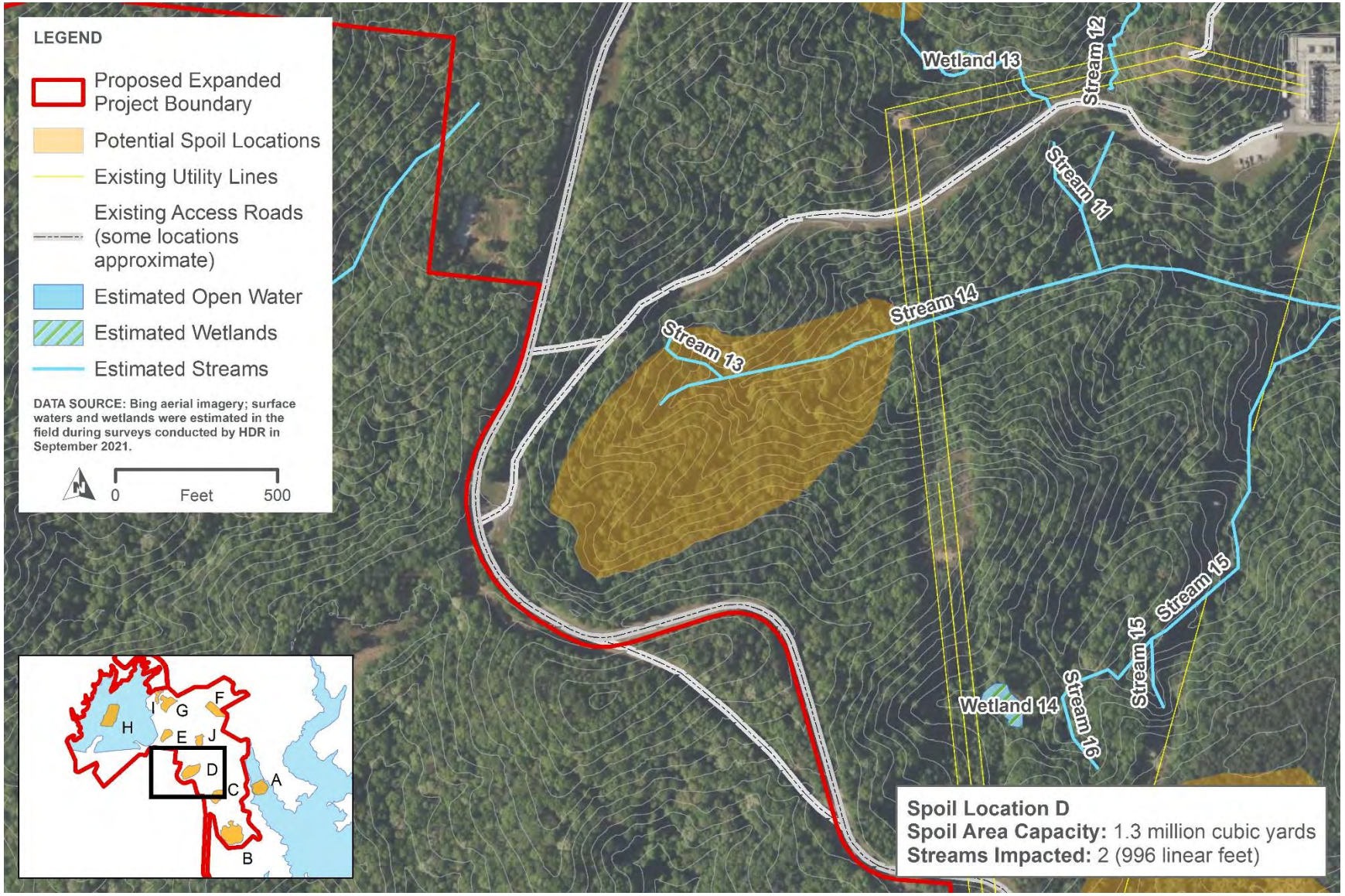
This page intentionally left blank.

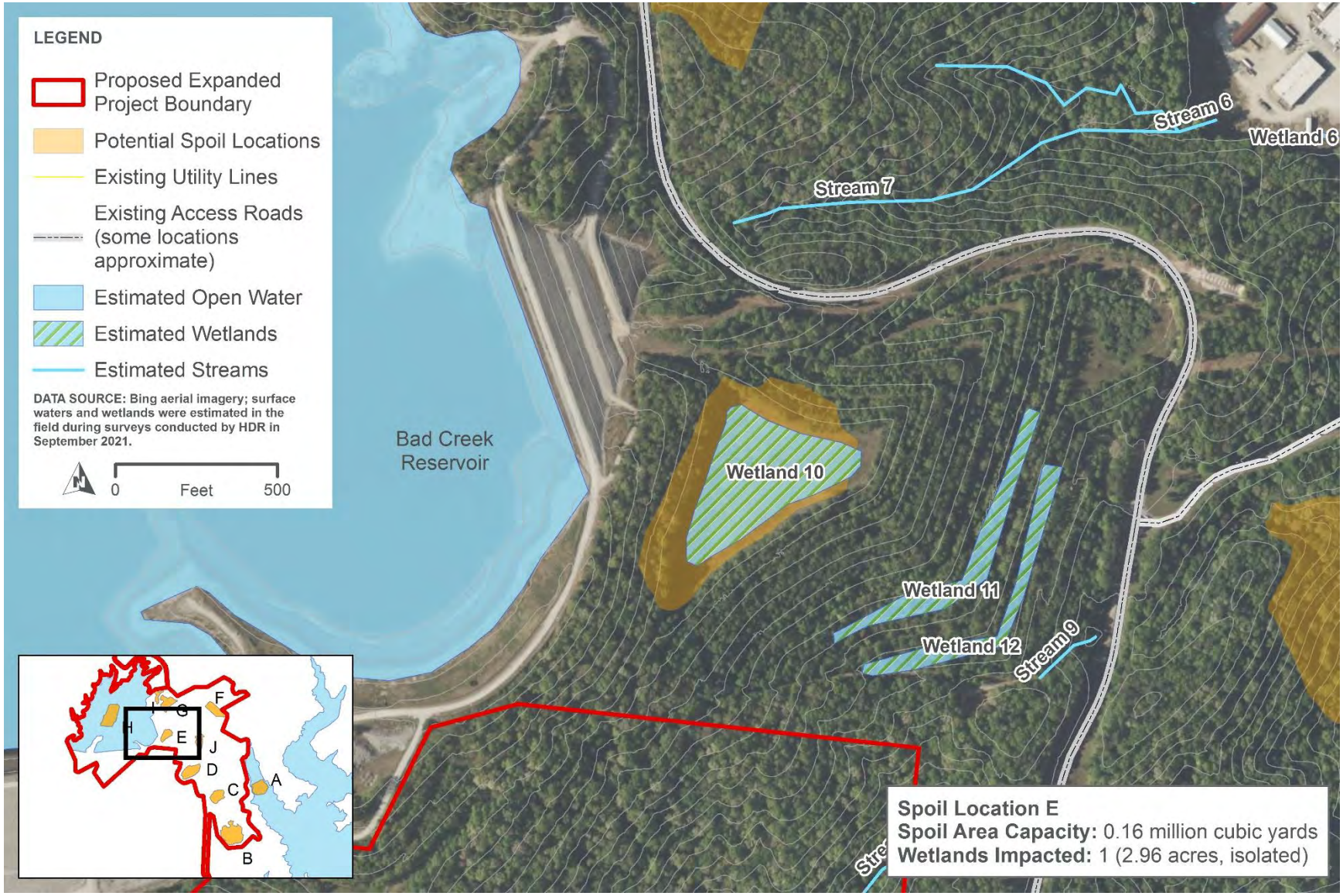

I
G
F
H
Bad Creek
Reservoir
E
J
D
A
C
Lake
Jocassee
B
LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Estimated Open Water
Estimated Streams
Estimated Wetlands
Existing Utility Lines
Existing Access Roads (some locations approximate)
N
0
Miles
0.5

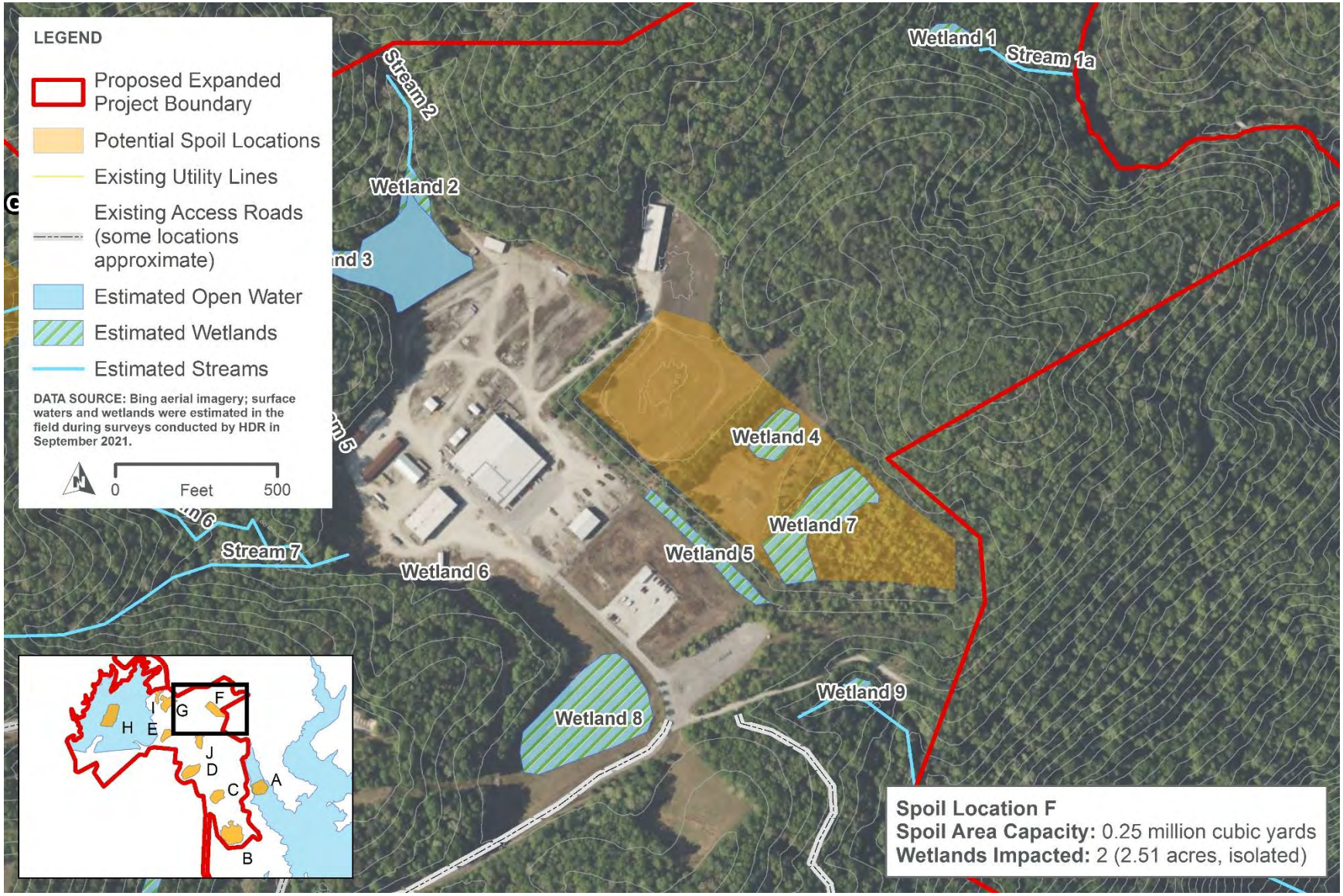

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
N
0
Feet
500
Stream 17
Lake Jocassee
A
B
C
D
E
F
G
H
I
J
Spoil Location A
Spoil Area Capacity: 1.3 million cubic yards
Open Waters Impacted: Lake Jocassee (13.9 acres)

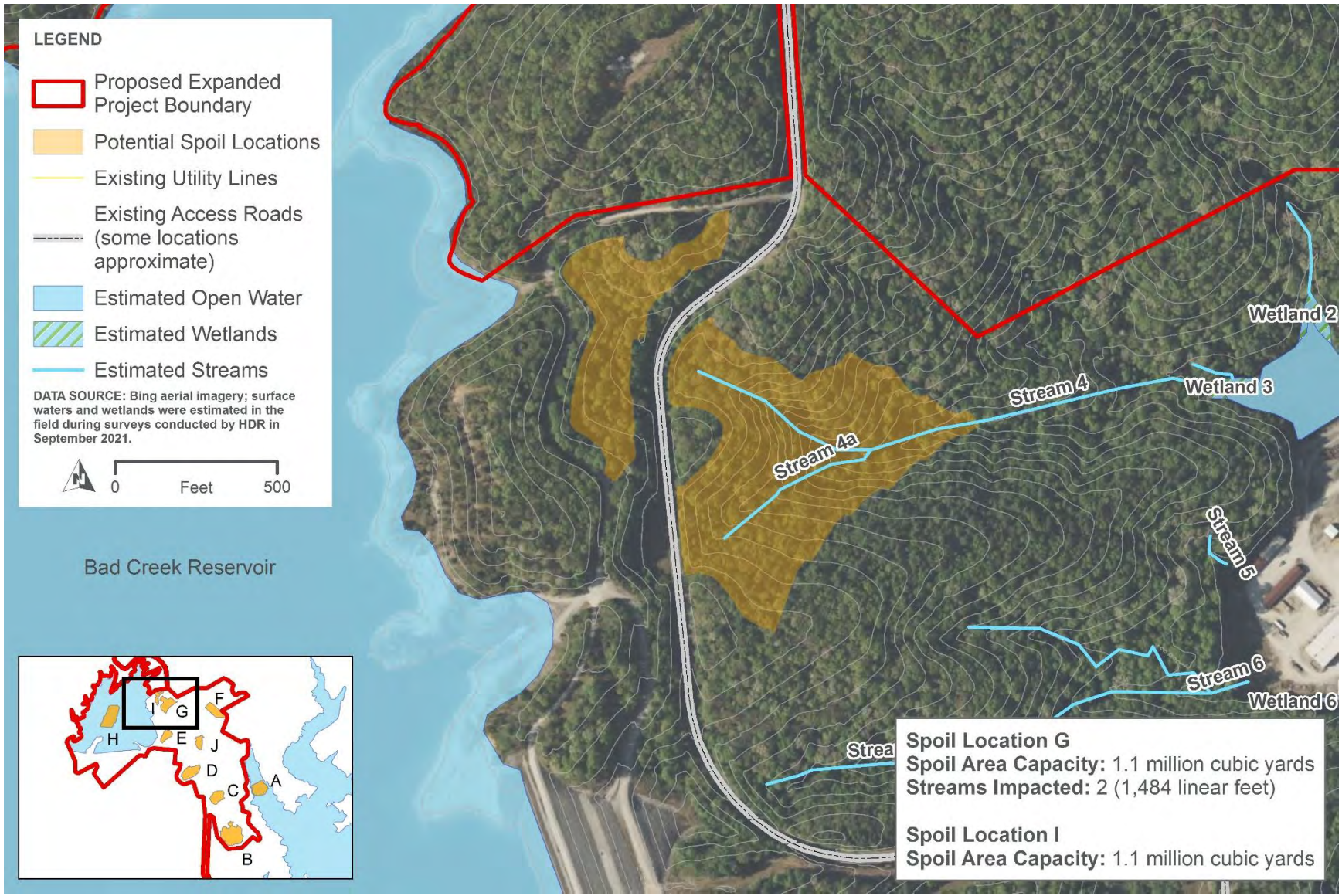

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
N
0
Feet
500
Stream 18
Stream 19
Stream 20
Stream 21
Stream 19
I
G
F
H
E
J
D
C
A
B
Spoil Location B
Spoil Area Capacity: 1.3 million cubic yards
Streams Impacted: 3 (1,865 linear feet)

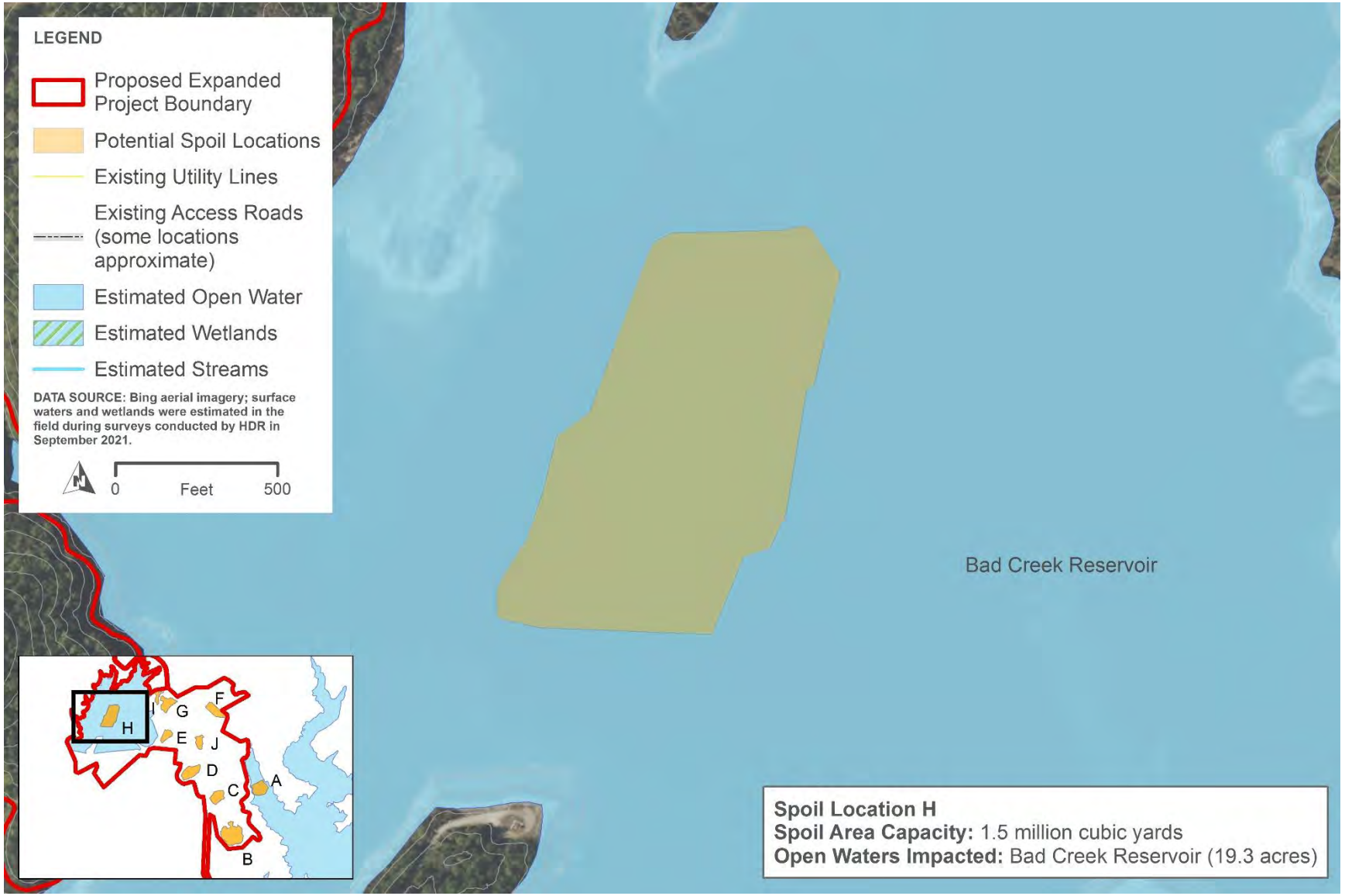

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Stream 15
Wetland 14
Stream 16
Stream 17
Stream 18
I
G
F
H
E
J
D
C
A
B
Spoil Location C
Spoil Area Capacity: 0.7 million cubic yards
Streams Impacted: 1 (286 linear feet)

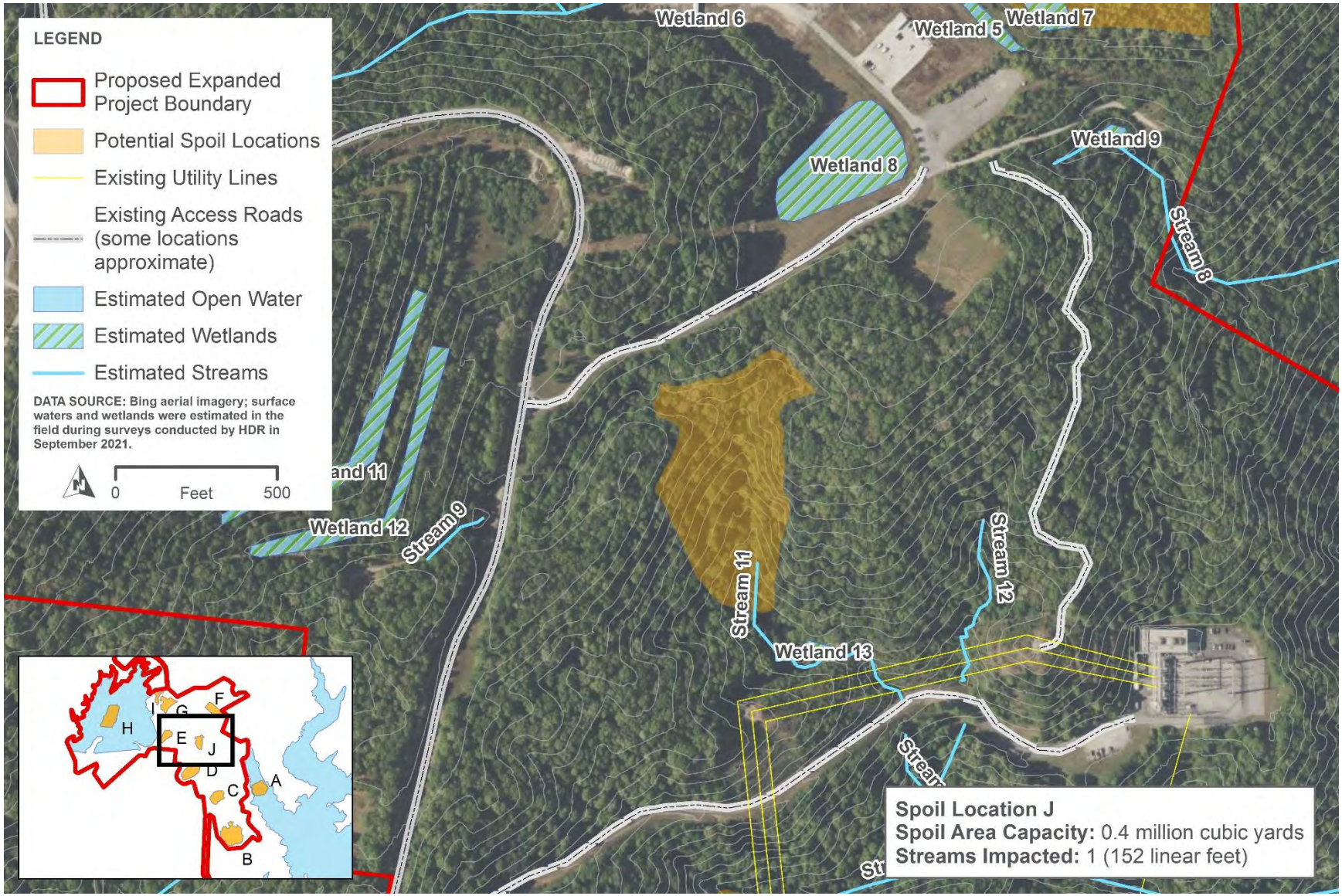

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Wetland 13
Stream 12
Stream 11
Stream 14
Stream 13
Stream 15
Stream 15
Wetland 14
Stream 16
I
G
F
H
E
J
D
C
A
B
Spoil Location D
Spoil Area Capacity: 1.3 million cubic yards
Streams Impacted: 2 (996 linear feet)


LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Bad Creek Reservoir
Stream 6
Wetland 6
Stream 7
Wetland 10
Wetland 11
Wetland 12
Stream 9
F
I
G
H
E
J
D
C
A
B
Spoil Location E
Spoil Area Capacity: 0.16 million cubic yards
Wetlands Impacted: 1 (2.96 acres, isolated)


LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Wetland 1
Stream 1a
Stream 2
Wetland 2
Wetland 4
Wetland 7
Wetland 5
Wetland 6
Stream 7
Wetland 8
Wetland 9
A
B
C
D
E
F
G
H
I
J
Spoil Location F
Spoil Area Capacity: 0.25 million cubic yards
Wetlands Impacted: 2 (2.51 acres, isolated)


LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Bad Creek Reservoir
Wetland 2
Stream 4
Wetland 3
Stream 4a
Stream 5
Stream 6
Wetland 6
Strea
I
G
F
H
E
J
D
C
A
B
Spoil Location G
Spoil Area Capacity: 1.1 million cubic yards
Streams Impacted: 2 (1,484 linear feet)
Spoil Location I
Spoil Area Capacity: 1.1 million cubic yards

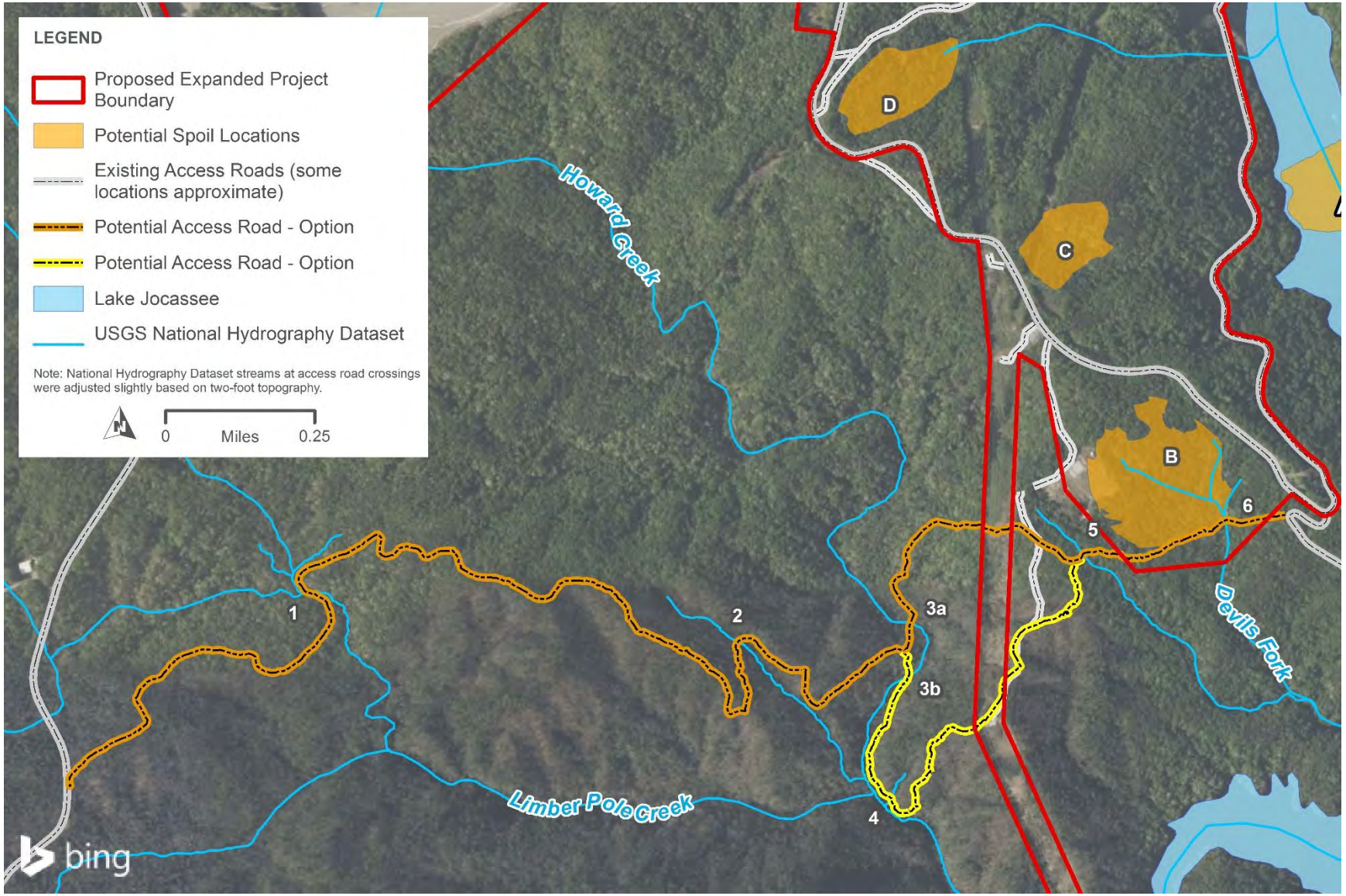

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Bad Creek Reservoir
H
I
G
F
E
J
D
C
A
B
Spoil Location H
Spoil Area Capacity: 1.5 million cubic yards
Open Waters Impacted: Bad Creek Reservoir (19.3 acres)

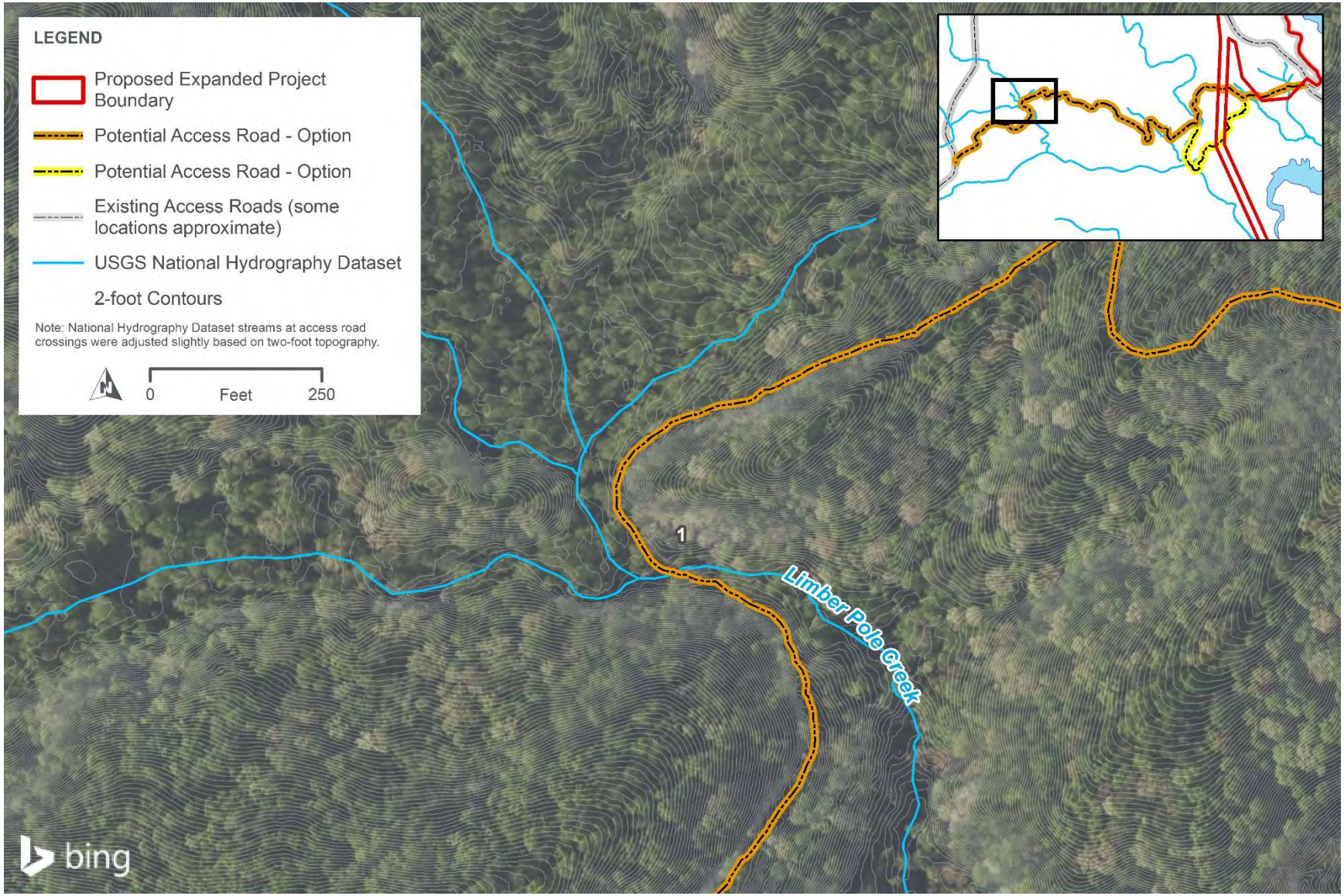

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Utility Lines
Existing Access Roads (some locations approximate)
Estimated Open Water
Estimated Wetlands
Estimated Streams
DATA SOURCE: Bing aerial imagery; surface waters and wetlands were estimated in the field during surveys conducted by HDR in September 2021.
0
Feet
500
Wetland 6
Wetland 5
Wetland 7
Wetland 8
Wetland 9
Stream 8
Wetland 12
Stream 9
Stream 11
Stream 12
Wetland 13
A
B
C
D
E
F
G
H
I
J
Spoil Location J
Spoil Area Capacity: 0.4 million cubic yards
Streams Impacted: 1 (152 linear feet)

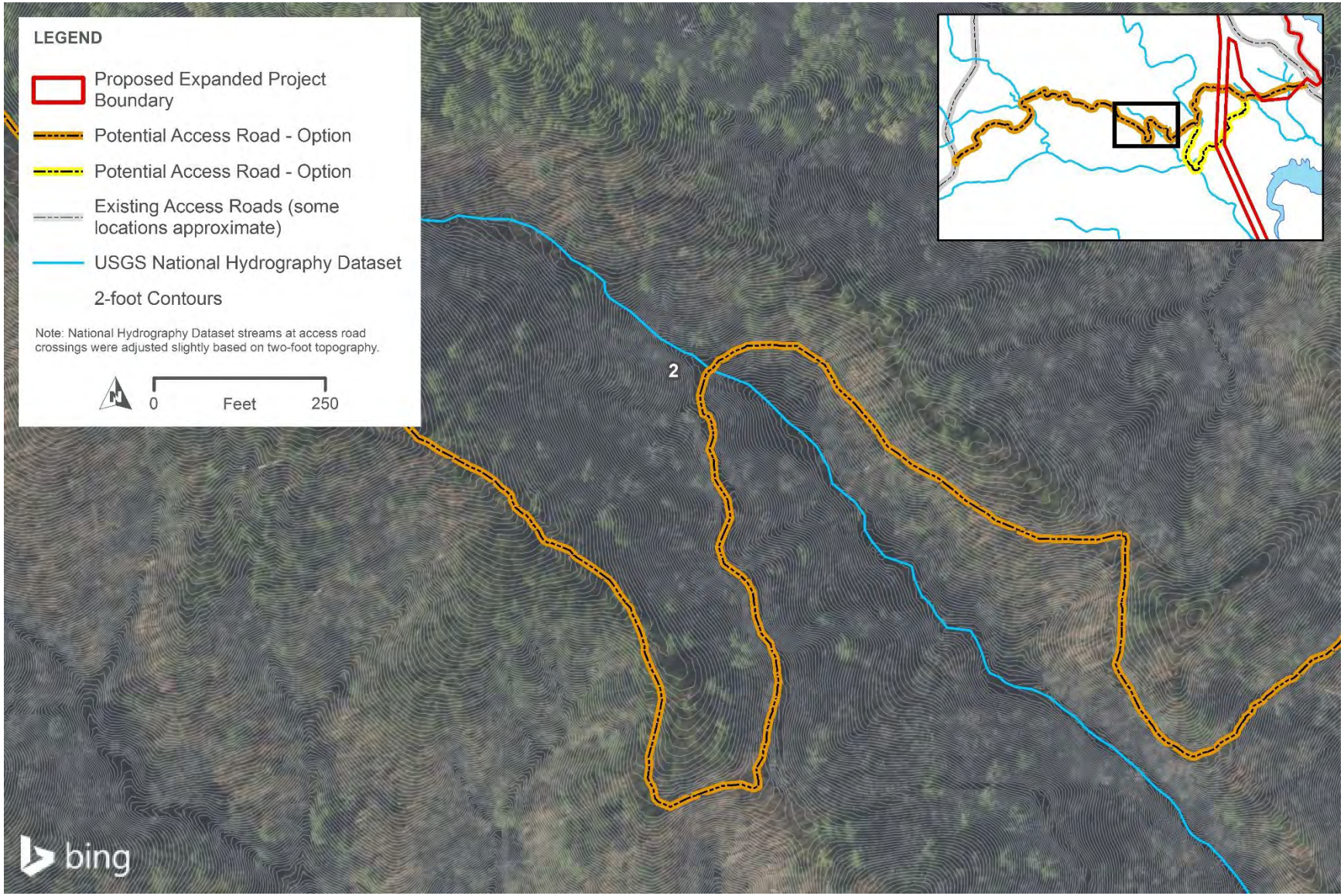
Attachment 2

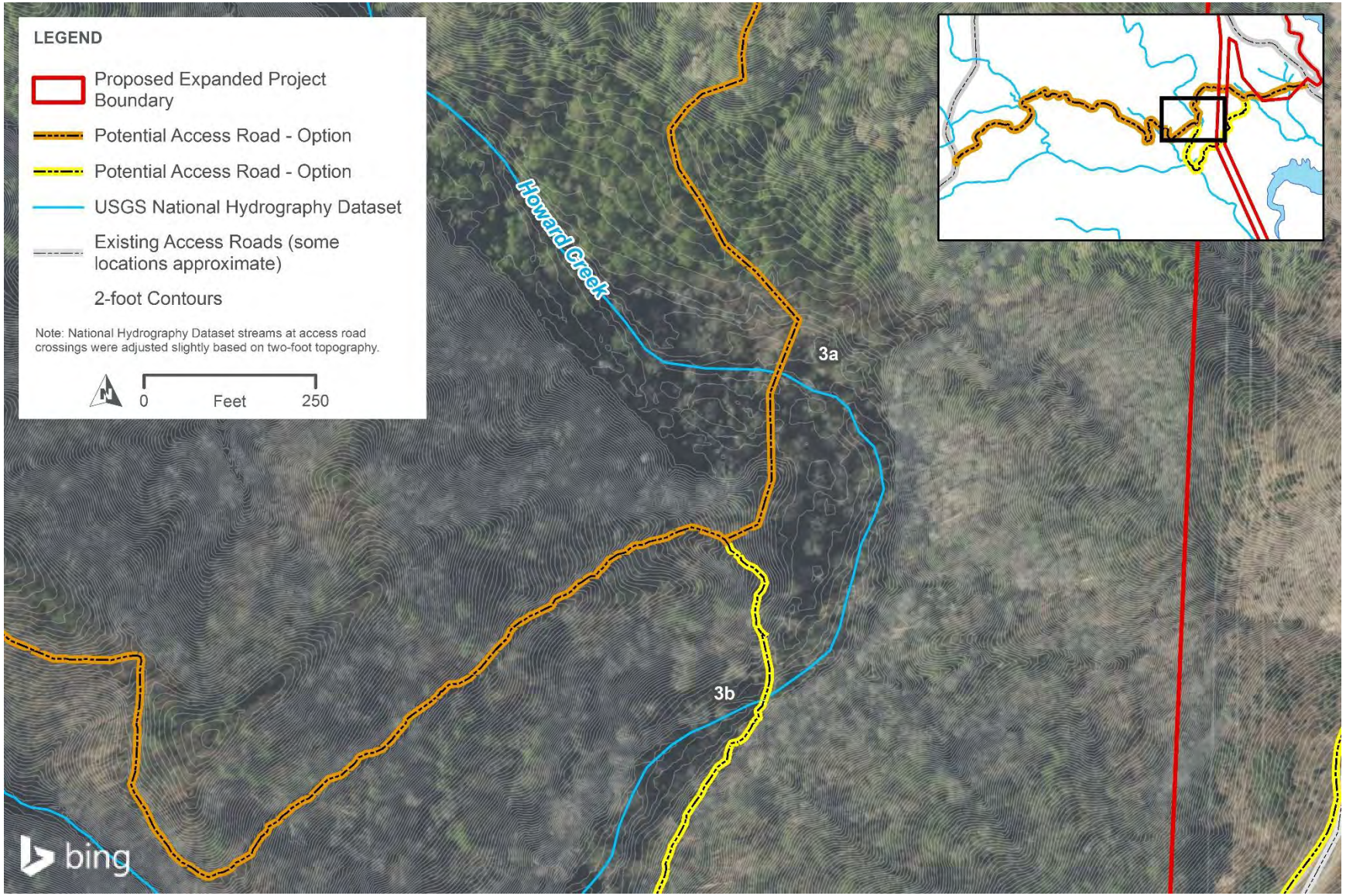
Attachment 2 – Potential Access Road Stream Crossings

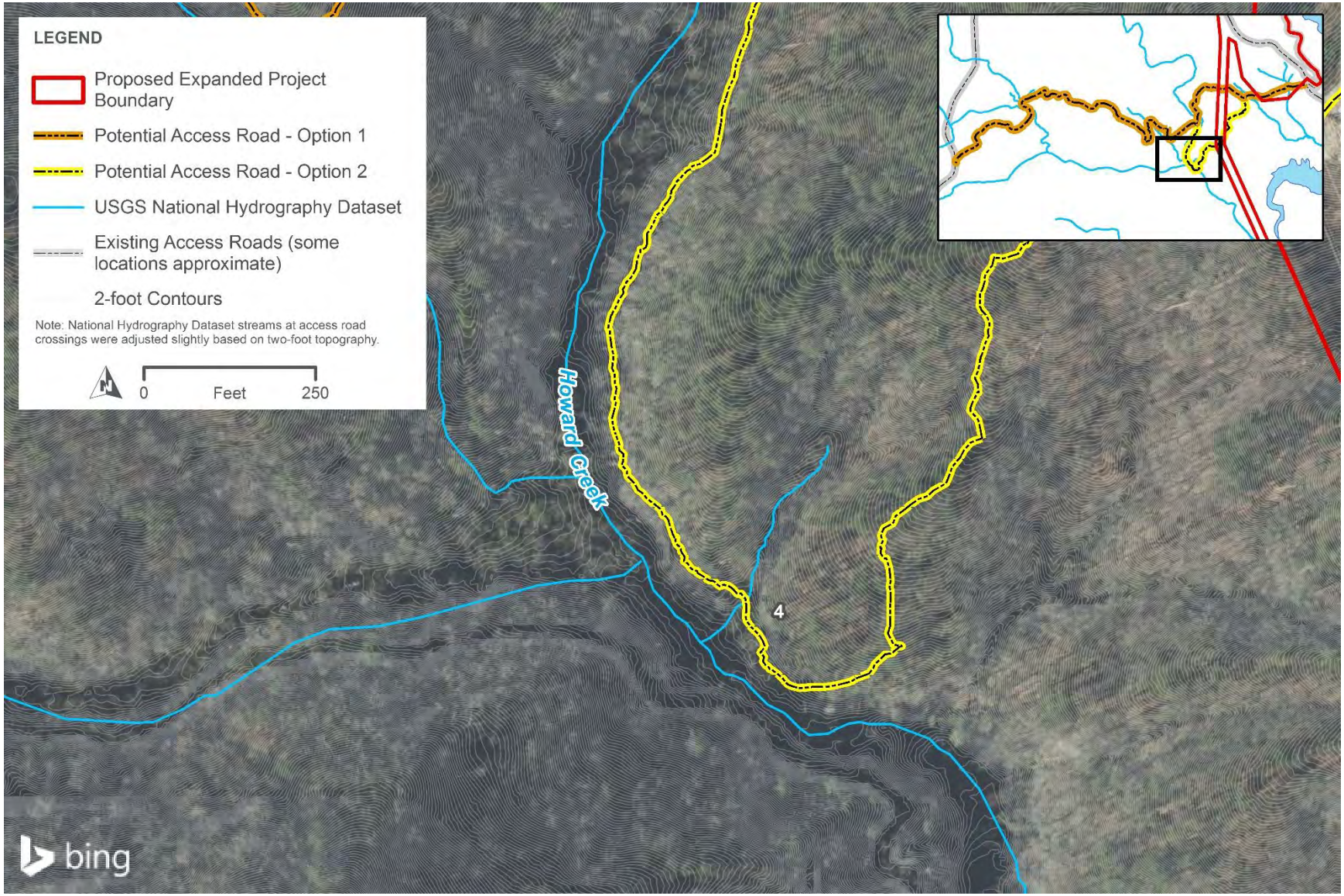
This page intentionally left blank.

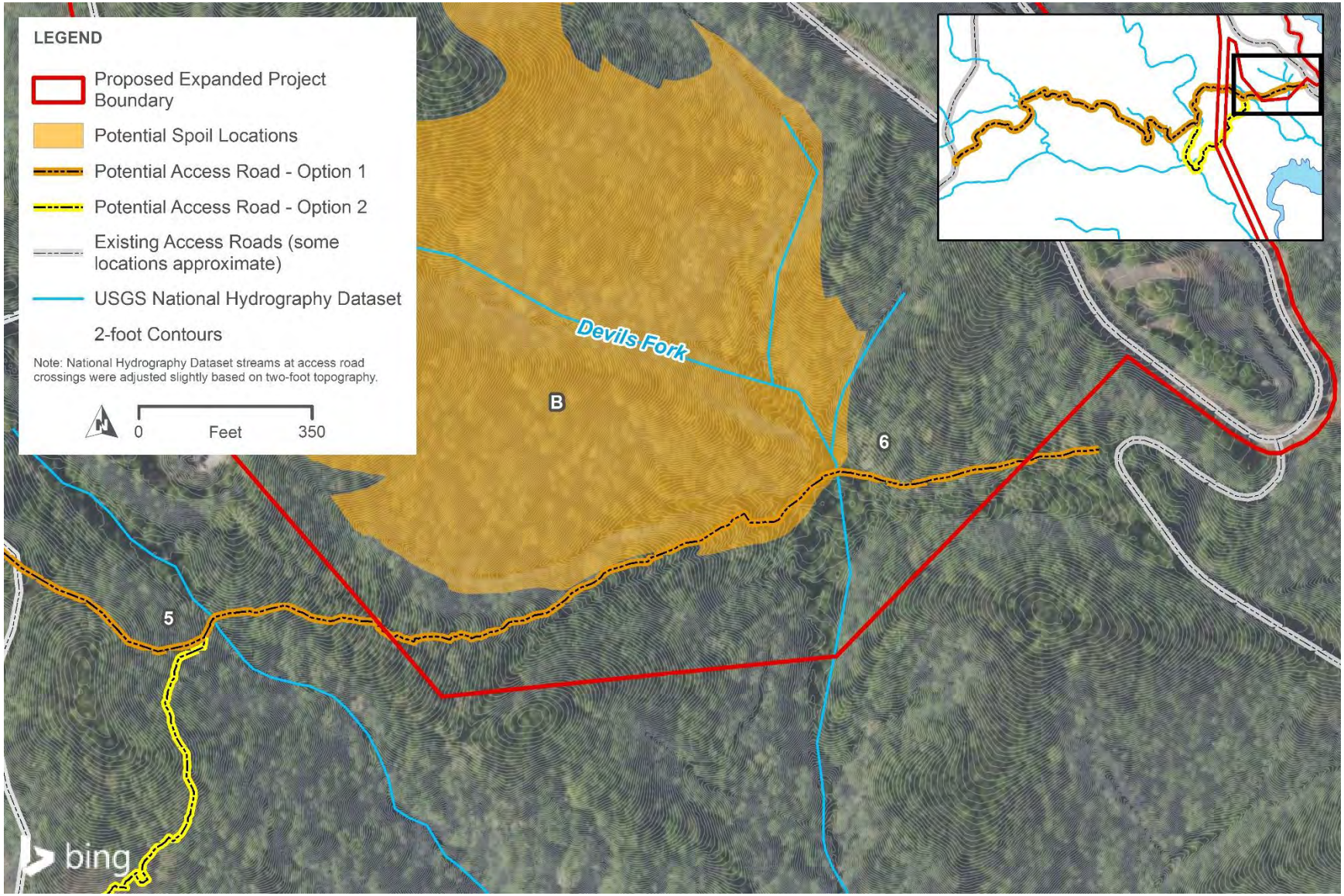

LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Existing Access Roads (some locations approximate)
Potential Access Road - Option
Potential Access Road - Option
Lake Jocassee
USGS National Hydrography Dataset
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
0
Miles
0.25
Howard Creek
Limber Pole Creek
Devils Fork
D
C
B
1
2
3a
3b
4
5
6
bing


LEGEND
Proposed Expanded Project Boundary
Potential Access Road - Option
Potential Access Road - Option
Existing Access Roads (some locations approximate)
USGS National Hydrography Dataset
2-foot Contours
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
N
0
Feet
250
1
Limber Pole Creek
bing


LEGEND
Proposed Expanded Project Boundary
Potential Access Road - Option
Potential Access Road - Option
Existing Access Roads (some locations approximate)
USGS National Hydrography Dataset
2-foot Contours
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
N
0
Feet
250
2
bing


LEGEND
Proposed Expanded Project Boundary
Potential Access Road - Option
Potential Access Road - Option
USGS National Hydrography Dataset
Existing Access Roads (some locations approximate)
2-foot Contours
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
0
Feet
250
Howard Creek
3a
3b
bing


LEGEND
Proposed Expanded Project Boundary
Potential Access Road - Option 1
Potential Access Road - Option 2
USGS National Hydrography Dataset
Existing Access Roads (some locations approximate)
2-foot Contours
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
0
Feet
250
Howard Creek
4
bing


LEGEND
Proposed Expanded Project Boundary
Potential Spoil Locations
Potential Access Road - Option 1
Potential Access Road - Option 2
Existing Access Roads (some locations approximate)
USGS National Hydrography Dataset
2-foot Contours
Note: National Hydrography Dataset streams at access road crossings were adjusted slightly based on two-foot topography.
0
Feet
350
Devils Fork
B
5
6
bing

Attachment C: Environmental Justice Study Report

This page intentionally left blank.

Environmental Justice Study Report

Bad Creek Pumped Storage Project

FERC No. 2740

Prepared for:

Duke Energy Carolinas, LLC

Prepared by:

Kleinschmidt Associates

August 2023

Kleinschmidt

EXECUTIVE SUMMARY

The Bad Creek Pumped Storage Project (Bad Creek Project or Project; FERC No. 2740) provides a variety of socioeconomic benefits to the region by providing clean, renewable energy and energy storage capabilities, recreational opportunities, and wildlife habitat preservation (Duke Energy 2022). Duke Energy is currently evaluating opportunities to add pumping and generating capacity by adding a second power complex (Bad Creek II Complex) adjacent to the existing Project. The additional facilities proposed, if pursued, would increase that regional benefit by supporting local employment and economic output, and result in additional state and local tax revenues (Duke Energy 2022). The area surrounding the Project has minimal residential development, and it is anticipated that the small population of environmental justice (EJ) individuals would see an overall benefit from the added economic growth of the Bad Creek II Complex construction. This study report describes the existing Bad Creek Project with and without the proposed additions and provides an analysis of the impacts that can reasonably be expected as they relate to EJ communities in the surrounding area.

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

ACRONYMS 1-1

1.0 INTRODUCTION 1-2

2.0 CURRENT OPERATION 2-3

3.0 PROPOSED ACTION 3-1

4.0 DESCRIPTION OF STUDY AREA 4-1

5.0 METHODOLOGY 5-1

6.0 RESULTS 6-1

7.0 ANALYSIS 7-1

8.0 DISCUSSION 7-1

9.0 CONSULTATION RECORD 9-1

10.0 REFERENCES 10-1

LIST OF TABLES

Table 4.1 Land Use in the Expanded Project Boundary, Not Including the Transmission Line Corridor 4-1

Table 6.1 Race and Ethnicity, Low Income, and English-Speaking Data for the 5-Mile Radius Around the Bad Creek Project 6-2

Table 6.2 Distances of Sensitive Receptor Locations to Proposed Expanded Bad Creek Project Boundary 6-5

LIST OF FIGURES

Figure 4.1 Environmental Justice Study Area 4-3

Figure 6.1 Census Block Groups within a 1-mile and 5-mile Radius of the Bad Creek Project. 6-3

Figure 6.2 Sensitive Receptor Locations within a 1-mile and 5-mile Radius of the Bad Creek Project. 6-4

LIST OF APPENDICES

Appendix A Consultation Documentation

ACRONYMS

B	
Bad Creek Project	Bad Creek Pumped Storage Project, FERC No. 2740
C	
Commission	Federal Energy Regulatory Commission
CT	census tract
D	
DPM	diesel particulate matter
Duke Energy	Duke Energy Carolinas, LLC
E	
EJ	environmental justice
F	
FERC	Federal Energy Regulatory Commission
K	
KT Project	Keowee-Toxaway Hydroelectric Project, FERC No. 2503
N	
NEPA	National Environmental Policy Act
P	
PAD	Pre-Application Document
PM	particulate matter
Project	Bad Creek Pumped Storage Project, FERC No. 2740
S	
SCDNR	South Carolina Department of Natural Resources
SD2	Scoping Document 2
U	
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

On February 23, 2022, Duke Energy Carolinas, LLC (Duke Energy) submitted the Bad Creek Pumped Storage Project (Bad Creek Project or Project; FERC No. 2740) Notice of Intent to Relicense and Pre-Application Document (PAD) to the Federal Energy Regulatory Commission (FERC or Commission). The PAD included an alternative licensing proposal for installation of additional energy storage and generation capacity by constructing a new 1,400-megawatt power complex (Bad Creek II Complex) adjacent to the existing Bad Creek Powerhouse to meet the growing need for energy storage and renewable energy production across Duke Energy's service territories. Duke Energy plans to make a final decision regarding the alternative licensing proposal for the construction of the Bad Creek II Complex prior to the submittal of a Final License Application for the Bad Creek Project.

Following the submittal of the PAD, the Commission filed a letter on June 16, 2022 requesting that Duke Energy conduct an Environmental Justice (EJ) Study for the Bad Creek Project relicensing pursuant to Section 5.9 of the Commission's regulations. The request for an EJ Study aligns with the socioeconomic resource issues identified by the Commission in Scoping Document 2 (SD2)[1] issued for the Bad Creek Project relicensing on August 5, 2022. Resource issues identified in SD2 address the effects of continued operations under the existing license as well as potential construction and operation of a second powerhouse (Bad Creek II Complex) during the new license term.

This study evaluates impacts to EJ communities as they relate to 1) relicensing the existing Project without construction of the Bad Creek II Complex, and 2) relicensing the existing Project and including construction of the additional facilities as described in the PAD alternative licensing proposal. The following impacts to the region surrounding the Bad Creek Project, as they relate to EJ and as requested by FERC in SD2, are addressed in this study:

- Effects of Bad Creek Project construction and operation activities on local roads (including traffic), housing, businesses, employment opportunities, and government services; and
- Effects of Bad Creek Project construction and operation activities on human health or the environment in identified environmental justice communities.

[1] Scoping Document 1 was issued for the Project on April 22, 2022 and superseded by Scoping Document 2 on August 5, 2022.

2.0 CURRENT OPERATION

The Bad Creek Project began operation in 1991 after roughly ten years of construction. Located in Oconee County, South Carolina, approximately eight miles north of Salem, South Carolina, the Bad Creek Reservoir (upper reservoir) was formed when Bad Creek and West Bad Creek were dammed and serves as the Bad Creek Project's upper reservoir. Lake Jocassee (lower reservoir) serves as the Bad Creek Project's lower reservoir and is licensed as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (KT Project; FERC No. 2503). The structures and features of the Bad Creek Project include the upper reservoir and dams, inlet/outlet structures in the upper and lower reservoirs, a water conveyance system, an underground powerhouse, tailrace tunnels, transmission facilities, and an approximately 9.25-mile-long transmission line corridor extending from the Bad Creek Project to the KT Project's Jocassee switchyard. The entirety of the Bad Creek Powerhouse is built within a large cavern inside a mountain. Similar to other hydroelectric stations, the engineering design of the Bad Creek Project involves the flow of water to produce electricity; however, the roughly 1,200-foot vertical distance between the upper and lower reservoirs makes the Bad Creek Project well-suited to take advantage of gravity to produce larger quantities of electricity for a given flow rate.

The Bad Creek Project was originally designed as a "weekly cycle" facility with approximately six hours of generation per day. This allowed Duke Energy to utilize roughly 29 hours of storage in the upper reservoir to generate at full load three hours in the morning and three hours in the evening, five days per week, and then pump back for a portion of each night and over the weekend utilizing Duke Energy's baseload coal and nuclear fleet. Current operations at the Bad Creek Project are "daily cycle" mode, alternating between generating and pumping on a daily basis, with the upper reservoir surface elevation typically maintained in the upper 50 to 60 feet, compared to a maximum drawdown of 160 feet. This operating mode allows Duke Energy to maximize head, energy density, and plant/unit efficiency and utilize the Bad Creek Project like a large battery to help balance the regional transmission system. Additionally, this mode of operation results in utilization of only 30 to 40 percent of the storage capacity of the Bad Creek Project due to the upper reservoir operating in the upper third of possible drawdown range.

The 30-year-old Bad Creek Project is one of the most powerful and flexible energy generation and storage assets in Duke Energy's system. Built primarily to store surplus

energy from baseload nuclear and fossil-fuel-driven power plants during times of low energy demand, today the Bad Creek Project is used to balance an increasingly complex energy grid. By pumping water from Lake Jocassee up to the Bad Creek Reservoir, the Bad Creek Project is able to provide storage of surplus baseload energy during low demand periods. While the Bad Creek Project is in turbine operation mode, water runs from the upper reservoir down to Lake Jocassee, providing power back to the grid when energy demand is higher or when renewable generation is unavailable (Figure 4.1).

3.0 PROPOSED ACTION

The demand for energy and energy storage has been steadily on the rise in the southeastern region of the country. In an effort to meet this growing demand, Duke Energy is proposing an expansion to the Bad Creek Project that will double the energy output of the station. The proposed Bad Creek II Complex would utilize the existing upper and lower reservoirs and consist of a new inlet/outlet within the existing upper reservoir, water conveyance system, and underground powerhouse. Additionally, a new inlet/outlet along the shoreline of the Whitewater River arm of Lake Jocassee would be constructed for the lower reservoir. As currently conceptualized, construction of the new Bad Creek II Complex would include the following additions to the FERC Project Boundary, with additional pertinent discussion included below:

- Upper reservoir inlet/outlet
- Low and high pressure headrace tunnels
- Manifold and penstock tunnels
- Vertical shaft
- Transformer yard
- New 525-kV switchyard
- New 525-kV transmission line from the new switchyard to the Jocassee switchyard (utilizing the existing transmission line right-of-way)
- Underground power complex
- Draft tube and tailrace tunnels
- Lower reservoir inlet/outlet

The Bad Creek II Complex underground powerhouse will be arranged and sized similarly to the existing Bad Creek Project powerhouse. In general, most of the features for the Bad Creek II Complex will be submerged, underground, and/or within lands classified as "project operations," which are not accessible to the general public. The location of the proposed lower reservoir inlet/outlet structure has been chosen to minimize construction-related environmental impacts to the Whitewater River arm of Lake Jocassee. Nevertheless, the Whitewater River cove of Lake Jocassee is anticipated to be closed to the public during construction of the Bad Creek II Complex.

4.0 DESCRIPTION OF STUDY AREA

The geographic scope (i.e., study area) of this EJ Study includes all areas within one mile of the proposed expanded Bad Creek Project Boundary[2], and within five miles of the proposed construction of the Bad Creek II Complex (Figure 4.1). The area surrounding the Bad Creek Project is generally rural, with minimal residential development on Lake Jocassee, and no residential development on the Bad Creek Reservoir. The expanded Project Boundary encompasses 1,490 acres, and includes primarily deciduous forest and open water, with mixed forest, pastureland, and agricultural land, and smaller amounts of development, barren land, and scrubland (Table 4.1).

Table 4.1 Land Use in the Expanded Project Boundary, Not Including the Transmission Line Corridor

Land Use Type	Percent
Barren Land	1.0
Cultivated Crops	2.4
Deciduous Forest	36.5
High Intensity Development	1.0
Medium Intensity Development	1.1
Low Intensity Development	2.1
Developed Open Space	3.3
Evergreen Forest	1.7
Hay/Pasture	8.2
Herbaceous	6.3
Mixed Forest	14.8
Open Water	20.5
Shrub/Scrub	1.1

Source: Duke Energy 2022

Each state, county, and applicable census block within the proposed expanded Bad Creek Project Boundary and proposed Bad Creek II Complex study area has been analyzed for

[2] Construction of the Bad Creek II Complex would require modifications to the existing Project Boundary to enclose the new facilities. Duke Energy currently owns or maintains under a property easement all lands that would be required for construction of the Bad Creek II Complex and intends to propose an expanded Project Boundary in the Final License Application that would include all lands necessary for access to, or control of, the expanded Project facilities.

EJ populations and potential impacts to them. Thirteen total census blocks have been identified within the study area. Of the thirteen total census blocks, five census block groups within four counties and two states are located within one mile of the Bad Creek Project: one in Jackson County, North Carolina; one in Transylvania County, North Carolina; two in Oconee County, South Carolina; and one in Pickens County, South Carolina. An additional eight census blocks within four counties and three states are located within five miles of the proposed Bad Creek II Complex: one in Rabun County, Georgia; one in Macon County, North Carolina; two in Pickens County, South Carolina; and four in Oconee County, South Carolina.

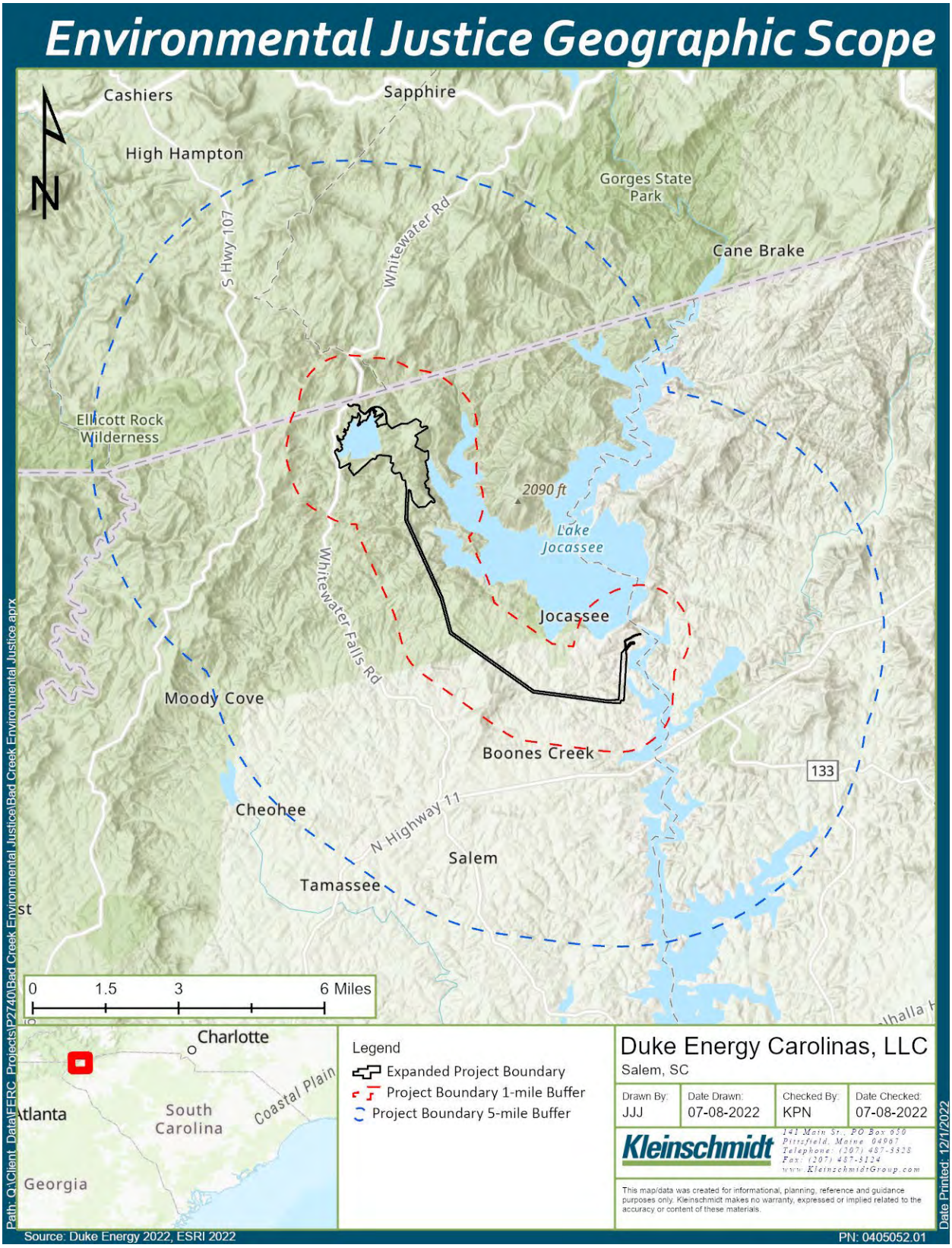


Figure 4.1 Environmental Justice Study Area

5.0 METHODOLOGY

Six objectives for accomplishing study goals were identified as part of the EJ Study Plan. The methods for accomplishing these objectives are outlined below.

Objective 1: Identify the presence of EJ communities that may be present within the study area.

The methodology used to identify the presence of EJ communities within the Bad Creek Project vicinity was adopted from the U.S. Environmental Protection Agency's (USEPA) *Promising Practices for EJ Methodologies in NEPA*[3] *Reviews* (2016). A table was prepared that included the racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic study area (Table 6.1). The table includes information from the U.S. Census Bureau's most recently available (2020a, 2020b, 2020c) American Community Surveys 5-Year Estimates for each state, county, and block group within the scope of this study. Racial data was obtained using Table B03002, and poverty data was obtained using Table B17017.

The thresholds used for populations meeting EJ status are as follows:

- For minority populations, the meaningfully greater analysis method was used, where the total minority population for a block group is at least 10 percent greater than that of the county population:

  (County minority population) x (1.10) = threshold above which a block group minority population must be for inclusion as an EJ community

- The "low-income threshold criteria" was used to identify EJ communities based on income level, where the block group must have a higher percentage of low-income households than the county.

Objective 2: Identify the presence of non-English speaking populations that may be present within the study area.

The presence of non-English speaking populations was identified using Table B16004 from the most recently available U.S. Census Bureau American Community Survey 5-Year Estimates for each state, county, and block group within the scope of this study.

[3] National Environmental Policy Act

Objective 3: Identify sensitive receptor locations in the study area.

Sensitive receptor locations include, but are not limited to, schools, daycare centers, hospitals, and elderly care facilities. Sensitive receptor locations within the scope of this study were identified using the U.S. Geological Survey National Structures Dataset. The dataset consists of the name, function, and location of manmade facilities as determined by disaster planning and emergency response needs (USGS 2022). The data from The National Map viewer was downloaded as an Esri™ File Geodatabase, and then populated onto a map of the Bad Creek Project vicinity showing the 1-mile and 5-mile buffers around the proposed expanded Project Boundary.

Objective 4: Identify outreach strategies to engage EJ communities and non-English speaking populations in the relicensing if present within the study area.

The Environmental Justice Guidance Under the NEPA (USEPA 1997) suggests outreach could engage universities, labor organizations, local schools and libraries, senior citizen's groups, civic associations, environmental and EJ non-governmental organizations. Additionally, EJ outreach employed by the USEPA has consisted of engagement calls, dialogue meetings and the use of "data sharing tools." Engagement calls are typically hosted over ZOOM™ or a similar platform to maintain a dialogue with members of the public on EJ issues. Dialogue meetings are very similar to engagement calls; however, they are targeted towards specific stakeholders, members of the community, or tribal governments. Data sharing tools include the use of web-based data and information sharing tools to disseminate information related to EJ issues.

This document discusses the potential need for outreach to EJ communities within the study area, above and beyond that currently proposed for the relicensing process. As this document has been developed prior to a decision regarding the development of the Bad Creek II Complex, targeted EJ outreach has not yet been undertaken.

Objective 5: Discuss:

a. **The effects of the relicensing and Bad Creek II Complex construction on identified EJ communities;**
b. **Effects that are disproportionately high and adverse; and**
c. **Potential effects on non-English speaking communities and sensitive receptor locations, if present within the study area.**

Potential effects to EJ communities were identified using the USEPA's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016) document and regional and site-specific conditions that may contribute to impacts. These are discussed in Section 7.0 of this study report.

Objective 6: Identify mitigation measures to avoid or minimize project effects on EJ communities, non-English speaking communities, and sensitive receptor locations, if present within the study area.

Mitigation measures for existing and potential Project effects are further discussed in Section 7.1 of this study report.

6.0 RESULTS

Using the meaningfully greater analysis method, one EJ community based on race was identified out of the thirteen census block groups within the scope of this study. Located in Transylvania County, North Carolina, the one race-related EJ community is primarily within the 5-mile buffer zone around the Project, with the southwestern portion located within the 1-mile buffer. Two EJ communities were identified based on income below poverty level, measured by household: one in Oconee County, South Carolina, and one in Transylvania County, North Carolina, both of which are located within the 5-mile buffer zone (Table 6.1; Figure 6.1). None of the identified EJ communities are in block groups that border Project lands (Figure 6.1).

Within the thirteen block groups in the study area, one block group includes a population of non-English speaking individuals. This block group is located in Pickens County, South Carolina, with one percent of the population unable to speak English (Table 6.1).

No sensitive receptor locations are present within the 1-mile radius surrounding the proposed expanded Bad Creek Project Boundary. Within the 5-mile radius around the proposed expanded Bad Creek Project Boundary there are two sensitive receptor locations: two schools, located within the 5-mile radius, on the southwestern extremity of the potentially effected zone (Figure 6.2). A table depicting the distances of identified sensitive receptor locations to the Bad Creek Project Boundary, the primary area within which proposed activities would take place, is provided as Table 6.2.

Table 6.1 Race and Ethnicity, Low Income, and English-Speaking Data for the 5-Mile Radius Around the Bad Creek Project

Geographic Area	Total Population (count)	White Alone, not Hispanic (count)	African American/ Black (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority Population (%)	Below Poverty Data (%)	Non-English Speaking Persons Aged 5 Years and Greater (%)
Georgia	10403847	5485855	3244348	19382	410705	5164	32810	213189	992394	47%	14%	1%
Rabun County	16645	14598	316	55	188	0	41	113	1334	12%	16%	0%
Census Tract 970202, Block Group 1	1348	1335	0	0	0	0	0	0	13	1%	14%	0%
North Carolina	10264876	6474688	2165301	112504	290525	5640	22962	230591	962665	37%	14%	1%
Jackson County	42938	34635	928	3283	302	0	56	1182	2552	19%	18%	0%
Census Tract 950900, Block Group 2	1425	1410	0	0	0	0	0	0	15	1%	9%	0%
Macon County	34813	30998	541	240	302	0	91	201	2440	11%	14%	0%
Census Tract 970502, Block Group 1	2128	2023	6	0	18	0	0	0	81	5%	9%	0%
Transylvania County	33775	30528	1560	89	47	17	0	410	1124	10%	13%	0%
Census Tract 960600, Block Group 3	1143	1019	0	0	19	0	0	0	105	11%	18%	0%
South Carolina	5020806	3196421	1333876	14748	78102	3784	9139	99278	285458	36%	15%	0%
Oconee County	77528	65463	5288	231	570	11	44	1686	4235	16%	16%	0%
Census Tract 030200, Block Group 1	1340	1261	0	0	0	0	15	36	28	6%	9%	0%
Census Tract 030100, Block Group 2	679	671	0	0	0	0	0	0	8	1%	12%	0%
Census Tract 030100, Block Group 1	1167	1142	7	0	0	0	0	4	14	2%	8%	0%
Census Tract 030200, Block Group 5	872	872	0	0	0	0	0	0	0	0%	6%	0%
Census Tract 030200, Block Group 2	1109	1090	16	0	0	0	0	3	0	2%	25%	0%
Census Tract 030200, Block Group 3	1201	1201	0	0	0	0	0	0	0	0%	8%	0%
Pickens County	124029	106292	8392	306	2424	26	178	1854	4557	14%	17%	0%
Census Tract 010200, Block Group 2	2267	2216	24	0	0	0	0	0	27	2%	9%	0%
Census Tract 010100, Block Group 1	1443	1331	76	0	16	0	0	20	0	8%	4%	0%
Census Tract 010200, Block Group 1	2279	2164	27	0	0	0	0	20	68	5%	14%	1%

Source: U.S. Census Bureau 2020a, 2020b, 2020c

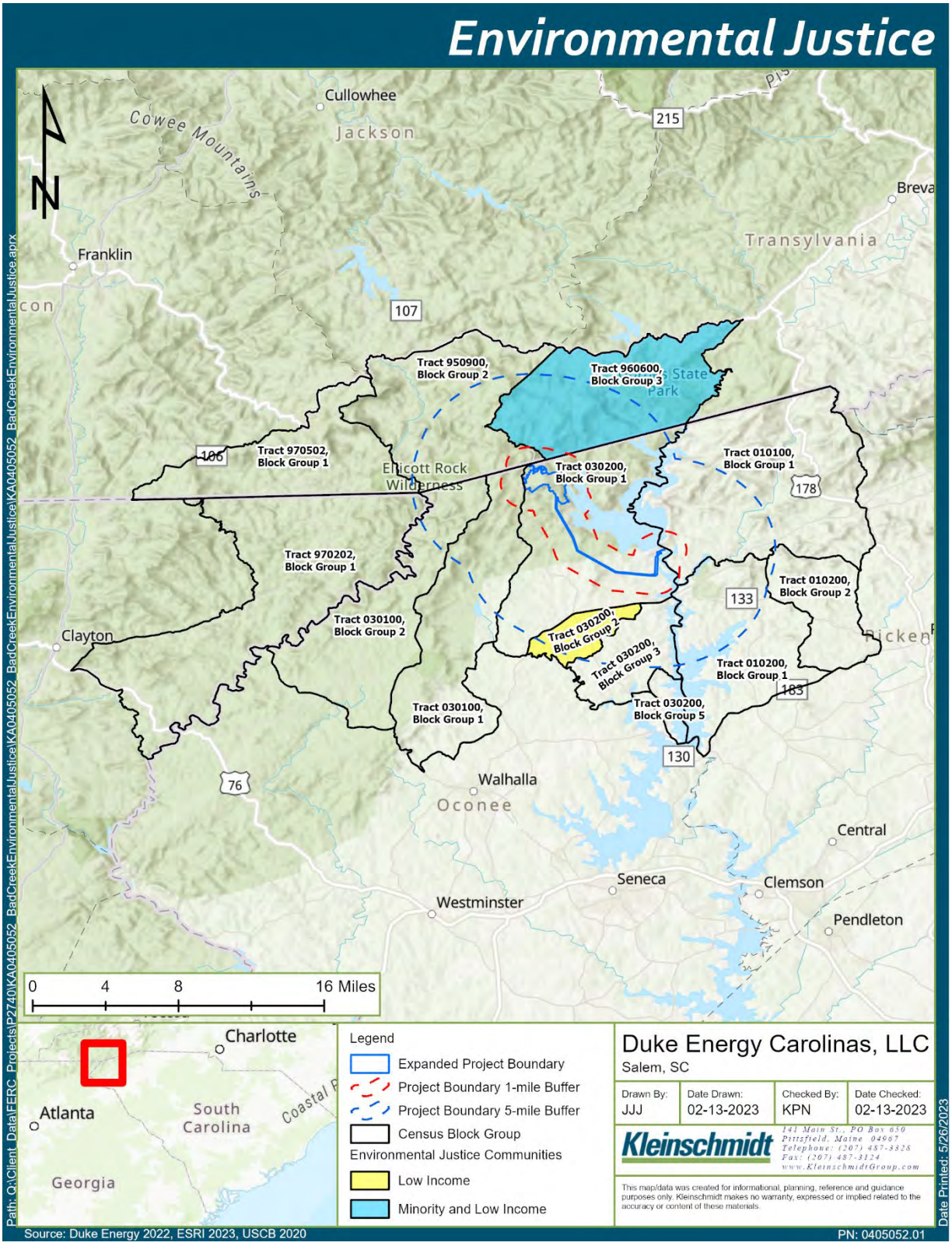


Figure 6.1 **Census Block Groups within a 1-mile and 5-mile Radius of the Bad Creek Project.**

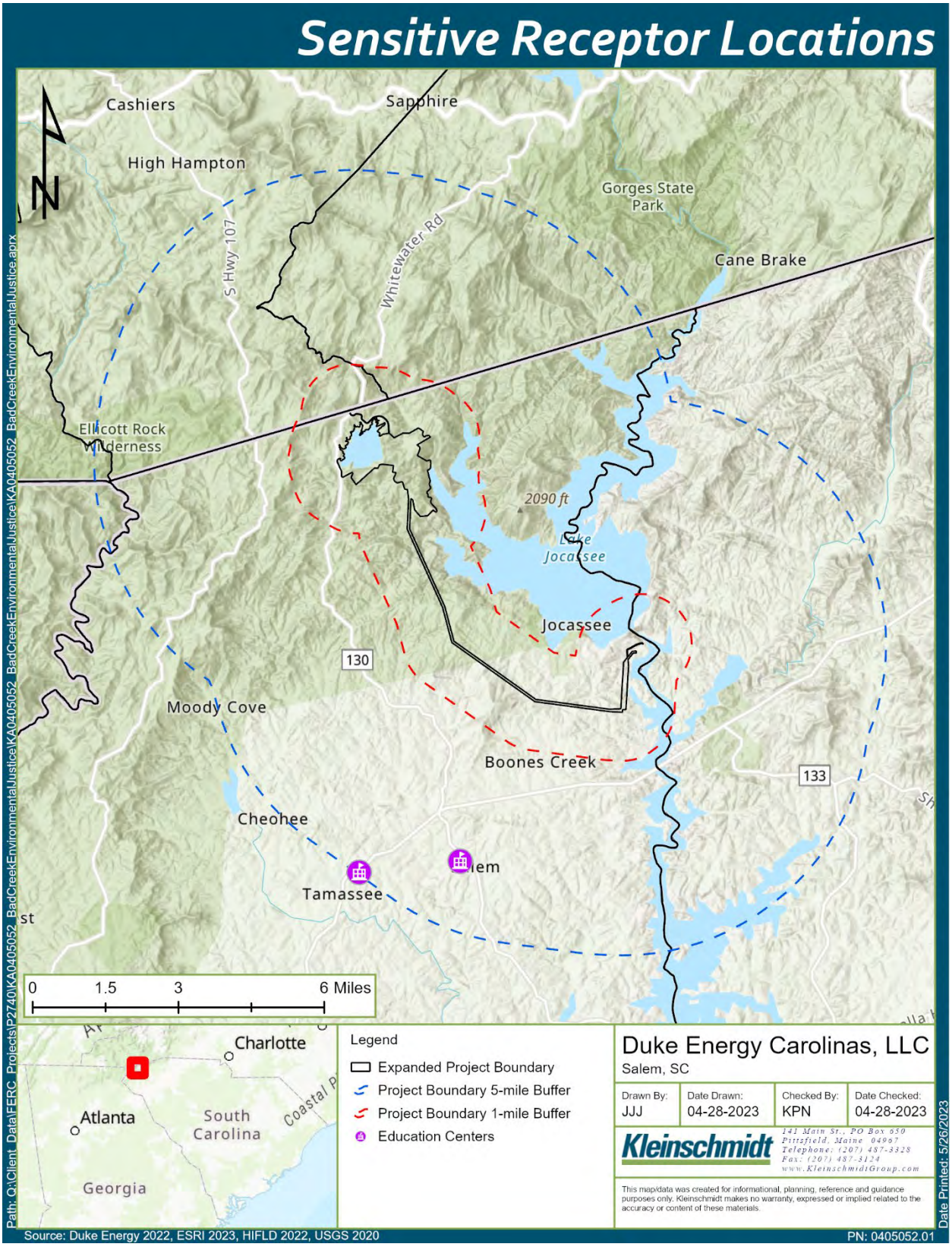


Figure 6.2 **Sensitive Receptor Locations within a 1-mile and 5-mile Radius of the Bad Creek Project.**

Table 6.2 Distances of Sensitive Receptor Locations to Proposed Expanded Bad Creek Project Boundary

Sensitive Receptor Location	Distance from Project Boundary (miles)
NEXT School Eagle Ridge	3.62
Tamassee Salem Elementary School	4.96

7.0 ANALYSIS

The USEPA-issued guidance document *Promising Practices for EJ Methodologies in NEPA Reviews* (2016) outlined the considerations for analysis of impacts to EJ communities as including exposure pathways; direct, indirect, and cumulative impacts to communities; and the distribution of potential impacts, either beneficial or adverse.

Exposure pathways are the routes by which contact, and the resulting impact, can occur. For the purpose of this study, the exposure pathways include noise, construction vehicle air pollution, and effects of project construction on local traffic and road networks. Additionally, potential impacts to subsistence fishing opportunities are reviewed and analyzed. These potential effects have been analyzed as they relate to relicensing both with and without the construction of the Bad Creek II Complex. The exposure pathways have been analyzed by direct, indirect, and cumulative impacts. The direct impacts occur at the time of the event and will include the time during construction of the Bad Creek II Complex. Indirect impacts are considered a result of the event but occur later in time or potentially farther away. They can be reasonably expected to happen and will include impacts during the year following completion of the Bad Creek II Complex construction. Cumulative impacts take into consideration the incremental impact of the event as it relates to past, present, and reasonably foreseeable future actions. Finally, given the pre-disposition of EJ populations to experiencing effects due to the historically disproportionate siting of environmentally hazardous locations, this study analyzes the uneven distribution of effects on EJ communities within the scope of the proposed actions.

7.1 Noise

Broadly, noise is considered unwanted and/or harmful sound and was first recognized as a hazard to public health in 1968 (APHA 2021). Environmental noise is more distinct and defined as unwanted and/or harmful noise created by outdoor sounds from human activities, such as road and railway traffic, airports, and industrial sites (APHA 2021). Major sources of environmental noise pollution related to construction activities include industrial machinery, outdoor power equipment, and increased traffic.

Research done over several decades indicates that excessive noise levels in the environment can contribute directly to auditory impacts such as hearing loss, sleep

disruption, and general annoyance (APHA 2021; Medic et al. 2017). Cumulative impacts from long-term environmental noise exposure include non-auditory impacts such as metabolic disturbances leading to diabetes and obesity, cardiovascular disease, noise-related hypertension, and exacerbation of mental health conditions such as depression and anxiety (APHA 2021). In general, temporary noise exposure is reversible and does not contribute to long-term cumulative impacts; however, in some instances, when coupled with underlying conditions, a temporary exposure of sufficiently intense noise levels can contribute to cardiovascular disease (Jariwala et al. 2017).

Finally, land use decisions and local zoning have historically favored wealthy and non-minority populations in determining where to locate sites that could result in elevated levels of noise pollution. This inequity at the decision-making level has led to roads, industrial sites, and other sources of noise pollution to be developed near EJ communities (APHA 2021). Due to the proximity of these types of sites to low-income and minority populations, EJ communities experience a higher baseline level of environmental noise compared to primarily non-EJ neighborhoods, leading to a population that is at a higher risk of developing noise-related health conditions. Added noise from temporary construction has the potential to have a disproportionately higher impact on EJ communities already experiencing poorer pre-existing health conditions from the baseline level of noise they are exposed to.

7.1.1 Impacts

Relicensing the Project as it Currently Operates (1-mile Radius Only)

Direct, Indirect, and Cumulative Impacts

Noise caused by the current operation of the Bad Creek Project is minimal. The powerhouse is located 600 feet underground within a mountain, resulting in negligible turbine or generator-related sound being emitted beyond the cavern, and therefore does not cause direct, indirect, or cumulative noise impacts to the surrounding EJ communities.

Additionally, only an exceedingly small portion of the block group containing EJ populations overlaps with the 1-mile radius around the Project and does not directly border the Project Boundary, further distancing any potential noise-related impacts to EJ communities within the Project vicinity.

Distribution of Impacts

There will be no substantive noise-related impacts to EJ communities within the 1-mile radius around the Bad Creek Project due to the relative distance of these populations to the Project powerhouse. Additionally, the location of the powerhouse 600 feet underground results in minimal noise reaching nearby populations from current operation. Therefore, there will be no disproportionately high impacts to EJ communities from relicensing the Bad Creek Project as it currently operates.

Relicensing the Current Project with Construction of the Bad Creek II Complex (1-mile and 5-mile Radiuses)

Direct Impacts

Noise from construction of the powerhouse, upper reservoir inlet/outlet, and lower reservoir inlet/outlet are the most likely causes of noise-related impacts to EJ communities from the addition of the Bad Creek II Complex. The most direct impacts will be isolated to the upper reservoir inlet/outlet construction due to the proximity of identified EJ census blocks to this section of the Project. However, further analysis of the land uses directly surrounding the upper reservoir, within the identified census block, indicates little to no residential development.

Indirect Impacts

The work done in the upper reservoir as part of the addition of the Bad Creek II Complex has the highest potential for impact to EJ populations; however, due to the sparse amounts of development and forested nature of the surrounding area, indirect noise-related impacts to EJ communities are not anticipated.

Cumulative Impacts

The Bad Creek II Complex powerhouse will be constructed underground and be of a similar size and arrangement to the existing powerhouse. Once constructed, the operation will be similar to existing Project operations, and will not cause additional noise-related impacts due to the depth underground of the second powerhouse. As such, cumulative noise-related impacts to EJ communities are not anticipated.

Distribution of Impacts

The area surrounding the Bad Creek Project is rural, with low levels of development, resulting in a generally quiet atmosphere. There is no residential development on the Bad Creek Reservoir, and the land around Lake Jocassee is dominated by mature growth forest, with minor residential development (Duke Energy 2022). The EJ communities present within the study area are not exposed to higher-than-average ambient noise, and therefore would not be disproportionately impacted by temporary construction noise.

7.2 Air Quality

The primary source of construction-related air pollution is diesel exhaust from earth moving machinery, resulting in a diesel particulate matter (DPM) release to the local environment (Boyle 2020). DPM is considered any solid particle that is emitted during the combustion process of a diesel engine and contains multiple types of metals and chemicals (Betts 2011). DPM is not the only pollutant to come from diesel machinery but it is among the most harmful, carrying particulates into lungs, and resulting in the potential development of chronic health conditions (Betts 2011).

Direct impacts occurring to nearby communities from construction include inhalation of DPM, general vehicle exhaust and particulate matter (PM), and dust turned up by increased road traffic and operations from earth-moving equipment. Exposure to these pollutants can contribute to health conditions that include asthma, reduced lung function, and cardiovascular disease (USEPA 2022a), as well as other chronic conditions such as chronic obstructive pulmonary disease and pulmonary fibrosis (Betts 2011). The effects of short-term exposure to PM and other forms of air pollution are not well known due to the difficulty of isolating the impacts of short-term exposure from impacts of consistent, ambient air pollution. Cumulative impacts of poor air quality resulting in chronic health conditions are influenced by many factors, including distance to traffic-related pollution, distance to point-source pollution, home environmental conditions, and socioeconomic factors that differ among communities (HEI 2013).

People living in communities of color and low-income tend to be disproportionately impacted by air pollution due to their proximity to factories, major roadways, and ports with diesel truck operations (USEPA 2022b), among other such industries. These sites are often located near EJ communities due to inequity at the decision-making level when

developing and siting highly polluting facilities, leading to a higher baseline of conditions caused by air pollution for EJ communities.

7.2.1 Impacts

Relicensing the Project as it Currently Exists (1-mile Radius Only)

Direct, Indirect, and Cumulative Impacts

Existing Project operation does not result in air quality related impacts to the Project vicinity. There will be no air quality related impacts from relicensing and continued operation of the existing Bad Creek Project.

Distribution of Impacts

There are no air quality related impacts from relicensing and continued operation of the Bad Creek Project. EJ communities will not be disproportionately impacted by continued Project operation.

Relicensing the Existing Project with Construction of the Bad Creek II Complex (1-mile and 5-mile Radiuses)

Direct Impacts

The short-term construction-related air pollution from building the Bad Creek II Complex has the potential to result in exacerbating already existing health conditions for EJ populations near the site. The construction activity most likely to impact air quality in the vicinity of EJ communities is the upper reservoir inlet/outlet work due to the proximity of that work to identified EJ populations. The air pollution caused by construction vehicles and equipment has the potential to be carried long distances on the wind and can include PM10 (particulate matter smaller than 10 microns in diameter), volatile organic compounds, and gases such as carbon dioxide, carbon monoxide, and nitrogen oxides (EPC 2023). The distance between EJ populations and the construction site, generally greater than one mile, will serve to mitigate potential impacts.

Indirect Impacts

Indirect impacts from construction of the Bad Creek II Complex may include exacerbation of pre-existing conditions but is unlikely to be the sole cause of development of those conditions due to the short duration of exposure and the good air quality that exists as a baseline in the Project vicinity. As with direct impacts, the distance between EJ populations and the construction site will be sufficient to result in minimal indirect impacts.

Cumulative Impacts

The Bad Creek Project vicinity is rural and largely undeveloped, with much of the land adjacent to Lake Jocassee designated for public recreation and resource conservation. Due to the natural character of the region and low baseline levels of air pollution, as well as the highly variable effect of localized, ongoing environmental conditions, it is not likely that the short duration of exposure from the Bad Creek II Complex construction will contribute to cumulative impacts to EJ communities in the Project vicinity.

Distribution of Impacts

The Bad Creek Project vicinity is rural and not highly developed, resulting in generally good air quality. There are no pre-existing facilities in the immediate Project vicinity leading to higher-than-average baseline air pollution conditions for EJ communities, and therefore, construction of the Bad Creek II Complex will not impact EJ communities at a disproportionately higher rate.

7.3 Subsistence Fishing

Across the country, many rural, marginalized, and Indigenous communities rely on subsistence resources, such as fish, for food and trade (OEPC 2021). Subsistence fishing, hunting, and harvesting continue to be important to the life and economy of marginalized and Indigenous people (OEPC 2021), and therefore an important part of the environmental discussion related to the construction of new projects and facilities.

7.3.1 Impacts

Relicensing the Project as it Currently Operates (1-mile Radius Only)

Direct, Indirect, and Cumulative Impacts

Due to the large fluctuations in upper reservoir elevations from approved existing Project operations, there are no recreational facilities or subsistence fishing opportunities located on the upper reservoir. Additionally, the upper reservoir is fenced in to prohibit public access and ensure public safety. The recreational facilities and subsistence fishing opportunities located within the nearby Devil's Fork State Park and Lake Jocassee will remain unchanged and be unaffected by continued Project operation. No direct, indirect, or cumulative impacts to subsistence fishing are anticipated as a result of relicensing the Bad Creek Project.

Distribution of Impacts

No impacts to subsistence fishing opportunities are anticipated as a result of relicensing and the continued operation of the Bad Creek Project.

Relicensing the Existing Project with Construction of the Bad Creek II Complex (1-mile and 5-mile Radiuses)

Direct Impacts

Although fishing is not permitted within the upper reservoir, the nearby Devil's Fork State Park potentially provides subsistence fishing opportunities on Lake Jocassee within the 5-mile buffer zone surrounding construction of the Bad Creek II Complex. Additionally, the Whitewater River located adjacent to the Project Boundary near the Bad Creek Reservoir is managed by the S.C. Department of Natural Resources (SCDNR) and stocked regularly, functioning as a desirable wild and stocked rainbow and brown trout fishery. The Whitewater River is located within the 1-mile and 5-mile buffer zones around the Project Boundary, and adjacent to a census block group with both low-income and minority populations. The Whitewater River cove of Lake Jocassee is expected to be closed to the general public for much of the duration of construction of the Bad Creek II Complex. However, the cove is only accessible by boat. Therefore, direct impacts to subsistence fishing opportunities for EJ communities as a result of project construction are not anticipated as the construction activities will be contained within the Bad Creek Reservoir and a portion of Lake Jocassee only accessible by boat.

Indirect Impacts

There will be no anticipated changes to the SCDNR stocking schedule or quantity associated with the project construction, and every effort will be made to limit the amount of pollution potentially entering the local freshwater rivers and streams. Temporary, localized water quality impacts during construction are not expected to adversely affect the Lake Jocassee fishery. Indirect impacts to subsistence fishing opportunities for EJ communities are not anticipated as a result of the Bad Creek II Complex construction.

Cumulative Impacts

There are no anticipated direct or indirect impacts to subsistence fishing opportunities for EJ communities, and the healthy baseline conditions and abundant fish population will not change as a result of construction. Therefore, no cumulative impacts are anticipated.

Distribution of Impacts

There will be no impacts to EJ communities related to subsistence fishing as a result of construction, and, therefore, no unequal distribution of impacts.

7.4 Effects of Project Construction on Local Traffic, Road Networks, and Aesthetics

Construction has the potential to impact local roads and traffic by creating congestion and travel delays, as well as temporarily restricting access to local businesses and residential areas (USDOT 2015). It is possible for these immediate impacts to spread to neighboring locations as people find alternate routes, potentially causing stress to roads that were not meant for increased capacity (USDOT 2015). Additionally, local businesses can experience hardship if customers are unable to access their location due to construction activities that block roads (USDOT 2015).

7.4.1 Impacts

Relicensing the Project as it Currently Exists (1-mile Radius Only)

Direct, Indirect, and Cumulative Impacts

There will be no changes to local traffic, road networks, or aesthetics as a result of relicensing and continued operation of the Bad Creek Project. Therefore, there will be no

impacts to EJ communities related to local traffic, road networks, or aesthetics as a result of relicensing.

Distribution of Impacts

There will be no impacts to EJ communities related to local traffic, road networks, or aesthetics as a result of relicensing, and, therefore, no unequal distribution of impacts.

Relicensing the Existing Project with Construction of the Bad Creek II Complex (1-mile and 5-mile Radiuses)

Direct Impacts

Existing access to the Bad Creek Project is by a 4.8-mile-long paved road leading from the Project entrance at SC Highway 130 to the powerhouse portal area at Lake Jocassee. It is expected that this existing access road will be utilized for construction-related activities at the powerhouse and lower reservoir intake/outlet work, with the potential addition of laydown areas for equipment. It is unlikely that EJ communities will be impacted by work done at this location due to the distance between the powerhouse construction and identified EJ populations.

Work conducted at the upper reservoir inlet/outlet location is the closest to identified EJ populations; however, impact to traffic and local roads within identified EJ census blocks is anticipated to be minimal. No residential development exists on the upper reservoir, and therefore no need for EJ populations to be traveling from this area for work or other activities, and no recreation is allowed on the upper reservoir due to the large drawdown fluctuations, limiting the need for travel to this area.

The removal of rock and soil to build the underground cavern for the additional powerhouse likely has the highest potential to cause impact to EJ communities. Excavation of the underground powerhouse will require disposal of significant quantities of material, mostly earth and rock "spoil." Spoil disposal methods and locations have not yet been determined but may include: 1) placement of rockfill at the submerged weir in Lake Jocassee; 2) disposal at designated, permitted upland spoil areas within the expanded Project Boundary or on Duke Energy-owned land adjacent to the Project Boundary; or 3) transport off-site. Disposal of excavated spoils may temporarily impact aesthetics,

streams and lands in the expanded Project Boundary, local water quality in and immediately downstream of the Whitewater River cove, or construction traffic.

Indirect Impacts

Following construction there will be no impact to local roads or traffic, and, therefore, no indirect impacts to EJ communities related to roads and traffic.

The disposal of excavated spoils has the potential for indirect impacts to long-term aesthetics and property value. If the disposal site is in close proximity to an EJ community, this could have the highest level of indirect impact. In analyzing potential spoil locations identified within the PAD, locations will be located within the immediate vicinity of the upper reservoir, Project operations properties, or adjacent to the Whitewater River arm of Lake Jocassee on Duke Energy-owned property. As such, no impacts to identified EJ communities would be anticipated from presently proposed spoil locations.

Cumulative Impacts

Cumulative impacts for this exposure pathway would be anticipated to be the same as indirect impacts. Please see the section above for a discussion on indirect impacts.

Distribution of Impacts

The distribution of impacts related to local roads and traffic will not be disproportionately high for EJ communities due to the undeveloped nature of the surrounding area. The pre-Project baseline of minimal pressure on local roads and traffic will result in even distribution of impacts.

Disproportionate impacts resulting from the disposal of excavated spoils are unlikely due to the undeveloped nature of the surrounding area but are not outside the realm of possibility depending on where the disposal site is and the baseline conditions of the site before material is left there.

7.5 Potential Effects on Non-English-Speaking Communities and Sensitive Receptor Locations

The nearest sensitive receptor location is a school located approximately four miles from the proposed construction site (Figure 6.2). Although noise can disrupt learning and contribute to mental and physical dysfunction in children and individuals with known sensory processing disorders, attention-deficit/hyperactivity disorder, post-traumatic stress disorder, and noise-induced developmental disorders (APHA 2021), it is unlikely that construction of the Bad Creek II Complex would have an effect on the sensitive receptor location due to the distance between the two sites.

Within the Project vicinity there is one small population of non-English speaking individuals located in Pickens County representing one percent of the population of the block group, or approximately 23 people (Table 6.1). This block group is primarily outside of the 5-mile radius, with only a small portion located within the 5-mile radius at the southeastern end. Due to the distance between the construction site and any non-English speaking individuals, impacts are not anticipated to this group.

8.0 DISCUSSION

The existing Bad Creek Project's continued operation is not expected to cause any noise or air quality-related effects due, in part, to the Project's relative distance to identified EJ communities. Subsistence fishing opportunities will remain unchanged in the vicinity with the continued operation of the existing Project. In addition, no changes to the local traffic, road networks, or aesthetics will occur as a result of relicensing, nor will there be effects to local non-English speaking communities and sensitive receptor locations.

Due to the history of inequitable siting of highly polluting facilities and industries within EJ communities, the potential for unequal distribution of impacts to these communities exists with any construction project or industrial site proposed today. The natural way in which sound and air pollution travel may result in temporary impacts outside the main construction area, necessitating the 1-mile and 5-mile radius analyses. Overall, the impacts to EJ communities from construction of the Bad Creek II Complex would be minimal due to the distance between construction activities and the nearest residential areas with EJ populations, and disproportionately adverse impacts to EJ communities should not occur due to the healthy baseline environmental conditions in the region.

Due to the distance between identified EJ communities and the potential project impacts, we have not identified the need for additional outreach efforts beyond those currently being employed by Duke Energy as part of the relicensing process. Should the proposed locations of spoil areas change, or alternative road closures/uses be identified, outreach may become necessary.

Construction of the Bad Creek II Complex has the potential for beneficial impact to the local economy by creating local jobs in areas such as contracting and construction work, plumbing, electrical, masonry, welding, and engineering (HoldRite 2023). Additional local economy benefits include increased business from the construction work force to establishments providing food and hospitality, entertainment, and retail sales. Though the direct sales impact from the construction work force will be temporary, it will contribute to indirect and cumulative benefits by giving the area a boost that will aid in the continuation of self-sufficiency and potentially providing resources for future improvements.

9.0 CONSULTATION RECORD

This report was provided in draft form to potentially interested agencies and stakeholders for review and comment on June 6, 2023. Comments were accepted on the draft report through July 31, 2023. Official responses to draft report distribution were received from the following entities:

- Advocates for Quality Development – June 28, 2023
- South Carolina Department of Parks, Recreation & Tourism – July 11, 2023
- South Carolina Department of Natural Resources – July 27, 2023

No substantive comments regarding the report, requests for report modifications, or requests for additional consultation were received. Consultation is included in Appendix A.

10.0 REFERENCES

American Public Health Association (APHA). 2021. Noise as a public health hazard. Retrieved from https://apha.org/Policies-and-Advocacy/Public-Health-Policy-Statements/Policy-Database/2022/01/07/Noise-as-a-Public-Health-Hazard on February 17, 2023.

Betts, K. S. (2011). Road rage? The role of diesel particulate matter in lung inflammation. Environmental Health Perspectives, 119(3), A132.

Boyle, Lindsey. 2020. Neighborhood air quality impact from construction site emissions in Portland, OR. *Master of Environmental Management Project Reports, 62*. Portland, OR. Retrieved from https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1064&context=mem_gradprojects on February 20, 2023.

Duke Energy Carolinas, LLC. 2022. Pre-application document. Bad Creek Pumped Storage Project FERC Project No. 2740. Oconee County, South Carolina. February 23, 2022.

Environmental Pollution Centers (EPC). 2023. Construction sites pollution. Retrieved from https://www.environmentalpollutioncenters.org/construction/ on March 3, 2023.

HEI Review Panel on Ultrafine Particles (HEI). 2013. Understanding the health effects of ambient ultrafine particles. HEI Perspectives 3. Health Effects Institute, Boston, MA. Accessed from https://www.healtheffects.org/system/files/Perspectives3.pdf on February 20, 2023.

HoldRite. 2023. The impact of construction: 3 ways your work affects everyday lives. Retrieved from https://www.holdrite.com/us/en/resources/blog/the-impact-of-construction-3-ways-your-work-affects-everyday-lives on March 9, 2023.

Jariwala, Hiral J., Syed, Huma S., Pandya, Minarva J., Gajera, Yogesh M. (2017). Noise pollution & human health: A review. Retrieved from https://www.researchgate.net/profile/Hiral-Jariwala/publication/319329633_Noise_Pollution_Human_Health_A_Review/links/59a54434a6fdcc773a3b1c49/Noise-Pollution-Human-Health-A-Review.pdf on February 20, 2023.

Medic, G., Wille, M., & Hemels, M. E. (2017). Short- and long-term health consequences of sleep disruption. *Nature and science of sleep*, *9*, 151–161. https://doi.org/10.2147/NSS.S134864.

Office of Environmental Policy and Compliance, U.S. Department of the Interior (OEPC). 2021. Environmental justice and subsistence: A virtual exhibit. Retrieved from https://storymaps.arcgis.com/stories/5f5e8702b70844e18a840551efdfc468 on April 24, 2023.

United States Census Bureau (U.S. Census). 2020a. B03002 | Hispanic or Latino origin by race. Retrieved from https://data.census.gov/table?q=B03002:+HISPANIC+OR+LATINO+ORIGIN+BY+RACE&g=0100000US_0400000US13,37,45_1500000US132419702021,370999509002,371139705021,371759606003,450730301001,450730301002,450730302001,450730302002,450730302003,450730302005,450770101002,450770102001,450770102002&tid=ACSDT5Y2020.B03002&moe=false on March 6, 2023.

United States Census Bureau (U.S. Census). 2020b. B16004 | Age by language spoken at home by ability to speak English for the population 5 years and over. Retrieved from https://data.census.gov/table?q=B16004:+AGE+BY+LANGUAGE+SPOKEN+AT+HOME+BY+ABILITY+TO+SPEAK+ENGLISH+FOR+THE+POPULATION+5+YEARS+AND+OVER&g=0100000US_0400000US13,37,45_1500000US132419702021,370999509002,371139705021,371759606003,450730301001,450730301002,450730302001,450730302002,450730302003,450730302005,450770101002,450770102001,450770102002&tid=ACSDT5Y2020.B16004&moe=false on March 6, 2023.

United States Census Bureau (U.S. Census). 2020c. B17017 | Poverty status in the past 12 months by household type by age of householder. Retrieved from https://data.census.gov/table?q=B17017:+POVERTY+STATUS+IN+THE+PAST+12+MONTHS+BY+HOUSEHOLD+TYPE+BY+AGE+OF+HOUSEHOLDER&g=0100000US_0400000US13,37,45_1500000US132419702021,370999509002,371139705021,371759606003,450730301001,450730301002,450730302001,450730302002,450730302003,450730302005,450770101002,450770102001,450770102002&tid=ACSDT5Y2020.B17017&moe=false on March 6, 2023.

United States Department of Transportation (USDOT). 2015. Towards sustainable pavement systems: a reference document. Chapter 5. Retrieved from https://www.fhwa.dot.gov/pavement/sustainability/ref_doc.cfm on March 3, 2023.

United States Environmental Protection Agency (USEPA). 1997. Environmental Justice Guidance Under the National Environmental Policy Act. Retrieved from Environmental Justice Guidance Under the National Environmental Policy Act (epa.gov) on March 10, 2023.

United States Environmental Protection Agency (USEPA). 2016. Promising practices for EJ methodologies in NEPA reviews. Retrieved from

https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf on February 10, 2023.

United States Environmental Protection Agency (USEPA). 2022a. EPA research: environmental justice and air pollution. Retrieved from https://www.epa.gov/ej-research/epa-research-environmental-justice-and-air-pollution on February 20, 2023.

United States Environmental Protection Agency (USEPA). 2022b. Research on near roadway and other near source air pollution. Retrieved from https://www.epa.gov/air-research/research-near-roadway-and-other-near-source-air-pollution on February 20, 2023.

United States Geological Survey (USGS). 2022. USGS National Structures Dataset – USGS National Map Downloadable Data Collection. Retrieved from https://data.usgs.gov/datacatalog/data/USGS:db4fb1b6-1282-4e5b-9866-87a68912c5d1 on February 10, 2023.

APPENDIX A

CONSULTATION DOCUMENTATION

From:	James Keane
To:	Crutchfield Jr., John U
Cc:	Alex Pellett; Dan Rankin; Elizabeth Miller; Greg Mixon; John Haines; Morgan Amedee; Pat Cloninger; Rowdy Harris; Tom Daniel; Wenonah Haire; Caitlin Rogers; syerka@ebci-nsn.gov; Alan.Stuart@duke-energy.com; Sarah Kulpa; Huff, Jen; Bruce, Ed; Dunn, Lynne; Maggie Salazar; Alison Jakupca
Subject:	Re: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Date:	Wednesday, June 28, 2023 9:07:36 PM

June 28, 2023

Mr. Stuart:

On behalf of AQD (Advocates for Quality Development), I have reviewed the above captioned report by Kleinschmidt and Associates of June 2023.
I find the report to be well researched and the findings in accordance with my understanding of the subject study area around the Bad Creek Project. I have no issues with the report and it confirms my belief that there will be minimal, if any, environmental justice issues resulting from the project.

Sincerely yours,

Terry Keane
Seneca, SC

From: Charles (Rowdy) B Harris
To: Crutchfield Jr., John U
Subject: [EXTERNAL] Re: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Date: Tuesday, July 11, 2023 1:30:16 PM
Attachments: image001.png

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

No comments from SCPRT.

Rowdy Harris
Park Manager
Devils Fork State Park
SC Department of Parks, Recreation & Tourism
161 Holcombe Circle
Salem, SC 29676
Office: (864) 944-2639
SCPRT.com
SouthCarolinaParks.com

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Tuesday, July 11, 2023 11:39 AM
To: Alex Pellett <PellettC@dnr.sc.gov>; Dan Rankin <RankinD@dnr.sc.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>; Greg Mixon <mixong@dnr.sc.gov>; John Haines <jhains@g.clemson.edu>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Charles (Rowdy) B Harris <charris@scprt.com>; Terry Keene <jtk7140@me.com>; Tom Daniel <danielt@dnr.sc.gov>; Wenonah Haire <wenonah.haire@catawba.com>; Caitlin Rogers <caitlin.rogers@catawba.com>; syerka@ebci-nsn.gov <syerka@ebci-nsn.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sarah Kulpa <sarah.kulpa@hdrinc.com>; Huff, Jen <Jen.Huff@hdrinc.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Alison Jakupca <alison.jakupca@kleinschmidtgroup.com>
Subject: RE: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review

Dear Bad Creek Relicensing Stakeholders:

Just a reminder to provide comments on the Bad Creek Relicensing Environmental Justice Study, if you have not done so already.

The comment period will be extended until July 31, 2023.

Please reply if you do or don't have any comments so we can include in the stakeholder consultation record.

Please let me know if you have any questions.

Thank you,

John Crutchfield

Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From: Crutchfield Jr., John U
Sent: Tuesday, June 6, 2023 7:43 AM
To: Alex Pellett <PellettC@dnr.sc.gov>; Dan Rankin <RankinD@dnr.sc.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>; Greg Mixon <mixong@dnr.sc.gov>; John Haines <jhains@g.clemson.edu>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Rowdy Harris <charris@scprt.com>; Terry Keene <jtk7140@me.com>; Tom Daniel <danielt@dnr.sc.gov>; Wenonah Haire <wenonah.haire@catawba.com>; Caitlin Rogers <caitlin.rogers@catawba.com>; syerka@ebci-nsn.gov
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sarah Kulpa <sarah.kulpa@hdrinc.com>; Huff, Jen <Jen.Huff@hdrinc.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Alison Jakupca <alison.jakupca@kleinschmidtgroup.com>
Subject: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Importance: High

Dear Bad Creek Relicensing Stakeholders:

Please find attached the draft Environmental Justice Study Report which is being provided for your review and comment. I have included the Bad Creek Relicensing Stakeholder SharePoint link where you can also access the report: 405052 Draft Bad Creek EJ Study Report_Draft for Stakeholder Review 06.2023.pdf

As you may be aware, the Environment Justice Study was placed into the Operations Resource Committee during our study plan identification process last year.

I am providing the draft report to those stakeholders who signed up for the Operations Resource Committee as well as other pertinent stakeholders who may have an interest in this study.

Duke Energy requests your review of the draft study report with comments provided via email to Alan Stuart and me by July 6, 2023.

Please reply to all recipients copied on this email so all stakeholders are aware of filed comments. Please reply if you do or don't have any comments so we can include in the stakeholder consultation record.

Note that all comments will be included in the relicensing consultation record and included in the final Environmental Justice Study Report which will be filed as part of the relicensing application with FERC.

After comments are received, Duke Energy will convene a virtual Teams meeting to review the Environmental Justice study report and received stakeholder comments.

Please let me know if you have any questions.

Thank you,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Elizabeth Miller
To:	Crutchfield Jr., John U
Subject:	[EXTERNAL] RE: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Date:	Thursday, July 27, 2023 9:19:36 AM
Attachments:	image001.png

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Hi John,

The SCDNR has no comments to provide on the Environmental Justice Draft Study Report.

Thank you,

Elizabeth

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Tuesday, July 11, 2023 11:40 AM
To: Alex Pellett <PellettC@dnr.sc.gov>; Dan Rankin <RankinD@dnr.sc.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>; Greg Mixon <MixonG@dnr.sc.gov>; John Haines <jhains@g.clemson.edu>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <CloningerP@dnr.sc.gov>; Rowdy Harris <charris@scprt.com>; Terry Keene <jtk7140@me.com>; Tom Daniel <DanielT@dnr.sc.gov>; Wenonah Haire <wenonah.haire@catawba.com>; Caitlin Rogers <caitlin.rogers@catawba.com>; syerka@ebci-nsn.gov
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sarah Kulpa <sarah.kulpa@hdrinc.com>; Huff, Jen <Jen.Huff@hdrinc.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Alison Jakupca <alison.jakupca@kleinschmidtgroup.com>
Subject: RE: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Importance: High

Dear Bad Creek Relicensing Stakeholders:

Just a reminder to provide comments on the Bad Creek Relicensing Environmental Justice Study, if you have not done so already.

The comment period will be extended until July 31, 2023.

Please reply if you do or don't have any comments so we can include in the stakeholder consultation

record.

Please let me know if you have any questions.

Thank you,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From: Crutchfield Jr., John U
Sent: Tuesday, June 6, 2023 7:43 AM
To: Alex Pellett <PellettC@dnr.sc.gov>; Dan Rankin <RankinD@dnr.sc.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>; Greg Mixon <mixong@dnr.sc.gov>; John Haines <jhains@g.clemson.edu>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Rowdy Harris <charris@scprt.com>; Terry Keene <jtk7140@me.com>; Tom Daniel <danielt@dnr.sc.gov>; Wenonah Haire <wenonah.haire@catawba.com>; Caitlin Rogers <caitlin.rogers@catawba.com>; syerka@ebci-nsn.gov
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sarah Kulpa <sarah.kulpa@hdrinc.com>; Huff, Jen <Jen.Huff@hdrinc.com>; Bruce, Ed <Ed.Bruce@duke-energy.com>; Dunn, Lynne <Lynne.Dunn@duke-energy.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Alison Jakupca <alison.jakupca@kleinschmidtgroup.com>
Subject: Bad Creek Relicensing Operations Resource Committee-Environmental Justice Draft Study Report Request for Review
Importance: High

Dear Bad Creek Relicensing Stakeholders:

Please find attached the draft Environmental Justice Study Report which is being provided for your review and comment. I have included the Bad Creek Relicensing Stakeholder SharePoint link where you can also access the report: 405052 Draft Bad Creek EJ Study Report_Draft for Stakeholder Review 06.2023.pdf

As you may be aware, the Environment Justice Study was placed into the Operations Resource Committee during our study plan identification process last year.

I am providing the draft report to those stakeholders who signed up for the Operations Resource Committee as well as other pertinent stakeholders who may have an interest in this study.

Duke Energy requests your review of the draft study report with comments provided via email to Alan Stuart and me by July 6, 2023.

Please reply to all recipients copied on this email so all stakeholders are aware of filed comments. Please reply if you do or don't have any comments so we can include in the stakeholder consultation record.

Note that all comments will be included in the relicensing consultation record and included in the final Environmental Justice Study Report which will be filed as part of the relicensing application with FERC.

After comments are received, Duke Energy will convene a virtual Teams meeting to review the Environmental Justice study report and received stakeholder comments.

Please let me know if you have any questions.

Thank you,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
526 S. Church Street, EC12Q | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, September 27, 2023 3:45 PM
To: thomasalexander@scsenate.gov; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; SAC.RD.Greenville@usace.army.mil; william.g.bailey@usace.army.mil; jenniferjbarnhart@fs.fed.us; oldhouse@palmettotrust.org; bereskind <bereskind@greenvillewater.com>; david.bernhart@noaa.gov; bobertzs@dnr.sc.gov; abrock@oconeesc.com; acaggiano@oconeesc.com; jerrycarter@schouse.gov; mgcase@icloud.com; Van_Cato@lgraham.senate.gov; Mike.Clampitt@ncleg.gov; kevin@americanwhitewater.org; nealcollins@schouse.gov; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; maureen.copelof@cityofbrevard.com; mike_corney@yahoo.com; steve@corney.org; mark@cottonrealestate.com; robert.dach@bia.gov; amin.davis@ncdenr.gov; Andy Douglas <adoug41@att.net>; heyward69@gmail.com; jeff_duncan@nps.gov; dannyedwards@bellsouth.net; christine.farrell@ncparks.gov; afell@scprt.com; tim@ncwf.org; gilstrap4@gmail.com; Andrew Gleason <andrewandwilla@hotmail.com>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Goudreau, Chris, NCWRC <chris.goudreau@ncwildlife.org>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Owen, Donna - City of Pickens <donnaowen@pickenscity.com>; growens@gmail.com; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Yantis,

Gerry - AQD <gcyantis2@yahoo.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Subject: Bad Creek FERC Project No. 2740 - Relicensing Study Progress Report 3

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good morning Bad Creek Relicensing Stakeholders,

Please find attached to this email the Third Study Progress Report filed today with the Federal Energy Regulatory Commission (FERC) supporting the Bad Creek Pumped Storage Project relicensing effort. These study progress reports are required under the Integrated Licensing Process and are issued quarterly.

We are making excellent progress on the proposed studies outlined in the Revised Study Plan approved earlier this year and have included a couple of the study reports in the attached Progress Report. As the field data collection phase for the ongoing studies begins to wind down, we will continue engaging our established Environmental Resource Committees and their members. For anyone interested in additional resource studies and associated details please visit www.badcreekpumpedstorage.com for more information.

Thank you for your meaningful participation in the relicensing of the Bad Creek Project. We look forward to working with stakeholders throughout the rest of the 2023 study season, including sharing study results with you as they become available.

If you need something, we are always available to assist you so please don't hesitate to ask.

Thank you !
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980=373-2079 |Cell 803-640-8765

From:	Crutchfield Jr., John U
To:	Alex Pellett; Alison Jakupca; Amy Breedlove; Andrew Grosse; Austen Attaway; bereskind; Green, William G; caitlin.rogers; Christopher Moore; Churchill, Christy; Wes Cooler; RankinD; Andy Douglas; Bruce, Ed; Greg Mixon; jhains@g.clemson.edu; Erika Hollis; Jeff Phillips; Jennifer Kindel; EMJOHNSON@scdah.sc.gov; jtk7140@me.com; Keith A. Bradley; Kelly Kirven; Ken Forrester; Kulpa, Sarah; quattrol; Dunn, Lynne; Raber, Maverick James; McCarney-Castle, Kerry; Abney, Michael A; Elizabeth Miller; lputnammitchell@gmail.com; Amedee, Morgan D.; Morgan Kern; Mularski, Eric; Wahl, Nick; Olds, Melanie J; Pat Cloninger; More, Priyanka; Bill Ranson-Retired; SelfR; Rowdy Harris; Salazar, Maggie; Samantha Tessel; Fletcher, Scott T; Scott Harder; taylors@dnr.sc.gov; Settevendemio, Erin; Chris Starker; Stuart, Alan Witten; Tom Daniel; Wenonah Haire; Dale Wilde; William T. Wood; suewilliams130@gmail.com; simmonsw@dnr.sc.gov; gcyantis2@yahoo.com; Kevin Nebiolo
Cc:	Lineberger, Jeff
Subject:	Bad Creek Relicensing - Initial Study Report Meeting (SAVE THE DATE)
Date:	Monday, December 4, 2023 7:04:05 AM
Importance:	High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Bad Creek Relicensing Stakeholders:

Duke Energy will convene a meeting of all relicensing stakeholders to review the Initial Study Report (ISR) results to be filed with FERC on January 4, 2024. The meeting will occur on Wednesday, January 17, 2024, 9 am–5 pm, at the Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100). The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2024-2025. Lunch will be served at the meeting.

Duke Energy will send a separate meeting invitation so you can schedule on your Outlook calendar. We strongly encourage in-person participation but will offer a virtual Teams meeting link for those who cannot attend in person. If you do not plan to attend in person, please respond to me so I can ensure there is an accurate headcount for lunch.

A meeting agenda will be provided to participants prior the January 17 meeting date.

Thanks, and we look forward to seeing you at the meeting.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Subject: Bad Creek Relicensing - Initial Study Report Meeting
Location: Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100)

Start: Wed 1/17/2024 9:00 AM
End: Wed 1/17/2024 5:00 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Crutchfield Jr., John U

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2024-2025.

Lunch will be served at the meeting. Please let John Crutchfield know if you will not attend the meeting in-person so an accurate headcount can be made for lunch.

An agenda will be distributed prior to the meeting date.

Contact Alan Stuart or John Crutchfield if you have any questions.

Microsoft Teams meeting

Join on your computer, mobile app or room device
Click here to join the meeting

Meeting ID: 261 126 676 00
Passcode: eNqYAQ
Download Teams | Join on the web

Join with a video conferencing device
duke-energy@m.webex.com
Video Conference ID: 118 891 291 4
Alternate VTC instructions

Or call in (audio only)
+1 704-659-4701,,653836333# United States, Charlotte
Phone Conference ID: 653 836 333#
Find a local number | Reset PIN

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
525 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

January 4, 2024

Electronically Filed

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Initial Study Report and Initial Study Report Meeting

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11, on December 5, 2022, Duke Energy filed the Revised Study Plan (RSP) describing the studies the Licensee is proposing to conduct in support of relicensing the Project. The Commission approved the RSP with modifications on January 4, 2023, in its Study Plan Determination (SPD).

Initial Study Report

As approved by the Commission in its SPD, Duke Energy is implementing the following six studies:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;

- Cultural Resources Study; and
- Environmental Justice Study.

During the 2023 field season, Duke Energy conducted studies in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC's SPD. In accordance with 18 CFR §5.15, Duke Energy has provided the attached quarterly updates regarding study implementation and is hereby filing the Initial Study Report (ISR) with the Commission. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission.

Duke Energy is filing the ISR with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. Parties interested in the relicensing process may obtain a copy of the ISR electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2] If any party would like to request a CD containing a copy of the ISR, please contact the undersigned at the address listed below. Note that Critical Unclassified Information (CUI) pertaining to locations of protected archeological sites is being filed separately.

ISR Meeting

The Commission's regulations at 18 CFR §5.15(c) require Duke Energy to hold a meeting with relicensing participants and FERC staff within 15 days of filing the ISR. Accordingly, Duke Energy will hold an ISR Meeting from 9:00 AM to 5:00 PM (approximately) on Wednesday, January 17, 2024, at its Wenwood Operations Center in Greenville, SC. An agenda for the ISR Meeting is provided in Attachment 3. Participants are free to join the meeting in its entirety or in part based on interests or availability, but please note the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Duke Energy encourages in-person participation by stakeholders and Commission staff, but can provide a Microsoft Teams option for participants where needed. Stakeholders who are interested in participating via web meeting should contact John Crutchfield (john.crutchfield@duke-energy.com) by January 11, 2024, to request such accommodation.

Duke Energy respectfully requests that the stakeholders who will attend the meeting contact John Crutchfield (contact information provided above) before close of business on Thursday, January 11, 2024. Lunch will be provided for meeting attendees who register their attendance by that date.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://badcreekpumpedstorage.com

the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Director of Outreach and Assistance
Federal Energy Regulatory Commission
Office of Public Participation
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission
Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs,
Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs,
Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

U.S. Army Corps of Engineers,
Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers,
Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers,
Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers,
Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs,
Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture,
Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of
Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency,
Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency,
Region IV
kajumba.ntale@epa.gov

Melanie Olds
FERC Coordinator
U.S. Fish and Wildlife Service,
SC Ecological Services Field Office
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service, Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service, Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
chris.wood@ncwildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

Jeff Boss
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave, 8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave, 8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Thursday, January 4, 2024 2:41 PM
To: Alexander, Thomas - SC Senate; Amedee, Morgan D.; Andrade, Kristin - USACE Greenville; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; bereskind; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance; Carter, Jerry - SC House of Representatives; Case, Mike; Cato, Van - US Senate; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Mayor, Clemson - cityofclemson; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Edwards, Danny - City of Walhalla, SC; Farrell, Christine - NC State Parks; Fell, Aiden - SCDPRT; Gestwicki, Tim - NC Wildlife Federation; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gledhill-Earley, Renee - NCSHPO; Gordon, Jeffrey - SC Office of Reg Staff; Goudreau, Chris, NCWRC; Green, Sara - SC Wildlife Federation; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Rowdy Harris; Hawkins, Ray - Jocassee Outdoor Center; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hreha, Lisa - USACE; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Johnson, Elizabeth - SCDAH; Keene, Terry - AQD; Kulpa, Sarah; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; Mitchell, Phil - Fishers Knob Home Owners Group; Ntale, Kajumba - Chief - USEPA; Olds, Melanie J; Owen, Donna - City of Pickens; growens@gmail.com; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Lorianne Riggin; Rimkunas, Matt - US Senate; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Sandifer, Bill - SC House of Representatives; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; Strong, Brian - NC State Parks; Stuart, Alan Witten; Tarver, Fred - NCDEQ; Thayer, Anne - SC House of Representatives; Liz Thomas; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation; Townsend, Russell - Eastern Band of Cherokee Indians; US Bureau of Land Management; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130 @gmail.com; Yantis, Gerry - AQD
Subject: P-2740 Bad Creek Relicensing - Initial Study Report Filing

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new

license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the next major ILP submittal, the Initial Study Report (ISR), which was electronically filed with FERC by Duke Energy on January 4, 2024. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission. Duke Energy is distributing this letter to the parties listed on the attached distribution list. Please note that, due to file size restrictions, the ISR is not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

In accordance with 18 CFR §5.15(c), Duke Energy intends to hold an ISR meeting with relicensing participants and FERC staff from 9:00 AM to 5:00 PM (approximately) on **Wednesday, January 17, 2024**, at our Wenwood Operations Center in Greenville, SC. Refer to the attached cover letter for additional meeting information and RSVP instructions.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

From:	Crutchfield Jr., John U
To:	Alex Pellett; Alison Jakupca; Amy Breedlove; Andrew Grosse; Austen Attaway; bereskind; Green, William G; caitlin.rogers; Christopher Moore; Churchill, Christy; Wes Cooler; Dan Rankin; Andy Douglas; Greg Mixon; jhains@g.clemson.edu; Erika Hollis; Jeff Phillips; Jennifer Kindel; EMJOHNSON@scdah.sc.gov; jtk7140@me.com; Keith A. Bradley; Kelly Kirven; Ken Forrester; Kulpa, Sarah; quattrol; Dunn, Lynne; Raber, Maverick James; McCarney-Castle, Kerry; Abney, Michael A; Elizabeth Miller; lputnammitchell@gmail.com; Amedee, Morgan D.; Morgan Kern; Mularski, Eric; Wahl, Nick; Olds, Melanie J; Pat Cloninger; More, Priyanka; Bill Ranson-Retired; SelfR; Rowdy Harris; Salazar, Maggie; Samantha Tessel; Fletcher, Scott T; Scott Harder; taylors@dnr.sc.gov; Settevendemio, Erin; Chris Starker; Stuart, Alan Witten; Tom Daniel; Wenonah Haire; Dale Wilde; William T. Wood; suewilliams130@gmail.com; simmonsw@dnr.sc.gov; gcyantis2@yahoo.com; Kevin Nebiolo
Cc:	Lineberger, Jeff
Subject:	RE: Bad Creek Relicensing - Initial Study Report Meeting Agenda
Date:	Monday, January 8, 2024 6:19:41 AM
Attachments:	Bad Creek Initial Study Report Meeting Agenda_01-17-2024.pdf
Importance:	High

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Bad Creek Relicensing Stakeholders:

Please find attached the agenda for the upcoming Bad Creek Relicensing Initial Study Report (ISR) meeting to be held on Wednesday, January 17, 2024, 9 am–5 pm, at the Duke Energy Wenwood Operations Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100).

Thanks, and we look forward to seeing you at the meeting.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

Meeting Agenda

Bad Creek Pumped Storage Project Relicensing
Initial Study Report Meeting

January 17, 2024
9:00 am – 5:00 pm

Wenwood Operations Center
425 Fairforest Way, Greenville, SC 29607

Introduction • Welcome and Agenda Review • Safety Moment • Introductions and FERC ILP Schedule Review	Alan Stuart
Water Resources	
• Task 1: Summary of Existing Water Quality Data and Standards	Maverick Raber
• Task 2: Water Quality Monitoring in Whitewater River Arm	
• Task 3: Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)	Joe Dvorak
• Task 4: Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)	Jen Huff
• Task 5: Water Quality Management Plan	Maverick Raber
Break	
Recreational Resources • Task 1: Foothills Trail Recreation Use & Needs • Task 2: Foothills Trail Conditions Assessment • Task 3: Whitewater River Cove Existing Recreational Use • Task 4: Whitewater River Cove Recreational Public Safety Evaluation	Kelly Kirven
Lunch	
Aquatic Resources	
• Task 1: Entrainment	Kevin Nebiolo
• Task 2: Desktop Studies on Pelagic & Littoral Habitat	Erin Settevendemio
• Task 3: Mussel Surveys & Stream Habitat Quality Surveys	Erin Settevendemio
Break	
Environmental Justice	Alison Jakupca
Cultural Resources	Christy Churchill
Visual Resources	Jen Huff
Proposed Spoil Area Herptile Survey	Scott Fletcher
Closing	Alan Stuart

From: Crutchfield Jr., John U
Sent: Tuesday, January 9, 2024 10:41 AM
To: Allan Creamer <Allan.Creamer@ferc.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: RE: [EXTERNAL] Bad Creek ISR meeting

Allan: One follow-up. Attached is the meeting agenda, FYI.

Thanks, John

From: Crutchfield Jr., John U
Sent: Tuesday, January 9, 2024 10:36 AM
To: Allan Creamer <Allan.Creamer@ferc.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: RE: [EXTERNAL] Bad Creek ISR meeting

Allan: Thanks, Happy New Year and good to hear from you!

I will forward you the Outlook Calendar notice which contains the Microsoft Teams link so you can join virtually.

Let Alan Stuart or me know if you have any questions or any issues access the Teams link. My mobile number is in my title address below.

Take care,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From: Allan Creamer <Allan.Creamer@ferc.gov>
Sent: Tuesday, January 9, 2024 10:32 AM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Subject: [EXTERNAL] Bad Creek ISR meeting

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Good Morning John,

I hope all is well with you, and you had a wonderful Christmas and New Year's.

I am working with David Dandy, our newest fish biologist in our group, on the Bad Creek Project. He will be attending the ISR in person. However, I will not be able to attend in person. However, I am letting you know that I would like to attend virtually, through the Microsoft Teams option. Please add me to your list of virtual attendees for this meeting.

Thank You!

Allan

Subject: FW: [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Thursday, February 1, 2024 2:21 PM
To: Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Shannon Bobertz <BobertzS@dnr.sc.gov>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <RigginL@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of

Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Wood, Chris J. <chris.wood@ncwildlife.org>; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; Al Shadwick <shadwick@hotmail.com>
Subject: Bad Creek Initial Study Report Meeting Summary

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants. On February 1, 2024, Duke Energy filed the ISR Meeting summary and a copy of the meeting presentation with FERC. The transmittal letter for this filing is attached. Please note that, due to file size restrictions, the meeting summary and presentation are not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Regards,
Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
525 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

February 1, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Filing of Initial Study Report Meeting Summary

Dear Acting Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants.

Pursuant to 18 CFR §5.15(c)(3), Duke Energy hereby files for Commission and stakeholder review the ISR Meeting summary. The ISR Meeting presentation is included as an attachment to the ISR Meeting summary. Duke Energy is filing the ISR Meeting summary with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. Parties interested in the relicensing process may obtain a copy of the ISR Meeting summary electronically through FERC's eLibrary system, or from Duke Energy's public relicensing website (https://badcreekpumpedstorage.com).

Duke Energy is not proposing any substantive modifications to ongoing studies or new studies based on discussion during or feedback on the ISR. As described in Section 1.1 of the ISR, Duke Energy has and will continue to consult with the relicensing Resource Committees voluntarily convened by Duke Energy to facilitate implementation of the relicensing studies and development of Duke Energy's relicensing proposal in the future draft and final license applications. Minor modifications to study methodology as noted in the ISR, primarily including expansions of methods or geographic scope to address specific stakeholder interests or requests relevant to the future environmental analyses that will be performed by FERC and other agencies, have been and will continue to be, as practicable, accommodated by Duke Energy in consultation with the Resource Committees.

The enclosed meeting summary highlights action items (for Duke Energy) that arose from discussions at the ISR meeting. This filing directly addresses several requests from the Commission staff at the ISR meeting, except those that will be provided to FERC by Duke Energy with the Updated Study Report (USR), which is scheduled for filing in January 2025:

- Updated spatial (GIS) data corresponding to study boundaries and proposed project facilities.
- Raw data from the Water Quality Study field data collection effort (Excel file to be filed along with the USR).
- Updates to the Environmental Justice Study Report to account for the most current Census data practicably available.

Duke Energy appreciates the participation of and looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301
Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Danny Edwards
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
dannyedwards@bellsouth.net

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstate forever .org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Meeting Summary

Project:	Bad Creek Pumped Storage Project Relicensing (FERC Project No. 2740)
Subject:	Initial Study Report Meeting
Date:	Wednesday, January 17, 2024
Location:	Duke Energy Wenwood Operations Center, 425 Fairforest Way, Greenville, South Carolina and Teams Meeting (virtual option)

In-person Attendees

Alan Stuart (Duke Energy)
John Crutchfield (Duke Energy)
Scott Fletcher (Duke Energy)
Nick Wahl (Duke Energy)
Mike Abney (Duke Energy)
Maverick Raber (Duke Energy)
Ethan Pardue (Duke Energy)
Garry Rice (Duke Energy)
Christy Churchill (Duke Energy)
Jeff Lineberger (Duke Energy)
Kelly Kirven (Kleinschmidt Assoc)
Kevin Nebiolo, PhD. (Kleinschmidt Assoc)
Todd Branham (Long Cane Trails)
Sarah Kulpa (HDR)
Ty Ziegler (HDR)
Joe Dvorak (HDR)
Eric Mularski (HDR)
Jen Huff (HDR)
Kerry McCarney-Castle (HDR)
Erin Settevendemio (HDR)
Bill Green (Terracon)
Mills Dorn (Terracon)
Erika Hollis (Upstate Forever)
Chris Starker (Upstate Forever)
Phil Mitchell (Fisher Knob HOA)
Jennifer Kindel (SCDNR)
Austen Attaway (SCDNR)
Pat Cloninger (SCDNR)
Alex Pellet (SCDNR)
Dan Rankin (SCDNR)
Lynn Quattro (SCDNR)
Sue Williams (AQD)
Gerry Yantis (AQD)
Terry Keane (AQD)
Wes Cooler (Naturaland Trust)
Glenn Hilliard (Foothills Trail Conservancy)
Rowdy Harris (SCPRT)
Andy Douglas (SC Wildlife Federation/ Jocassee Lake Tours)

Virtual Attendees

Alan Creamer (FERC)
Sarah Salazar (FERC)
David Gandy (FERC)
Dustin Wilson (FERC)
Catherine Roberts (FERC)
Mike Spencer (FERC)
Melanie Olds (USFWS)
Bill Ranson (Foothills Trail Conservancy/ Professor Emeritus Furman Univ.)
Jeff Phillips (Greenville Water)
Amy Chastain (SCDNR)
Elizabeth Miller (SCDNR)
Kelly Schaeffer (Kleinschmidt Assoc)
Alison Jakupca (Kleinschmidt Assoc)
Andrew Gleason (Foothills Trail Conservancy)
Lynne Dunn (Duke Energy)

Introduction (9:00 am)

The Bad Creek Pumped Storage Project (Bad Creek) Initial Study Report (ISR) was filed with the Federal Energy Regulatory Commission (FERC) on January 4, 2024 – this meeting is being held to discuss the individual studies and study findings presented in the ISR and receive feedback from relicensing participants/stakeholders as well as FERC under the Integrated Licensing Process (ILP) 18 CFR §5.15.

Alan Stuart (Duke Energy Project Manager) opened the meeting, welcomed participants in the room and online, stated the meeting would be recorded, and provided an overview on meeting facility layout and emergency action responsibilities. He then stepped through the meeting agenda, facilitated participant introductions, and provided a safety moment (frostbite). Sarah Salazar (FERC Project Coordinator) requested that the list of meeting attendees be filed with the meeting summary. A. Stuart confirmed the list of attendees will be included with the filing.

Bill Ranson (via chat) requested a moment of silence in recognition of the passing of Malcolm Schaffer, a well-respected geologist, friend, and colleague who performed most of the geologic mapping and geotechnical investigations for the original Bad Creek Project as well as recent geotechnical feasibility studies for the proposed Bad Creek II Complex (Bad Creek II) while working for Duke Energy then HDR. The group held a moment of silence to honor his life and contributions.

A. Stuart provided a general summary of the project and an overview of specific Project-related components that have changed since filing of the revised study plan (RSP) on December 5, 2022.

1. Expanded Project Boundary

A. Stuart presented a slide showing the proposed expanded project boundary for the proposed second powerhouse Bad Creek Power Complex (Bad Creek II). The existing FERC project boundary is proposed to be expanded by approximately 210 acres to enclose Duke Energy-owned land necessary for construction and operation of the new project facilities and that could potentially be affected by spoil placement from materials excavated for the proposed project expansion.

- S. Salazar asked if Duke Energy could submit a GIS file of the proposed expanded project boundary. A. Stuart agreed. ACTION ITEM – Duke Energy to submit GIS files.
- Chris Starker asked if Duke Energy has ownership of all property in the transmission line corridor or only its rights-of-way, and if so, would lease agreements be needed for the expanded project. A. Stuart noted Duke Energy owns most of the land in-fee-simple, though there is an agreement in place with the George Family to secure five parcels of private land (under purchase option) consisting of approximately 2,100 acres (of which 88 acres is expected to be needed for the expanded transmission corridor). Other than the 88 acres needed, the powerlines will be located in the existing power lines' corridors. The general area of purchase option was highlighted in the Teams Meeting chat.

    - C. Starker asked for clarification that no other purchases would be necessary and that would be the only other land will be acquired for transmission lines. A. Stuart confirmed.
- Rowdy Harris indicated that property is managed as a Wildlife Management Area (WMA) and asked whether Duke Energy will use what they need (88 of the 2100 acres) and allow public access to the remaining portion of the properties. A. Stuart indicated that that is not known but is a possibility.

2. Additional Spoil Area

A. Stuart introduced an additional potential spoil area (Spoil Area J) that has been added since the filing of the RSP (it is an existing spoil area from original construction) and indicated Duke Energy is still evaluating which spoil areas to use for Bad Creek II spoil placement based on natural resources studies and minimizing impacts to those resources as practicable relative to the feasibility of expanded project construction.

3. Temporary Access Road/ Fisher Knob Access Road

A. Stuart described the potential new temporary access road to provide access for residents of the Fisher Knob community during construction of Bad Creek II (while Bad Creek Road is closed to the public). Fisher Knob Access Road will be a connector road extending from Whitewater River Road to the Fisher Knob Community. The road will be predominantly gravel, 3.7 miles long, and would only be maintained during construction. The road would be closed following project construction.

- S. Salazar asked Duke Energy for the GIS files with new proposed spoil area and Fisher Knob Access Road and any other updated GIS layers. A. Stuart noted Duke Energy will share with FERC and also place on the relicensing SharePoint Site for project stakeholders. ACTION ITEM – Duke Energy to submit GIS files.
- Phil Mitchell asked how long the temporary road would be in place and maintained. A. Stuart answered 6 to 7 years (for the duration of construction). P. Mitchell asked if Duke Energy plans on installing a gate from Whitewater River Road/ Rt 130. A. Stuart said while that level of detail hasn't been developed yet, it would be secured since it would provide alternate access to the construction/site.
- P. Mitchell asked where the turn off from Whitewater Road is located. A. Stuart indicated the location on the map and noted it is just above the entrance gate to Fisher Knob, near the Jersey barriers located along highway 130, and would extend south of the old laydown yard into Fisher Knob community (near the existing entrance gate). A. Stuart briefly noted there were two options for access roads and Duke Energy considered the one with the least impacts to streams and natural resources.
- Garry Rice asked for clarification on the length of the access road. (3.7 miles)
- Andrew Gleason asked, for trail maintenance reasons, would the Foothills Trail Conservancy (FTC) use the temporary access road to access Musterground Road site and is the plan to close hiking access during the construction period. A. Stuart noted the current plan is to close public access to Musterground Road because the entrance (parking) area will be part of the active construction site for 6 to 7 years.

- S. Salazar asked for a description of the Fisher Knob community. A Stuart noted it is a residential community with 22 houses (per P. Mitchell) in the community; four of those are rental homes and the rest are vacation homes. There is only one full-time resident (P. Mitchell). There are two new homes under construction for a total of 24 properties in the Fisher Knob Community.
- S. Salazar asked for confirmation that the justification for building the road is to provide access to the residents. A. Stuart noted yes, that is correct, as Duke Energy is concerned about construction traffic and the public sharing the same road. P. Mitchell added there is currently only one way off the peninsula (i.e., Bad Creek Road) and if Bad Creek Road would somehow fail or be impassable, there would be no way to access homes (residents or emergency services). Duke Energy agrees it is important to provide alternate access for homeowners and first responders, but also to minimize impacts to the extent feasible and reiterated the road will not be paved or permanent.
- P. Mitchell asked when Duke Energy anticipates closing Bad Creek Road. A. Stuart noted the access road would need to be developed and in place prior to Bad Creek II construction.
- E. Miller asked for confirmation that Musterground Road would be closed (to the public) for entire construction period (6-7 years). A. Stuart confirmed yes, access would be closed to through-traffic and recreation during construction period. There will be heavy construction traffic in that area due to proposed spoil location J and construction of the new powerhouse and switchyard in the area, therefore, due to safety reasons, Duke Energy plans to shut down access, and acknowledges this will be a temporary impact that needs to be considered in mitigation or enhancement plans for the new license.
- Pat Cloninger noted SCDNR owns land with lake access to Musterground Road. How would access be mitigated/how would DNR be able to access that site? A. Stuart said he was unaware there was access to the lake from Musterground Road and will need to discuss further with the SCDNR. However, A. Stuart noted that the concern is for public access and SCDNR should be able to maintain access in coordination with Duke Energy. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- E. Miller stated that Duke Energy and SCDNR will also need to discuss SCDNR's prescribed burning schedule and management operations in the vicinity of Musterground Road. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- Dan Rankin asked for confirmation that access to the Whitewater River Falls overlook and parking area would also be closed during the construction period. A. Stuart confirmed this is presently the plan and expectation.
- A. Stuart discussed the plan for temporary metal bridges crossing streams along the temporary access road to minimize impacts and added that Duke Energy has expanded relevant relicensing studies (change from RSP) to incorporate additional assessments for water, aquatic, visual, and cultural resources with potential to be impacted by the temporary access road. Additionally, work for Section 404/401 permitting has begun and will consider all potential impacts associated with the proposed temporary access road.

4. Increase in Hydraulic Capacity for Proposed Bad Creek II

A. Stuart noted the proposed maximum hydraulic capacity for Bad Creek II has changed since originally estimated in the Bad Creek II feasibility study for variable speed units, based on information provided by turbine manufacturers. There is a <2 percent difference (increase) in generation and an approximate 9 percent difference (increase) in pumping capacity than originally accounted for in design assumptions. Studies affected by this pumping change include the entrainment study and the CHEOPS study. Additionally, A. Stuart noted Duke Energy also plans to run model scenarios with a previously developed near-field CFD model to estimate the effects of increased pumping capacity (increased generation won't be considered due to marginal increase of <2 percent).

- Microsoft Teams Chat Conversation: S. Salazar asked SCDNR in their comments on the ISR for additional information regarding management goals for prescribed burning and typical frequency of controlled burns near Musterground Road. E. Miller replied SCDNR will need to discuss internally as this will be a 10-Year Plan.
- Erika Hollis asked for clarification that studies completed and included in the ISR did not take into consideration the recently revised generation/pumping capacities. A. Stuart confirmed.
- S. Salazar asked whether pumping/generation increases change the normal/maximum pool elevations for Bad Creek Reservoir or water fluctuation. A. Stuart stated that Duke Energy will continue to operate under the existing (160-foot) operating band for min elevation / max elevations (as defined by the existing license), but Bad Creek II will allow for faster water exchange between the upper and lower reservoirs.
- C. Starker asked whether additional studies (due to recently defined increases in pumping and generation) affect the relicensing timeline and whether there will be an updated ISR or additional studies. A. Stuart noted relevant reports would be updated and re-distributed (i.e., entrainment report is the only affected report that has been distributed thus far; CHEOPS report is not yet drafted and the CFD modelling will be a different effort from the original study under the Water Resources Task 3 report) to the resource committees. The relicensing timeline would not be affected. A. Stuart also stated that the updated reports and consultation with Resource Committees would be included with the Updated Study Report (USR) to be filed with FERC in January 2025. C. Starker asked if Duke Energy would like to see comments now, as well as on the revised report. A. Stuart encouraged submitting comments on the ISR now.
- S. Salazar stated a second season of studies is typical for relicensing through the ILP process; noted the table on page 43 of the ISR outlines the ILP milestones and encouraged stakeholders to refer to the schedule and be aware of milestones so opportunities aren't missed to submit comments and offered participants to reach out to her with process-related questions.

John Crutchfield introduced the individual studies and Duke Energy relicensing leads for each study and also stepped through the ILP Schedule, stating 2023 was the first year of studies and many update meetings were held throughout the year with various resource committees to

gather feedback and foster collaboration as part of the ILP process. Quarterly progress reports were also submitted per the ILP process in 2023.

He then turned the meeting over to Maverick Raber to begin the individual study discussions. The presentation is attached to this meeting summary.

Water Resources (10:00 am)

Task 1 – Existing Summary of Water Quality Data and Standards

M. Raber presented an overview of objectives, methods, and results of Task 1. Task 1 is complete and the final report was filed with the ISR.

- No comments/questions or discussion.

Task 2 – Water Quality Monitoring in the Whitewater River arm

M. Raber presented an overview of objectives, methods, and results of Task 2. A draft report including results of Study Year 1 was filed with the ISR; results of Study Year 2 will be shared with the resource committees and a synthesis of both years of data will be provided in the USR.

- No comments/questions or discussion.

Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee due to a Second Powerhouse

Joe Dvorak presented an overview of objectives, methods, and results of Task 3.

- C. Starker asked if the increased velocity (in Whitewater River cove flow over the expanded weir) is due to the increased pumping under Bad Creek II or if it is due to the extension of the weir. J. Dvorak noted it's a combination of both; expanding the weir doesn't have any impacts regarding mixing downstream under increased generation, however, it slightly accelerates flow across the top of the weir under maximum reservoir drawdown conditions, which haven't ever occurred.
- Wes Cooler asked what J. Dvorak's opinion on the cost-benefit of expanding the submerged weir. J. Dvorak stated that there are environmental and cost benefits regarding spoil placement and location of placement to consider; however, from a hydraulics standpoint, expanding the weir wouldn't have a significant effect either way. He noted Lake Jocassee has never been drawn down to minimum pond where changes in velocity magnitude would be most evident from the increased generation and pumping under the Bad Creek II scenarios modeled for the CFD studies.

Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS modeling)

Jen Huff presented an overview of objectives of Task 4, work done thus far, and changes to the existing CHEOPS model originally used for Keowee-Toxaway Project relicensing. Sue Williams

confirmed units of measurement. J. Huff stated work is ongoing and results will be shared with resource committees in Spring 2024.

- No comments/questions or discussion.

Task 5 – Future Water Quality Monitoring Plan

M. Raber stated Task 5 will begin this year (2024). Tasks 1-4 objectives were to assess current operations, while Task 5 will be carried out in coordination with resource committees and Section 404/401 permitting activities considering future activities. This task will be broader in scope and will incorporate potential spoil impacts.

- S. Salazar asked about the composition (size class and rock/mineral type) of the spoil materials that will be potentially placed. For example, concerning Spoil Location A on the downstream side of the weir and mixing on the downstream side of the weir, would that have implications for turbidity issues in the Whitewater River cove? (*Note – the word "backside" in reference to the weir was used in this comment; for clarity, significant vertical mixing in the Whitewater River cove is typically limited to the upstream side of the weir [the side closer to the Project], while there is very limited/localized mixing on the downstream side of the weir*). Also, would inherently low pH in the existing bedrock and weathered soils have implications for lowering pH in the water?
- M. Raber answered there is minor mixing (localized eddies) on the downstream side of the weir where rock spoils (mostly boulder-sized) would be potentially placed to extend the weir in the downstream direction. These are the types of impacts that will be addressed in the development of Task 5 of the Water Resources Study; the spoil make-up and locations will be further analyzed under this task. M. Raber agreed that the area is underlain by mostly granitoids with low alkalinity, which results in headwaters low in pH. A. Stuart prompted M. Raber to briefly describe a situation at the Cedar Cliff Hydro project where water quality during and after construction (including placement of rock spoil in a deep reservoir) was evaluated due to high pyrite content in the spoils placed in the reservoir; however, no changes to water quality resulting from placed spoils have been observed.
- E. Hollis asked where the other dam is located – M. Raber stated it is in Tuckaseegee, North Carolina (*for clarity – 16 miles north*) with similar geology and terrain as Bad Creek. R. Maber noted elevated turbidity was an issue at Cedar Cliff during placement of finer grained material. A. Stuart stated there were lessons learned at the Cedar Cliff project (fines were filtered from the rock before placing the rock) that may be applicable to Bad Creek, which could also include some sort of screening or separating out of fines prior to placement in the lake.
- B. Ranson noted the Bad Creek site is underlain predominantly by Toxaway Gneiss (granitic) and some schist, which would have naturally low pH/result in slightly acidic weathered rock/soils.
- S. Salazar mentioned she looks forward to further information and synthesis on these topics and wants to make sure studies or components of studies aren't considered in a vacuum.

- C. Starker asked out of the ten potential spoil sites, how would spoils be placed and is there purposeful intent on location placement, or is it based on convenience since many look like they are on streams/headwaters. M. Raber reiterated the steep topography of the site and associated streams are largely ephemeral and intermittent. Scott Fletcher stated there were eight terrestrial spoil areas assessed and the cover type of most spoil areas consists mostly of mixed hardwood-pine and several areas did have steep ephemeral streams bisecting the site. Most locations, except location J, are mature forested areas. Sarah Kulpa added many of the potential spoil areas correspond to areas of previously used spoil areas (associated with the original construction and noted that several of these areas were revegetated (forested) following Bad Creek Project construction. Placement of spoils also takes into consideration access to excavation areas as well as the limits of topography. M. Raber noted locations will be chosen to minimize impacts, to the extent possible, and these are items/impacts that will be considered under Task 5 (Future Water Quality Monitoring Plan) of the Water Resources Study in 2024.
- C. Starker clarified his earlier question that nothing “intentional” will be done with the spoil material for stream restoration or perhaps enhancements in the Foothills recreation trail corridor. M. Raber stated that from a water resources perspective, spoil placement will also be addressed under the 404/401 permitting, including alternatives analysis for different disposal options. Eric Mularski noted Duke Energy will be working through permitting process with the U.S. Army Corps this year – and not all spoil areas will be used. An Approval for Jurisdictional Determination (AJD) request will be submitted for the 404/401 application as well.
- S. Salazar asked about selection of spoil area placement areas vs. placement out of convenience and wouldn’t a goal of the modeling effort be to determine if adding to the existing submerged weir (Spoil Area A) would mitigate vertical mixing and exchange rates vs. not disposing anything along the weir.
- A. Stuart answered yes, one of the mitigative components to reduce spoils in the uplands is to place more spoils along the weir, which is why Duke Energy performed CFD modeling to ensure that placing spoil at the downstream side of the weir would not have adverse water quality impacts with regard to vertical mixing (per the results of the CFD modeling under Task 3 of the Water Resources Study).
- Sarah Kulpa noted the allocation of spoils in individual spoil locations would also be a function of the excavated material sizes (i.e., finer soils vs. large rock). A. Stuart agreed that the material size and quality will be a limiting factor and consideration in placement.
- S. Salazar noted that while spoils could be considered an impact, there are potential benefits associated with the spoils. A. Stuart noted these factors will be taken into consideration in consultation with stakeholders in the license application and 404/401 permit application.

Break (11:18am)

John Crutchfield said due to short time period prior to the lunch break, the Cultural Resources presentation would occur before lunch rather than afterward, with the Recreation Resources

presentation to begin after lunch. The slight change in the agenda order was noted but otherwise the remaining Resource Committee presentations on the published agenda are in the presented order during the afternoon session.

Cultural Resources (11:29 am)

Christy Churchill provided an overview of the objective, methods, and results of the Cultural Resources Study and introduced Bill Green and Mills Dorn of Terracon who performed the Cultural Resources Survey. She noted the letter for the original Area of Potential Effects (APE) was filed with the State Historic Preservation Office (SHPO) in November of 2022, and in September of 2023, a subsequent letter asking for concurrence on the expanded APE (in alignment with the proposed expanded project boundary) was filed. (*Note: the figure on Slide 151 reads "original project boundary", however, it should read "proposed expanded project boundary"*).

- C. Churchill provided definitions for the SHPO and THPO (Tribal Historic Preservation Office) acronyms.
- Catherine Roberts provided clarification on the term "Paleoindian," which is a somewhat arbitrary term referring to the time around the last glacial maximum around (~10,000 years bp). She stated the ISR indicated this site may not be able to be avoided (Site 38OC249). C. Churchill noted no impact or disruption to this site is anticipated; it's on the edge of the APE and not near any construction.
- C. Roberts stated none of the artifacts shown in the report looked Paleoindian and are probably later as Paleoindian sites are rare. B. Green noted the projectile points shown on Slide 153 could be potential Haw River projectile points due to the distinct notches on the (pre-Clovis, Paleoindian, or early archaic) projectiles, which were found below early archaic points, which is why the report says possible Paleoindian.
- Jennifer Kindel asked if any bats / evidence of bats were noted in the rock shelter? S. Fletcher noted he would carry out a field reconnaissance to confirm bat evidence in the rock shelter and noted there was a bat survey done in 2021, however, this rock shelter was not included in the study. ACTION ITEM – Duke Energy to make a site visit to rock shelter to assess for evidence of bats.
- Andy Douglas mentioned drone sightings were reported over the summer by boaters. A. Stuart said those were probably the drones deployed for the Whitewater River Cove Boat Evaluation survey for the Recreation Study.
- S. Salazar made the correction that the boundary shown on the slide is the proposed expanded APE, not the existing APE. A. Stuart pointed out the two alternatives for Fisher Knob access road on the existing map.
- E. Miller asked for clarification if Duke Energy was going to carry out a full survey of the rock shelter for bats. S. Fletcher said they would add it to their field list and take it under consideration during upcoming study plan development for bat surveys for the 404/401 permit. E. Miller asked if the results would be included as an addendum to the original bat survey (done by ESI in 2021). A. Stuart clarified it might not be an addendum but would be made available the resource agencies.
- Jennifer Kindel reminded the group any bat surveys need to be timed surveys.

- S. Salazar reiterated stakeholder request for bat presence in the rock shelter. Bat presences should be considered along the access road as well since there would be some new clearing.
- S. Salazar noted that on the slide shown (Slide 151), the alternative temporary road access road options are both blue and purple lines. (*Note: the chosen access road option is the purple alternative (northern route), which minimizes impacts to the Howard Creek riparian buffer zone and therefore is the preferred alternative. Both routes are shown on the figure because both routes were surveyed for the Cultural Resources Study*).
- S. Salazar reiterated that any concerns or identification of data gaps should be filed in comments on the ISR meeting summary. And additional information requests or modifications to any of the existing studies need to be submitted in the ISR so modifications can be made in the second year of studies. Please file comments incorporating any additional information that needs to be collected in light of the changes to the Project since the RSP filing.
- S. Salazar asked, regarding drones and associated complaints, whether Duke Energy notifies the public and if not, is that something that can be done to alleviate concerns proactively.
- C. Churchill noted they do notify the FAA but don't notify individuals of the public. The drone Andy Douglas referenced earlier was study related and otherwise, Duke Energy drone surveys are limited to the transmission lines. Homeowners (Fisher Knob) were also made aware of the drones, stakeholders, as well as State Park representatives. Boaters are from all over (out of state) - R. Harris mentioned the only way to make the information available would be to place a flyer at the state park boat ramps, and these do not typically receive much attention from visitors.

<<< Please Note: Duke Energy has redacted the photo of the rock shelter (Site 38OC249) from the ISR meeting presentation (Slide 154) to avoid public disclosure of potential location.>>>

Lunch 11:51 (S. Salazar asked Duke Energy to mute the Microsoft Teams meeting during the lunch break.)

Recreational Resources (12:35)

Task 1 – Foothills Trail Recreation Use and Needs

Kelly Kirven gave an overview of the objectives, methods, and preliminary results of Task 1 of the Recreational Resources Study.

- G. Rice asked about QR codes for the surveys and how effective the QR code surveys were and if during the survey recreationists were asked if they scanned a QR code. K. Kirven noted responses vary depending on recreation site and the 61 surveys they did receive is a good dataset to work with. She indicated many folks don't like to stop to do an in-person survey, so facilitators let them know there were QR codes (and a website address) at the trail heads to take the survey later. K. Kirven noted that based on

Kleinschmidt's experience with these types of surveys, the quality of responses provided later in time (i.e., via QR code or website) can vary and also be disassociated with recreation location. As such, information will be analyzed separately as cell service is limited on the trail and surveys accessed via QR codes were likely filled out later. The carrying capacity will be done in collaboration with Jeremy Wimpey at Applied Trails Research.

- Dustin Wilson noted in the Study Plan Determination (SPD) FERC recommended Duke Energy develop a website for recreationists to access the survey in addition to providing the QR code in the field, mostly because sometimes QR codes aren't self-explanatory. He asked if specific instructions on how to access the survey after scanning the QR code were provided by the facilitators. K. Kirven noted they did not distribute instructions; however, when recreationists encountered a survey facilitator, the facilitator gave them instructions on how to access the survey via the QR code. K. Kirven stated in a previous meeting in consultation with the Recreation and Visual Resources Committee, Duke Energy decided it may be best to not include the survey on the website because that would allow people who had not actually been on the trail to fill out the survey. D. Wilson noted FERC does not recall reading about the decision not to include the surveys on the website and asked that future decisions be included in future filings. (*Note for clarification – not discussed directly during the meeting – while Duke Energy did not provide access to the survey on the relicensing website, the signs posted at trail access locations with the QR code also provided a website address [URL] that users could access directly instead of the QR code to complete the survey. Duke Energy believes that this fulfilled the intent of FERC's comment on the SPD.)*
- D. Wilson mentioned he had questions regarding trail carrying capacity and asked if any representatives from Applied Trails Research were present on the call. K. Kirven asked for FERC to submit their questions to her and she would distribute them to Applied Trails Research. D. Wilson noted that sometimes in order for a carrying capacity analysis to result in long term solutions and in consideration of the public and stakeholders, it is useful for stakeholders to see photographs of groups of hikers to help them provide input on carrying capacity. K. Kirven noted the study is still underway so any input or suggestions FERC has will be considered for incorporation into the study report.
- E. Miller asked if, in addition to the use data collected via traffic counters, there will be additional data collected on the type of recreation activities visitors are participating in on the land accessed via the Musterground Road. K. Kirven acknowledged there are a variety of activities that could potentially occur on the land accessed via Musterground Road, although no additional data collection is planned at this time. E. Miller stated during the study development there was no mention the site would be closed for 6-7 years, so that is a new impact that needs to be taken into consideration. K. Kiven acknowledged due to the evolving circumstances surrounding construction and spoil placement and the many unknowns surrounding the new powerhouse, the 6-7 year closure wasn't determined at of the time of the study plan development however, these impacts will certainly be acknowledged and addressed to the extent possible. *(Note for clarification – not discussed directly during the meeting – the RSP does acknowledge closure as a potential short-term impact to recreational resources, however at the time of*

study plan development, it was anticipated that the Wildlife Management Area lands accessed via Musterground Road would not be affected.)

- Duke Energy will hold a Recreation and Visual Resources Committee meeting to talk through some of the recent changes to plans for Musterground Road access, among other topics.

Task 2 – Foothills Trail Conditions Assessment

K. Kirven gave an overview of the objectives, methods, and results of Task 2 of the Recreational Resources Study. The Foothills Trail (FHT) conditions assessment was performed by Long Cane Trails. She also noted this task is focused on the trail corridor; a draft report has been submitted and Duke Energy is working through submitted comments. Comments were received by the FTC, SCDNR, and Friends of Lake Keowee Society (FOLKS), however, due to the compressed timeline between receiving comments and the ISR filing, there was not enough time to meet with the resource committee, therefore, the draft report was filed with the ISR and a meeting will be held with the resource committee in the near-term to discuss study results and comments. A final report will be filled with the Updated Study Report.

- C. Churchill asked about figure and if the trail (blue line) follows the actual trail. K. Kirven answered it does roughly follow the trail but is not refined. The FTC provided a similar comment. The trail corridor displayed in the figures will be refined in the final report.
- Glenn Hilliard asked how and when will comments on the Task 2 report be considered for incorporation in the report – the FTC provided many additional items for consideration in areas that may need upgrades. K. Kirven noted Duke Energy will hold a resource committee meeting in the near-term to identify maintenance vs. improvements vs. PM&E measures so Duke Energy can decide what upgrades may be incorporated into the study report. ACTION ITEM – Resource and Visual Resources Committee meeting to be scheduled
- D. Wilson noted the FTC provided comments on the PSP stating Duke Energy was interested in transitioning ownership of the trail to the FTC; this should be kept in mind considering there are 89 items identified for improvement along the 43-mile-long section. A. Stuart clarified – Duke was/is considering turning maintenance over to the FTC but has not committed to anything and discussions will continue if that route is chosen; Duke Energy will update FERC on any changes.
- D. Wilson noted along those lines regarding the Whitewater River cove closure and potential mitigation measures to address lack of access to that area, to keep in mind the potential to transfer maintenance to an agency and let FERC know of any mitigatory measures suggested by the agencies so FERC is aware. A. Stuart reiterated Duke Energy's goal is to develop a stakeholder settlement agreement and effectively mitigate to the extent possible and will certainly let FERC know of any proposed mitigation measures.
- S. Salazar noted culvert cleaning is listed as a maintenance item; in the interest of synthesizing information to facilitate the NEPA document there may be a need to consider cleaning of culverts on wildlife (e.g., tricolored bats) and other species that may use culverts for habitat. Fallen trees that are halfway felled could be considered snags

for bat (roosting) habitat. S. Salazar offered that this is just a reminder to not consider any study results in a vacuum.

- Kelly noted SCDNR did provide comments on the study report and many of those comments were centered on bat habitat and culverts. License application will include a proposal of maintenance/upgrades for comment/review for FERC's NEPA analysis.
- S. Salazar stated the tricolored bat is now a proposed species for listing under the Endangered Species Act, so FERC will be analyzing that along with other proposed species. FERC plans to update the IPaC report for the project based on new GIS files to get on the record before the second study season begins since the original IPaC is now outdated.
- J. Kindel also mentioned consideration of the gray bat which is a new addition to the species list for South Carolina and agreed with concerns around culverts along the trail.
- E. Miller (via chat) asked if photos of the culverts will be provided. K. Kirven answered the photos are small in the draft report (as insets) but perhaps could include larger versions of photos in an appendix to the final report. ACTION ITEM – topic to be discussed/reviewed at the Resource and Visual Resources Committee meeting.
- A. Stuart asked if is there a certain size criterion for culverts for bat habitat? J. Kindel noted SCDNR and SCDOT have been working together to identify a size criteria. Culverts running under highways with water running through are of key concern. For large colonies, a larger culvert would be needed. A. Stuart asked if this would include all culverts along the 43-mile-long trail. K. Kirven noted the only culverts that would potentially be disturbed (or cleaned) are the ones that were identified as needing maintenance during the assessment and noted that some language could be added into the license that during the license term bat surveys should be conducted prior to culvert cleaning. Todd Branham (Long Cane Trails) indicated none of the culverts he saw along the trail were larger than 24 inches in diameter and all were made of plastic. J. Kindel indicated that plastic culverts are not typically favorable bat habitat, as bats are not likely able to grip plastic for roosting. K. Kirven noted this will be a point of discussion in the upcoming meeting. ACTION ITEM – topic to be discussed at the Resource and Visual Resources Committee meeting.
- Glen Hilliard said in the original Bad Creek license, Duke Energy reserved the right to open/close/move the FHT at any time. He suggested that preserving the trail in perpetuity (conservation easement) would be desirable mitigation for Bad Creek relicensing. C. Churchill mentioned the trail is part of the existing license agreement. K. Kirven noted Duke Energy doesn't plan on closing the trail for any reason (portions of the trail could be closed at times due to safety concerns or maintenance needs) but that a complete trail closure is not a realistic scenario.
- A. Stuart noted the current lease expires in 2027 and at that time another long-term lease would be executed. K. Kirven indicated the FHT is a unique and regionally important recreation source, and preliminary recreation study results support that. G. Hilliard provided clarification on moving the trail – K. Kirven noted the carrying capacity analysis could indicate a need for small portions of the trail being shifted if a rare plant population, safety issue or something similar is identified.

- A. Gleason added not only is the FHT regionally important, visitors from every state and some other countries visit the FHT, attesting to its national importance. K. Kirven agreed – quite a few surveys were submitted by people visiting from other regions.

Task 3 – Whitewater River Cove Existing Recreational Use

Kelly Kirven gave an overview of the objectives, methods, and results of Task 3 of the Recreational Resources Study. This study task is complete.

- C. Churchill asked for confirmation if each dot on the figure shown on Slide 83 represents a boat. K. Kirven confirmed.
- In response to results of boats being displaced for the 5-7 years during Bad Creek II construction, C. Churchill asked if closures are from the entire lake or just Whitewater River cove, because there plenty of other things to do as far as recreating opportunities. Similarly, G. Rice added, boaters are not displaced from the lake, they are only displaced from the small portion of the lake (i.e., Whitewater River cove). K. Kirven clarified/agreed – the rest of Lake Jocassee will still be available to the public; displacement would only be from Whitewater River cove. Most recreationists in the Whitewater River cove were sightseeing as they spent less than an hour in the cove. There are similar types of sightseeing opportunities (i.e., other waterfalls) that would still be open to the public during Bad Creek II construction.
- C. Churchill asked how the study was conducted so the boats weren't counted more than one time. K. Kirven noted this was a challenging task carried out by a Duke Energy data analyst who devised a categorical system so that boats were assigned an identifier so they weren't counted twice.
- D. Wilson noted it would be a good idea as Duke Energy develops a construction/public safety/recreation plan for mitigation to consider different types of signage/online posting other types of recreation / scenic water falls in the area and even locations (lat/long coordinates) that the public could visit while they would not be able to recreate in Whitewater River cove. This is a potential mitigative measure Duke Energy could easily implement. K. Kirven agreed it would be a great idea to provide information on other lake features similar to viewing/recreation in the Whitewater River cove.
- A. Douglas added there is limited parking availability at Devils Fork State Park, which provides the only public access to Lake Jocassee and the Whitewater River cove. The SCPRT (Rowdy Harris) closes down the parking lot when it's full. Since there is limited public access to the lake, there is limited opportunity for increased use. There will be no more additional parking, no additional docks, in the next 5-7 years (i.e., usage is not likely to change). K. Kirven agreed – the lake has very low development and limited access so there's very little room for increased use.
- A. Gleason noted the parking capacity of Devils Fork State Park is not the only deciding factor regarding how many boats are on the lake. Rental boats have increased in the last few years (i.e., boaters who do not park in the lots).

Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

Kelly Kirven gave an overview of the objectives and methods of Task 4 of the Recreational Resources Study. This study will be conducted in 2024.

- C. Starker asked whether response rates were calculated for surveys under Task 1 of the Recreational Resources Study. K. Kirven noted as indicated in previous meetings, there was no response rate (except in person if a person declines the survey). Nothing was sent out with the expectation of getting responses back. Information documenting how many people declined and how many people had taken the survey before was captured. A. Stuart asked if there was a chance that the same person could be asked twice. By using the same three surveyors throughout the study, they were able to recognize folks who had taken the survey before so they weren't double counted; there was also a question on the survey asking visitors about timing or frequency of past visits.
- Gerry Yantis asked if there was a way to indicate how many actual people were in a group (e.g., one person may have done the survey in a group of 10). K. Kirven returned to an earlier slide under Task 1 (slide 67) showing the survey form which asks how many individuals are in the group. Traffic counters were used primarily to collect data about parking area usage to inform analysis of parking lot capacity and adequacy; trail counters were used to count individuals passing by the trail counter.
- No questions specific to Task 4 were received.

Aquatic Resources (1:49)

Mike Abney introduced the Aquatic Resources Study and provided the tasks under the study.

- David Gandy – FERC requests all raw water quality data and any associated metadata (file with USR). ACTION ITEM – Duke Energy to provide raw data to FERC.

Task 1 - Entrainment

Kevin Nebiolo discussed objectives, methods, and results of the Entrainment Study.

- C. Starker asked if regression models (or similar) were used to confirm there was an increased chance of entrainment at lower lake elevation levels? K. Nebiolo answered no, distributions were fit and medians were compared.
- A. Douglas asked about the total population of threadfin shad and how the total population of threadfin shad in the lake is known to estimate the total population that would be entrainable (12 percent). K. Nebiolo noted Duke Energy conducts annual hydroacoustic surveys of pelagic forage fish. A. Douglas noted shad are the primary prey for loons and stated that the majority of shad suffer mortality in the winter, and that is when the loons are present. K. Nebiolo said most shad are entrained in the meteorological fall, from September to November.
- D. Rankin asked if the use of American Shad as a surrogate for Threadfin Shad was based on swim speed or size. K. Nebiolo returned to an earlier slide to review the equation used which involves population growth rates and stated that there is not a discrete population growth rate available in literature or publicly available resources for

Threadfin Shad, therefore they identified several taxonomic surrogates and chose the most conservative option.

- A. Douglas asked if shad are put into the lake every year. D. Rankin answered shad are not stocked, they are a self-sustaining population.
- E. Hollis asked why only Threadfin Shad and Blueback Herring were considered. K. Nebiolo answered that these two species were the most susceptible to entrainment and those for which we have population data. Other species entrained at lower numbers would have to be evaluated as a qualitative analysis involving population parameters and intrinsic properties of the species. A. Stuart clarified that these species consisted of at least 90 percent of the species entrained.
- Jeff Lineberger asked about what sort of driver temperature is for entrainment loss since some large percentage of shad die anyway. K. Nebiolo noted that the analysis did not find a correlation trend between entrainment with temperature in this data set, however he acknowledged that it is a known problem and consideration in entrainment studies.
- A. Douglas asked what percentage of area Whitewater River cove is compared to the entire lake. A. Douglas indicated 12 percent seems very high. K. Nebiolo stated that the data set available is not spatially explicit, just the lake itself. (*Note: Whitewater River Cove is approximately 1.5% of the lake by surface area*)
- G. Rice asked whether the model predicts what does happen or what may happen. K. Nebiolo stated that this predicts what may happen. G. Rice asked if a large event (i.e., 12% of threadfin shad population entrained) happens every year? K. Nebiolo stated no, it does not happen with any regularity. M. Abney also clarified that this analysis assumes 100% mortality, which we know not to be true (another conservative measure). A. Stuart asked D. Rankin how long we have been monitoring the forage fish populations in the lake, which they said is around 30-40 years, and the operation of the facility does not appear to be a threat to the population. D. Rankin also stated that the hydroacoustic monitoring has shown the population to vary widely during that time and is unpredictable from year to year.
- D. Rankin asked, with such wide bounds on the population size, how did the study determine 12 percent? K. Nebiolo stated it was based on the median population size of the data set. D. Rankin wondered if it's the same amount (proportion) of the population every year.
- D. Gandy asked if estimated population growth rates were only from Fishbase or if there was a review of literature. K. Nebiolo indicated they used FishBase and USEPA 316b resources for growth estimates.

Break

Task 2 – Desktop Studies on Pelagic and Littoral Habitat

Erin Settevendemio presented an overview of the objectives, methods, and results of Task 2 of the Aquatic Resources Study.

No further discussion.

Task 3 – Mussel Surveys and Stream Habitat Quality Surveys

Erin Settevendemio presented an overview of the objectives and methods of Task 3 of the Aquatic Resources Study. The draft report has been submitted and comments have been received; Duke Energy will continue to address comments in consultation with the resource committee.

- E. Hollis asked whether mussels were expected to be found. Nick Wahl indicated there have been mussels observed in Lake Jocassee; however, no protected species. Simply because no mussels were found doesn't mean they aren't present.
- S. Salazar – did the stream habitat assessment methods include distinguishing between native and non-native vegetation and do survey reports make note of that? E. Mularski noted the habitat assessment forms didn't have any categories for native vs. non-native vegetation; however, as far as invasive species within the vegetation plots while carrying out the SQT study, no areas were noted where an infestation of non-native species occurred. S. Salazar commented Japanese stiltgrass (*Microstgium vimineum*) was observed and noted in the PAD (Natural Resources Assessment) (in the transmission line corridor); if the new access road is near these locations it would be prudent to keep in consideration of measures for disturbance and spread of non-native invasive species. E. Mularski noted stiltgrass is present all throughout the southeast. E. Settevendemio agreed there was no *Microstegium*, and noted if it's already onsite that Duke Energy would need to keep it in consideration to prevent spreading. E. Mularski mentioned that there are no obvious infestations of non-native species present in the forested areas. Non-native species were observed within disturbed areas on the project site particularly the maintained transmission right of way.

Environmental Justice (2:43 pm)

Alison Jakupca presented an overview of the objectives, methods, and results of the Environmental Justice (EJ) Study and noted that no need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as part of the relicensing. One EJ community based on race identified in Transylvania County, NC - primarily within 5-mile buffer zone (with SW portion in 1-mile buffer zone). Two EJ communities based on low income identified in Oconee County, SC and Transylvania County, NC (both within 5-mile buffer zone). Undeveloped (forested land) around Project and between the Project and EJ communities is an effective PM&E measure.

- D. Wilson noted that due to proposal of new construction (associated with Bad Creek II), FERC requires the larger 5-mile buffer for the EJ communities study. Additional outreach should be addressed for the Bad Creek Project. Typically, members of the EJ communities are not NGOs or member of groups with any type of standing; therefore, FERC would like to see some targeted public outreach in local communities.
    - ACTION ITEM – Duke Energy to conduct additional Public Outreach.
- D. Wilson stated new census data were just released for 2022; FERC suggests rerunning the EJ analysis to see if there are any changes from current results (which used 2020/2021 data). It is likely Duke Energy will need to re-run the EJ study as the

project progresses and census data are updated. D. Wilson suggested new data should be used in USR and again in the PLP/DLA. A. Jakupca noted that re-running the data would also necessitate extensive updates of data tables and maps and questioned the practicality or efficiency of making multiple updates.

  - ACTION ITEM – Duke Energy to identify plan and timing to rerun EJ analysis with updated census data. An updated EJ report will be submitted with the USR using updated census data.

- D. Wilson discussed the potential for adding the proposed Fisher Knob road into the analysis would that increase the radius for potential for EJ communities. A. Jakupca noted the Fisher Knob community is in the 5-mile buffer and the identified EJ communities are well away from Fisher Knob.
- FERC asks in the USR to describe public outreach (where, when, attendance). A. Jakupca asked about timing and when FERC recommends outreach to occur, when new EJ analyses should be run, and how that fits in with the regulatory schedule.
- D. Wilson answered when we reach FLA (which is used for NEPA), FERC would like to see outreach methods and outreach and comments at the FLA stage. So between the USR and FLA FERC would want to have revised map and table using the most updated census block data. In terms of outreach, D. Wilson suggested a community meeting (town hall, school, local community center) near to EJ communities and posting it in these areas (and perhaps not relying on online advertisement or notice). The reason for the meeting is to get some substantive feedback and this feedback could serve to develop a PM&E measure. FERC would like to see these steps taken during an EJ study and acknowledges this is a new resource area for analysis in relicensing so it is not as straightforward as the other studies.
- S. Salazar asked if the Fisher Knob access road is included in the buffer for EJ. A. Jakupca noted yes, it is in the buffer. If the radius were expanded down to the north and south, there would likely be no impacts to EJ communities due to their location in relation to Fisher Knob. S. Salazar asked whether EJ communities would be affected along the hauling routes used by construction vehicles.
- A. Jakupca said trucks would come down Bad Creek Road / Rt 130 and turn directly into the Project. A. Stuart noted any gravel delivered to the site would likely be transported down Rt 130 from the north, noting trucks will be accessing the site regardless of whether it's for the access road or the new construction.
- S. Salazar noted the access road will be built first when considering timing of impacts, and trucks may take a route that may go near one of the EJ communities in the north.
- G. Rice noted we can't control which way haul trucks come to the site. Traffic is generally sparse in the vicinity of the Bad Creek Project.
- S. Salazar noted on other projects, vehicle emissions associated with project construction is a concern (as well as impacts to EJ communities).
- A. Jakupca noted even if the boundary was expanded far beyond the 5-mile buffer, the classification would not fit the "disproportionately high" category.
- D. Wilson thanked S. Salazar for mentioning about haul trucks and haul roads and asks Duke Energy to keep in mind the location of the trucking company location used and quarry location to disclose in the FLA for FERC's NEPA analysis.

Visual Resources (3:32 pm)

J. Huff presented an overview objectives, methods, and preliminary results of the Visual Resources Study; she gave a brief introduction of the nine tasks under the study. She presented preliminary results from early December field work to take day-time and night-time photos. This information was presented in a recent (early January 2024) resource committee meeting but was not provided in the ISR. Based on stakeholder input, key views have been selected and the study will use those confirmed views to perform the remaining study tasks regarding aesthetics for the Project.

- G. Rice asked if a person can only see Project-related features in leaf-off conditions, how important would that impact be if nobody is there to note that impact, and whether there is any way to address that. J. Huff noted we can describe that in the narrative of the report, however, if there were ever an event that would remove most of the vegetation (e.g., ice storm), then more terrain and features would become visible, so this is the conservative approach. G. Rice asked if the new transmission towers look similar to the existing and J. Huff confirmed that they do.
- W. Cooler mentioned a lighting ordinance on a different study stated light should be seen from a site but the source of light should not be seen and believes this to be a good definition for controlling light pollution. People living in remote areas like Bad Creek value darkness and would be happy for anything done to keep light on the Project property. J. Huff noted the site is very hard to see if you actually aren't there on site.
- C. Starker mentioned dark sky lighting and acknowledged there is some lighting necessary for safety. J. Huff noted you can see lights from the inlet/outlet portal, though this light is not as prominent as the house lights at Fisher Knob.
- D. Wilson added he is looking forward to seeing the selected key observation points and noted it would be helpful to have a sense of the height of the spoil site (not just aerial extend), and asked if this could be something (GIS/DEM or a visualization) submitted to FERC. J. Huff answered Duke Energy could include that in the report as a table with the heights – during the study solid structures were modeled as vertical slopes to be conservative (side slopes weren't taken into account). D. Wilson noted that would be very helpful for potential aesthetic impact along with long-term plans for spoils. ACTION ITEM – Duke Energy to include table of spoil pile height in the draft report.

Herptile Survey (3:55 pm)

S. Fletcher presented an overview on objectives, methods, and findings of the Herptile Survey (reptile and amphibians). This survey was not a relicensing study but was performed to support Section 404/401 permitting and based on a request from the SCDNR to document any species listed in the S.C. Wildlife Action Plan (SWAP). A herptile study plan was developed in consultation with the resource committee, including SCDNR and USFWS, and the report was also reviewed by the resource committee. Terrestrial herptile field surveys were carried out on the eight terrestrial proposed spoil locations. During the survey 14 species were identified and the only SWAP species observed was the Eastern Box Turtle. This task is complete and was included as an attachment in the ISR.

Additionally, S. Fletcher indicated Duke Energy will be developing a study plan and carrying out an additional survey for bats due to potential clearing associated with the proposed temporary access road, spoil areas, transmission line, etc. This will also support Clean Water Act USACE 404 permitting to avoid impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the USFWS [to comply with Section 7 of the ESA] for the 404 permitting. Duke Energy will target filing the study plan in line with the summer survey guidance (to be updated in March) to concentrate on proposed cleared areas. Acoustic work needs to be done in accordance with timing restrictions, so Duke Energy will prepare a study plan with HDR and will submit study plan to meet these time of year restrictions (targeting June). The study plan will include details from the soon-to-be revised (March 2024) Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidance. A. Stuart added that survey will be good for five years from time of survey. With the unified federal agenda, the tricolored bat will receive final listing and the little brown bat will have proposed rule in September 2024 (*Note: since 1/24/2024, the USFWS has stated that there is no current timeframe regarding the listing date*); the hoary bat will also be up for listing in the next couple years and all three of these species were identified in the 2021 bat survey.

Melanie Olds recommends sending proposed study plan to USFWS for approval. S. Fletcher acknowledged and agreed. Duke Energy will send the study plan to the USWFS, FERC, and the Wildlife & Botanical Resource Committee.

S. Salazar noted to SCDNR that FERC's list of comprehensive plans includes the 2015 SWAP and the 2008 SCORP. If these are not the current versions, please update. E. Miller verified the 2015 SWAP is the current version.

S. Salazar provided a segue to a question about tricolored bat seasonal population zones. S. Salazar asked for clarification from USFWS and SCDNR. On a different project, there have been comments on the seasonal population zones for tricolored bats but there were no sources provided where zones occur. Until there is an official publication for FERC to reference, zones need to be identified in coordination with M. Olds/USFWS in the Project vicinity so FERC can assess potential impacts. Duke Energy will take that into account and touch base with M. Olds.

M. Olds stated there is no map for distribution yet but hibernation range for NLEB will be same for tricolored (Blue Ridge portion of the state), and the rest of state will be year-round active for tricolored bat. This may change as more information comes in but that's the current consideration.

S. Salazar said for the other project, there were three zones identified – the true hibernation zone, year-round active zone, year-round zone 2. M. Olds stated South Carolina is year-round active zone 1. There is no zone 2 in the state of South Carolina (however other southern states have all three classifications). S. Fletcher noted this information will be important and will be considered in consultation with USFWS.

S. Salazar asked when Duke Energy plans to file the study plan with the USFWS as FERC will also need to review. Duke Energy is targeting April 15 for the study plan and completing the study in June.

M. Olds agreed it would be best to wait until the new version of the survey guidelines is available (in March) as it will have the dates/maps of seasonal population zones. ACTION ITEM – Duke Energy to file study plan with the USFWS and FERC targeting April 15, 2024.

Additional Comments Submitted During Study Year 1

S. Fletcher presented comment submitted by the S.C. Wildlife Federation regarding blasting effects on wildlife. Duke Energy responded to the comment on December 19, 2023.

- The environmental report to be filed with the license application will contain information regarding blasting and impacts and proposed environmental measures and the BA will have a noise component as well.

S. Fletcher also presented a comment submitted by Advocates for Quality Development (AQD) regarding increased potential for increased runoff and erosion along new temporary roads and spoil areas.

- Most spoil placed in storage will be rock sized and materials will not be placed on slopes due to instability. French drains will be installed over aquatic resource areas. A sediment and erosion control plan will also be submitted for regulatory agency approval; implementing sediment and erosion control best management practices are a standard practice for Duke Energy construction sites.

J. Crutchfield and A. Stuart provided closing comments and reminded participants to sign the attendance sheet. Duke Energy will file the meeting summary and presentation with FERC and upload to the resource committee SharePoint site (along with the meeting recording) within 15 days as dictated by the ILP process.

A. Stuart presented the FERC ILP next steps and stated Duke Energy will start relicensing Settlement Agreement discussions with stakeholders in March. The goal is to have a final agreement by the end of November 2024 to support the Draft License Application development (filing expected March 2025). An independent facilitator will facilitate the discussions in-person. The Settlement Agreement trial balloon (i.e., Duke Energy's non-binding initial set of proposals is being drafted now and will be presented to relicensing participants/potential settlement parties in March 2024). By the end of September 2024, Duke Energy hopes to have the Agreement in Principle, which is the precursor to the Settlement Agreement. A. Stuart acknowledged Duke Energy may need to make some assumptions since not all studies will be complete.

E. Hollis asked how would we proceed if we don't know Bad Creek II will be built? A. Stuart answered we are presently moving under the assumption that Bad Creek II will be built and noted there is still a lot of work to be done.

S. Salazar thanked participants for participation and for questions and comments throughout the relicensing process. Later in the process (next year at this time) after the USR, the milestones won't let up, so everybody is encouraged to stay engaged and spoke a bit about upcoming tasks and milestones.

A. Stuart thanked the FERC staff for their suggestions and recommendations. Duke Energy's goal is to reduce the amount of Additional Information Requests (AIRs) after filing the license application. If Bad Creek II is going to be constructed, Duke Energy would like to start project expansion construction in 2027 to hit internal milestones to support its continued renewable energy commitment.

S. Salazar reminded the participants to feel free to contact her for any process-related questions and added her phone number and email in the meeting chat and requested Duke Energy include her contact information in the meeting summary as well. Sarah.Salazar@ferc.gov; 202-502-6863 ACTION ITEM – Include Sarah Salazar's contact information in meeting summary (completed herein).

Follow up – A. Stuart corrected himself from an earlier statement regarding construction activities related to rock quarry location – the McNeely Quarry is not in Cashiers, it is in the town of Sapphire, relatively close to the Project (9.4 miles northeast from Bad Creek).

A. Stuart offered final thanks and closed the meeting at 4:25 pm.

Bad Creek Pumped Storage Project No. 2740

Initial Study Report Meeting

DUKE ENERGY.
BUILDING A SMARTER ENERGY FUTURE®

JANUARY 17, 2024

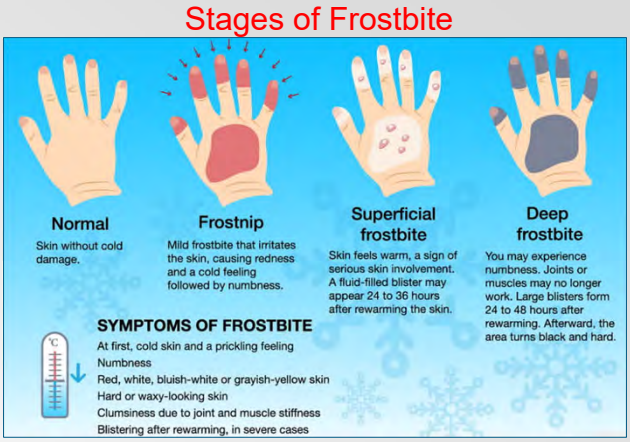
1

Meeting Agenda

- Welcome and Meeting Purpose
- Safety Moment
- Water Resources Study
  - Break
- Recreational Resources Study
  - Lunch
- Aquatic Resources Study
  - Break
- Environmental Justice Study
- Cultural Resources Study
- Visual Resources Study
- Proposed Spoil Area Herptile Surveys
- Closing

2

Safety Moment – FROSTBITE



- **Frostbite** occurs when skin and tissue freezes; commonly affects fingers/toes/ears/extremities. Can cause permanent tissue damage or lead to amputation.
- **Temperatures** below 0°F can cause frostbite **within hours**, however, frostbite can occur over longer periods at temps as warm as 31°F. You cannot get frostbite in temperatures above 32°F (however, you are still at risk for hypothermia if body temperature falls below 95°F).

- **What to do** – If extremities turn red or numb, or you begin to experience pins and needles, get somewhere warm to avoid further damage. Frostnip (or 1st degree frostbite) is usually not permanent, but advanced stages require medical help.
- **Do not** touch or rub skin to try to warm it; unless in life threatening situation, **do not walk** if feet are affected by frostbite to avoid further damage.
- **Do not** place anything **hot** on areas affected by frostbite – skin needs to be warmed up slowly with consistent heat.

https://www.independent.co.uk/news/world/americas/frostbite-symptoms-how-cold-fast-b2002317.html

3

FERC ILP Schedule

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) and Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 24, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 7, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 17, 2024

4

Resource Committees

Lead Technical Manager
- John Crutchfield

Project Manager
- Alan Stuart

Aquatic Resources
- Mike Abney
- Nick Wahl

Cultural Resources
- Christy Churchill

Water Resources
- Maverick Raber

Recreation & Aesthetics
- Alan Stuart
- Ethan Pardue

Wildlife & Botanical Resources
- Scott Fletcher
- Mike Abney

Operations
- Lynne Dunn
- Alan Stuart

5

Bad Creek II Complex –
General Overview and Project Update

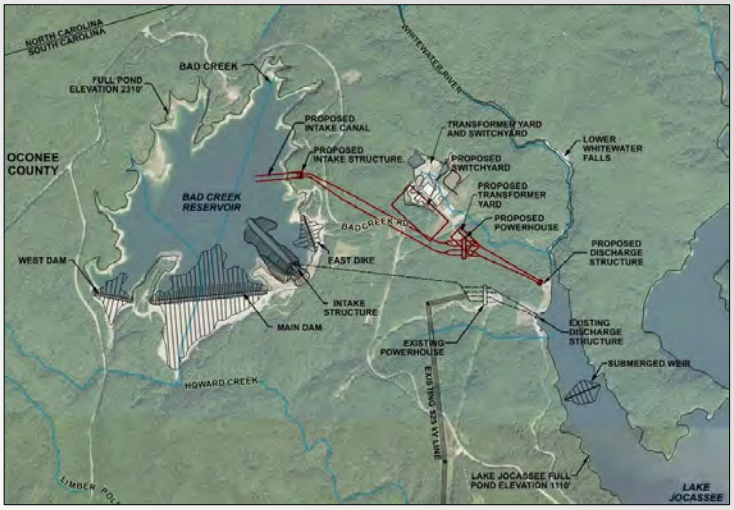
- Proposed Expanded Project Boundary
- Proposed Temporary Access Road (Fisher Knob Access Road)
- Increased Hydraulic Capacity

6

General Project Overview

Existing Bad Creek Powerhouse
- Four units used for peak load generation
- 1,400 MW capacity; 23 hours of storage
- Generates using water from Bad Creek Reservoir
- Pumps back water from Lake Jocassee using excess night/weekend energy

Proposed Bad Creek Powerhouse Addition
- Would essentially double existing Bad Creek capacity
- Utilize existing Bad Creek Reservoir
- Two new underground tunnels and powerhouse (4 Units)
- Additional 1,400 MW capacity; Total site ~3,360 MWs with 11 hours of storage



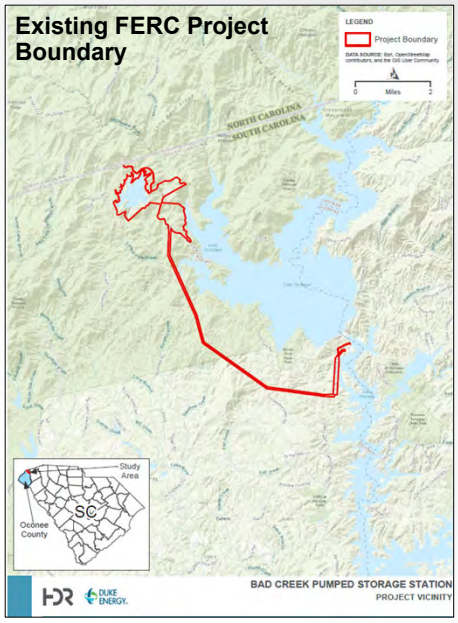
Privileged & Confidential/Attorney-Client Communication; Attorney Work Product

7

Proposed Expanded Project Boundary

8

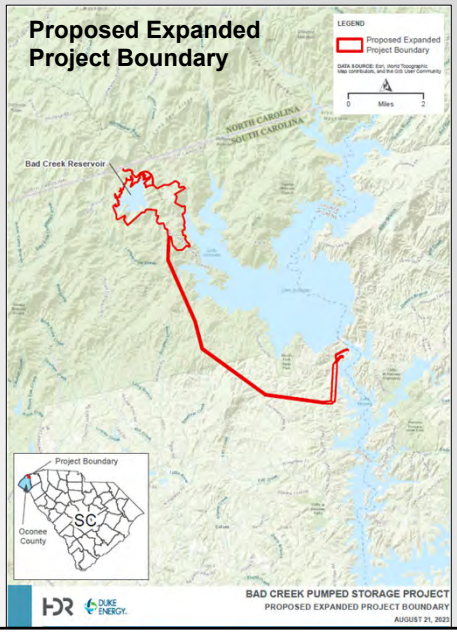
Proposed Expanded Project Boundary for Bad Creek II



Project boundary expanded to include areas potentially impacted from spoil placement

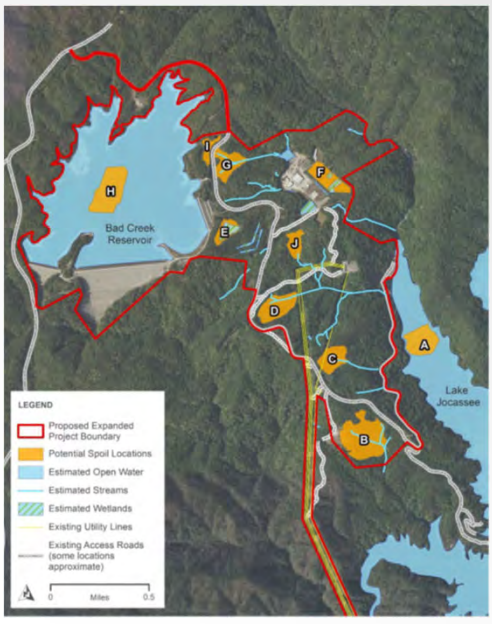
Original: 1,280 acres
Expanded: 1,490 acres

Increase of ~210 acres



9

Proposed Expanded Project Boundary for Bad Creek II



- According to preliminary studies, approximately **4 million cubic yards of excavated material** for Bad Creek II construction will need to be deposited at upland spoil locations and/or along the submerged weir in Lake Jocassee.
- Since the RSP filing, **an additional spoil area** related to the construction of a proposed transformer yard (location J) was added and brings the total amount of material to 4.4 million cubic yards.
- Preferred potential areas for spoil placement are **currently under evaluation**.

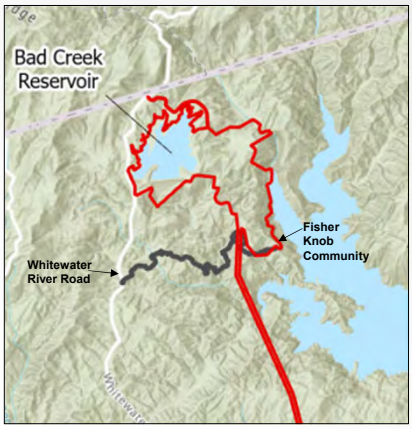
10

Proposed Temporary Access Road

11

Fisher Knob Temporary Access Road

- Duke Energy is proposing to develop an access road to provide an alternate route to the Fisher Knob Community for use during Bad Creek II construction.

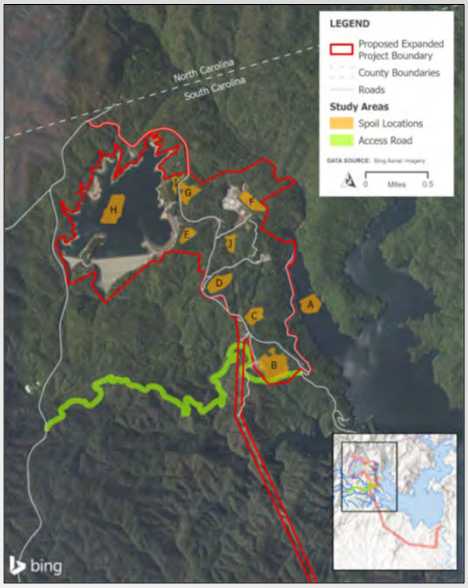


- The proposed gravel service road would be approximately 3.7 miles long, primarily follow an existing unmaintained logging road on property owned by Duke Energy and would only be maintained during construction of Bad Creek II.

12

Fisher Knob Temporary Access Road

- The temporary access road would necessarily be constructed in advance of construction for Bad Creek II and prior to the new license issuance – the road is not proposed to be part of the expanded FERC Project boundary.
- The road will use temporary bridges to cross on-site streams.
- Individual study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been expanded since the RSP filing to assess the potential effects of the Fisher Knob Access Road.



13

Bad Creek II Maximum Hydraulic Capacity

14

Bad Creek I and Proposed Bad Creek II Hydraulic Capacities

	Bad Creek I				Proposed Bad Creek II			
	Generation		Pumping		Generation		Pumping	
	Original (cfs)	Upgraded (cfs)	Original (cfs)	Upgraded (cfs)	Original (cfs)	Updated (cfs)	Original (cfs)	Updated (cfs)
Unit 1	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 2	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 3	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Unit 4	4,000	4,940	3,690	4,060	4,860	5,000	4,120	4,890
Total	16,000	**19,760**	14,760	**16,240**	19,440	**20,000**	16,480	**19,560**

Total Generation Capacity (with BCII): 19,760 + 20,000 = 39,760 cfs
Total Pumping Capacity (with BCII): 16,240 + 19,560 = 35,800 cfs

- Modeled (CFD) versus updated generation capacity is similar (39,200 cfs vs. 39,760 cfs, **<2 percent difference**)
- CFD model to be re-run with updated pumping capacity (32,720 cfs vs. 35,800 cfs, **~9 percent difference**)
- Studies affected by this change (pumping): Entrainment study and CHEOPS study

15

Water Resources Study

16

Water Resources Study Task Refresher

Study Task	Status
Task 1 – Summary of Existing Water Quality Data And Standards	**Complete**
Task 2 – Water Quality Monitoring in Whitewater River Arm	**Ongoing**
Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)	**Complete**
Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)	**Ongoing**
Task 5 – Future Water Quality Monitoring Plan Development	**Beginning in 2024**

17

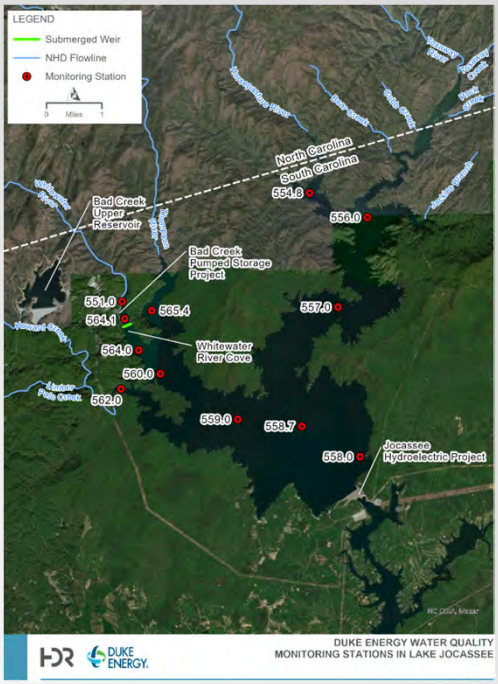
Task 1 - Summary of Existing Water Quality Data & Standards

- **Objective:** Compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations.
- **Status:** **Complete**

18

Task 1 – Desktop Methods Summary

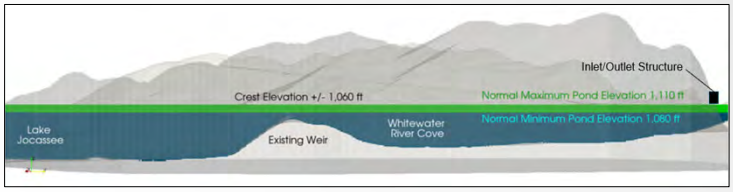
- ***Study Area***:
  - The study areas for this desktop review include **Lake Jocassee** and **Howard Creek**.
- ***Data Sources***:
  - Lake Jocassee: Duke Energy water quality data from 12 monitoring stations in Lake Jocassee
  - Howard Creek: Clemson University water quality data from Howard Creek (Abernathy et al. 1994)
- ***Water Quality Parameters***:
  - Temperature, Dissolved Oxygen, pH, Nitrogen, Phosphorus, Chlorophyll a, Conductivity, and Turbidity



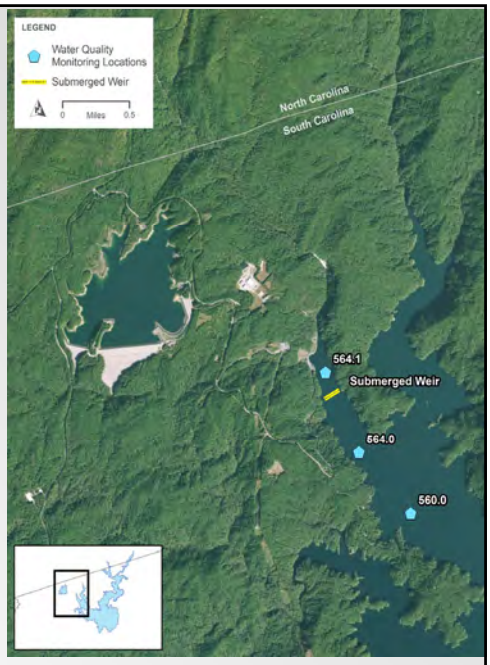
19

Task 1 – Desktop Methods Summary

- ***Lake Jocassee -*** Data were separated into "pre operations" (<1991) and "post operations" (1991-present) to compare present-day water quality conditions with conditions that existed prior to operations.
  - For the three stations in the Whitewater River cove, a third time period was assessed (1985-1991) to cover the "construction" period upstream and downstream of the submerged weir.



- ***Howard Creek -*** Data were assessed between pre construction (1980/1981) and post construction (1993) downstream of Bad Creek to compare water quality.



20

Results Summary – Overall Lake Jocasee

1. There is very little difference in average/max/min values or standard deviations in water temperature or DO between pre and post Bad Creek operation (*with the exception of Station 564.1 discussed on next slide*).

2. There are no discernable patterns (over decades of data) that would suggest Lake Jocassee temperatures or DO are affected by operations or are outside the range of natural conditions.

(Data for water temperature and DO are included below – all other parameters are included in the Final Report.)

Depth-Averaged Temperatures Pre vs. Post Operations

Monitoring Station	Temperature (°C)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	12.5	4.9	12.1	4.8	-0.4
558.0	12.9	5.2	13.5	5.4	+0.6
559.0	12.5	5.0	12.1	4.9	-0.4
560.0	11.7	4.6	12.3	4.9	+0.6
562.0	15.3	5.6	16.0	5.3	+0.7
565.4	14.1	5.4	13.1	4.7	-1.0
551.0	13.5	5.8	14.8	7.3	+1.3
564.0	12.1	4.7	12.7	4.9	+0.6
564.1	13.9	5.6	17.2	5.5	+3.3
557.0	11.7	4.5	12.2	4.8	+0.5
554.8	14.6	5.5	14.2	5.3	-0.4
556.0	12.8	4.9	13.4	5.2	+0.6

Surface Dissolved Oxygen Pre vs. Post Operations

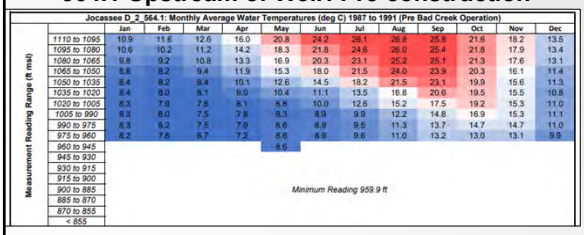
Monitoring Station	Dissolved Oxygen (mg/L)				Difference
	Pre operations		Post operations		
	Average	Standard Deviation	Average	Standard Deviation	
558.7	6.9	2.4	6.9	1.9	0
558.0	6.5	2.8	7.0	1.8	+0.5
559.0	6.5	2.7	6.5	2.2	0
560.0	6.7	2.5	6.4	2.3	-0.3
562.0	7.8	2.7	7.9	2.0	+0.1
565.4	7.3	2.9	7.1	2.5	-0.2
551.0	9.9	1.3	9.6	1.6	-0.3
564.0	6.4	3.0	6.2	2.6	-0.2
564.1	7.4	3.2	8.5	0.8	+1.1
557.0	6.8	2.9	6.8	2.3	0
554.8	7.7	3.1	7.4	2.8	-0.3
556.0	7.4	2.9	7.3	2.6	-0.1

21

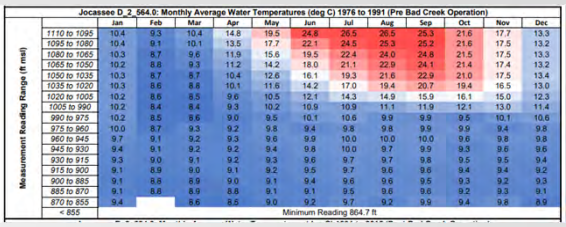
Results Summary - Whitewater River Cove Temperature

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

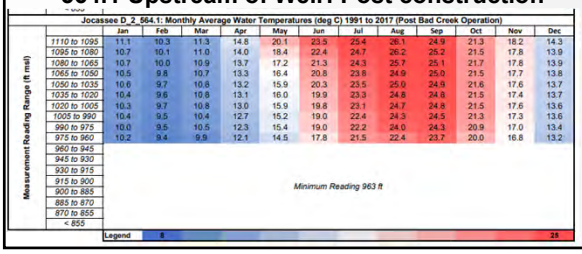
564.1 Upstream of Weir: Pre construction



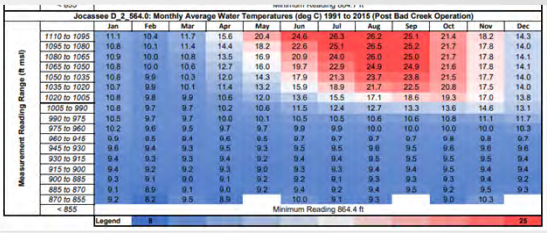
564.0 Downstream of Weir: Pre construction



564.1 Upstream of Weir: Post construction



564.0 Downstream of Weir: Post construction

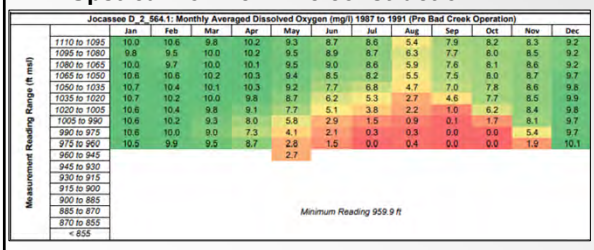


22

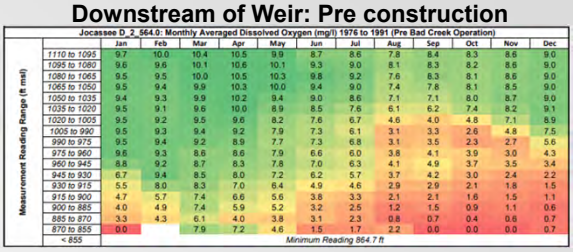
Results Summary - Whitewater River Cove Dissolved Oxygen

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

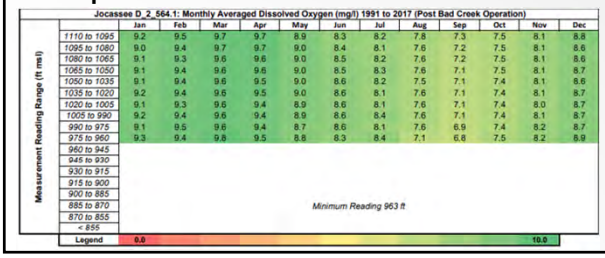
Upstream of Weir: Pre construction



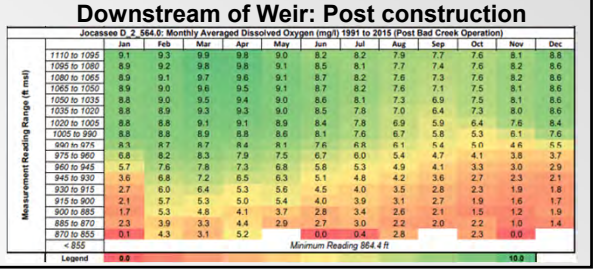
Downstream of Weir: Pre construction



Upstream of Weir: Post construction



Downstream of Weir: Post construction



23

State Water Quality Standards Compliance – Lake Jocassee

Full period of record	Numeric Surface Criteria (SCDHEC)	No. Samples	Percent of dataset not meeting criteria	Fully Supporting?
DO	At or >6.0 mg/L	4,241	<1.0%	Yes
pH	6-8 standard units	4,253	<1.0%	Yes
Phosphorus	At or <0.02 mg/L	2,228	9.8%	Yes
Nitrogen	At or <0.35 mg/L	545	6.1%	Yes
Chlorophyll a	At or <10 ug/L	1,753	<1.0%	Yes
Turbidity *(Whitewater River Cove only)*	At or <10 NTU	550	<1.0%	Yes

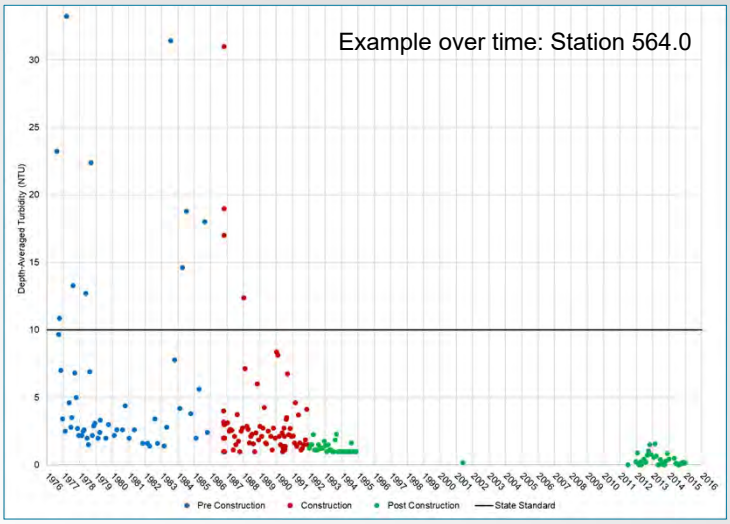
- Parameters without numeric criteria (temperature, DO saturation, conductivity) meet narrative criteria where provided. Where criteria is not provided, because Lake Jocassee supports a diverse, healthy fish community, the water quality parameter is considered to be fully supporting.

24

Results Summary - Whitewater River Cove Turbidity

- Where data are available, NTU values are higher during pre construction periods than during construction and post construction periods (see graph below – example from Station 564.0).

- **Future construction activities** at Bad Creek could increase turbidity in the Whitewater River cove; however, these events would likely be short-lived and based on previous data, recovery in the water column is expected to be rapid.
- Along with appropriate BMP measures, impacts are expected to be **temporary and limited** to the Whitewater River cove.



25

Howard Creek Water Quality – Methods Summary

- Clemson University monitored water quality before and after Project construction – their results from 1993 are summarized in the Final Report and represent post operational conditions in Howard Creek to provide baseline (current-day) conditions.
- Water quality parameters and sampling locations were determined in coordination and agreement with FERC, SCDHEC, and SCDNR.

26

Howard Creek Water Quality

- Results (Abernathy et al. 1994) indicated that even with the major construction of the Project, most baseflow water quality conditions were relatively unchanged during and after construction and post construction water quality conditions were generally similar to pre construction.
- Notable changes included slightly elevated total alkalinity, total hardness, and specific conductance, which were linked to seepage through dams coming into contact with newly placed grout.

- During the 18-year study "Long-term Recovery Monitoring of the Howard Creek Fishery", results showed that Howard Creek has maintained a recovered condition from 1995 to at least 2015 (the last survey period), indicating suitable water quality and habitat.

27

Conclusions - Water Resources Task 1

- ***Lake Jocassee – Take home points***
  1. Upstream of the submerged weir, the water column undergoes vertical mixing and there is no indication of stratification (post 1991) regardless of season.
  2. Downstream of the submerged weir, stratification is observed and is consistent between pre and post operation conditions. These results show mixing is confined to the portion of the Whitewater River cove upstream of the submerged weir.
  3. All water quality parameters assessed in Lake Jocassee are fully supportive of designated use classifications.
- ***Howard Creek – Take home points***
  1. Results from Abernathy et al. (1994) indicate most water quality parameters under operational conditions are similar to and fall well within the range of natural/seasonal variation observed under pre operational conditions.
  2. Water quality conditions assessed are fully supportive of designated use (with the exception of pH at times, which is naturally low as mountain streams in the vicinity of Lake Jocassee are typically poorly buffered and have low pH values due to underlying bedrock.)

Based on existing data, it is not expected that the addition of a second powerhouse will affect water quality in Lake Jocassee or Howard Creek.

28

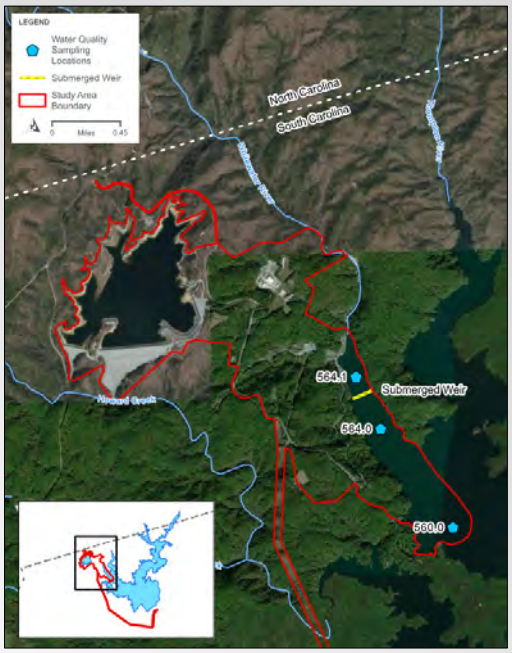
Task 2 – Water Quality Monitoring in Whitewater River Arm

- **Objective:** Collect continuous temperature data and periodic DO (bi-weekly) and temperature from three historical locations in the Whitewater River Cove to gather current-day representative (i.e., baseline) water quality information in Summer 2023 and 2024.
  - Intended to provide sufficient information to support an analysis of the potential Project-related effects on water resources in the Whitewater River arm under existing and upgraded unit operations. Specifically, the effectiveness of the existing submerged weir and vertical mixing will be assessed.
- **Status:** Ongoing

29

Task 2 – Methods

- Duke Energy collected continuous water temperature data and periodic temp and DO concentrations (bi-weekly) from locations near three historic monitoring stations to determine current-day representative (i.e., baseline) water quality information during the summer of 2023.
- Data collected in 2023 represented conditions under two- and three-unit operations at the Project. Conditions in the Whitewater River arm are reflective of conditions in the upper reservoir.
- The **interim draft report** included in the ISR has preliminary results and a brief discussion from the year 1 study period (June 1 – October 11, 2023); the Updated Study Report will include results from study year 1 and study year 2 (June – September 2024) and will provide a complete assessment of results for both study years.



30

Task 2 – Methods

31

Task 2 – Methods

Field Dates for Water Quality Measurement

Date	Details
June 1	Datalogger deployment
June 13	Data download and vertical profile
June 28	Data download and vertical profile
July 12*	Data download and vertical profile
July 24	Data download and vertical profile
August 10*	Data download and vertical profile
August 21	Data download and vertical profile
September 7	Data download and vertical profile
September 23	Data download and vertical profile
October 11	Datalogger removal

Depth of VuLink Dataloggers

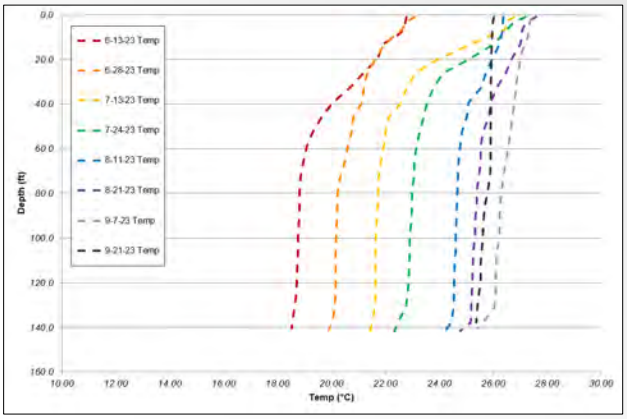
Approximate Water Depth (ft)	Approximate Elevation (ft msl)	Notes
3	1,107	Near surface
30	1,080	Normal maximum Lake Jocassee drawdown elevation
50	1,060	Approximate crest of the submerged weir
70	1,040	Approximately 20 ft below the crest of the submerged weir
100	1,010	Approximate location of thermocline

32

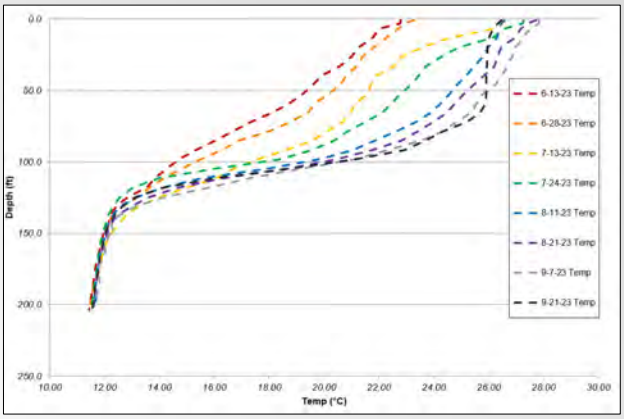
Task 2 – Year 1 Results

Temperature Summary:

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.



Station 564.1



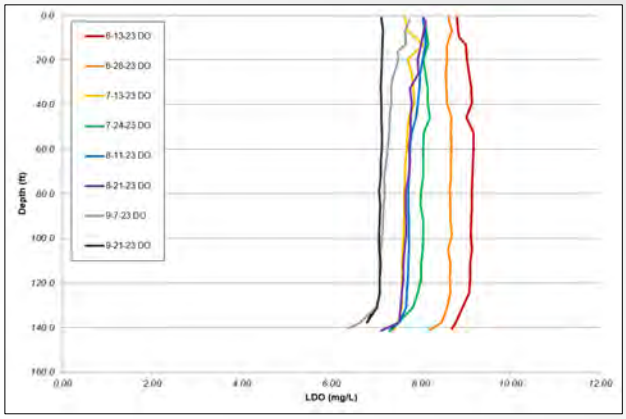
Station 564.0

33

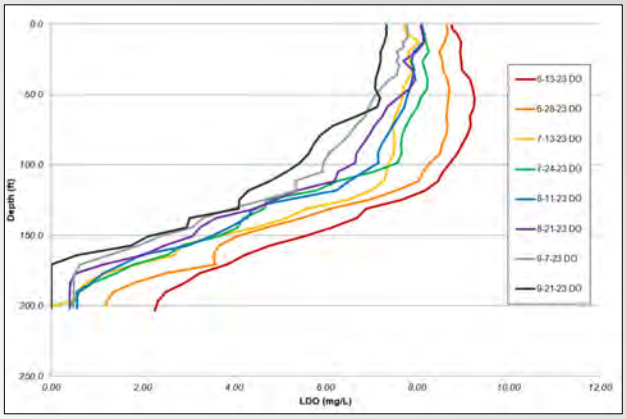
Task 2 – Year 1 Results

DO Summary:

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.



Station 564.1



Station 564.0

34

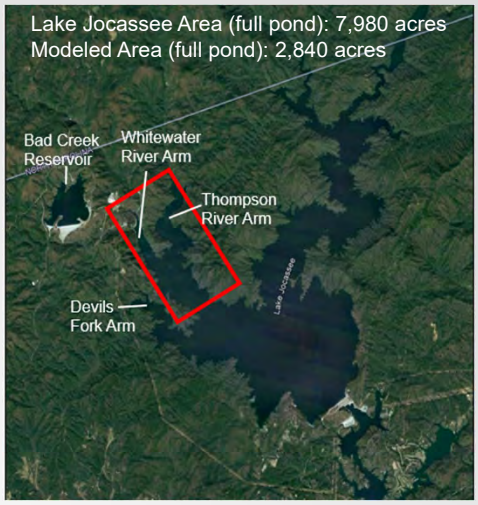
Task 2 – Year 1 Conclusions

- Results from water quality monitoring in the Whitewater River cove indicate water upstream of the submerged weir is well-mixed and does not stratify during the summer. Data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios.
- The second study season (study year 2) will commence in June of 2024 through September 2024 to capture conditions in the Whitewater River cove with all four existing unit upgrades completed.
- A comprehensive data summary will be provided following collection of summer 2024 monitoring data, and the full two-year study report will be provided for resource committee review.

35

Task 3 - Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)

- **Objective:** Develop CFD model to evaluate flows and extent of vertical mixing in the Whitewater River arm and downstream of the submerged weir due to the addition of Bad Creek II.
- **Status:** **Complete**

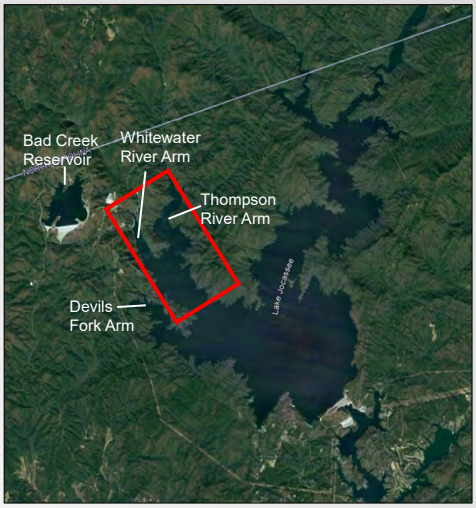


36

Task 3 – Study Approach

1. 2-D hydraulic model (Innovyze) was developed to help determine the downstream modeling extent (model domain) required for the CFD model.
2. CFD model was developed to evaluate hydraulic effects (depth, velocity, flow patterns) of Bad Creek II operations on vertical mixing in the Whitewater River cove.
3. Sixteen scenarios were evaluated using pumping and generating modes under existing and proposed conditions (including potentially expanded weir).

Lake Jocassee Area (full pond): 7,980 acres
Modeled Area (full pond): 2,840 acres



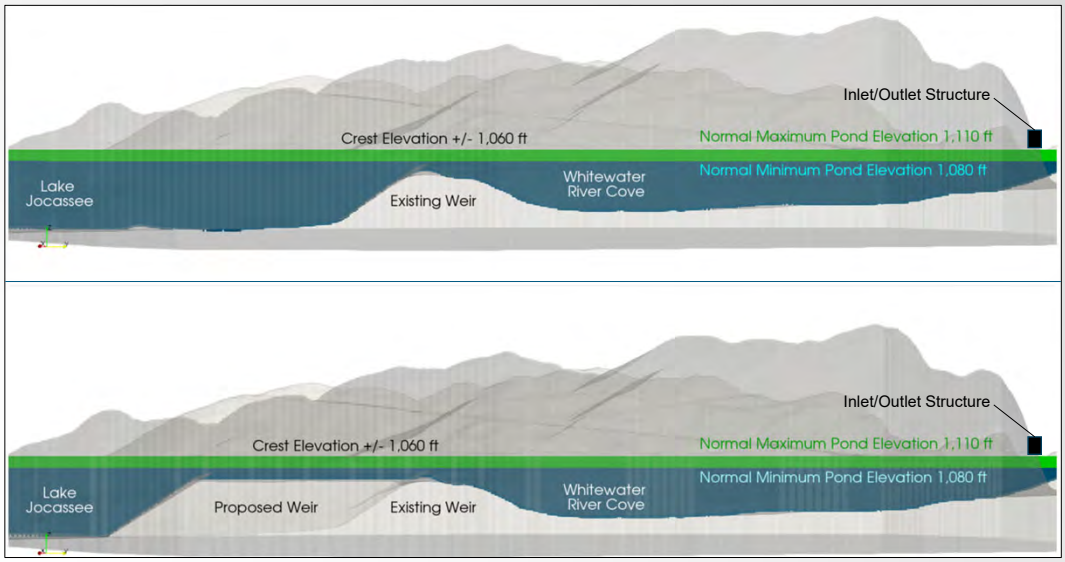
37

Task 3 Methods – CFD Modeled Scenarios

Station	Operating Mode	Submerged Weir Configuration	Scenario	Flow (cfs)	Jocassee Reservoir Elevation (ft msl)
Bad Creek Only	Generating	Existing	1	16,000	1,110
			2	16,000	1,080
	Pumping		7	13,780	1,110
			8	13,780	1,080
	Upgraded Generation	Existing	13	19,440	1,110
			14	19,440	1,080
	Upgraded Pumping		15	15,000	1,110
			16	15,000	1,080
Bad Creek and Bad Creek II	Generating	Existing	3	39,200	1,110
			4	39,200	1,080
	Pumping		9	32,720	1,110
			10	32,720	1,080
	Generating	Expanded	5	39,200	1,110
			6	39,200	1,080
	Pumping		11	32,720	1,110
			12	32,720	1,080

38

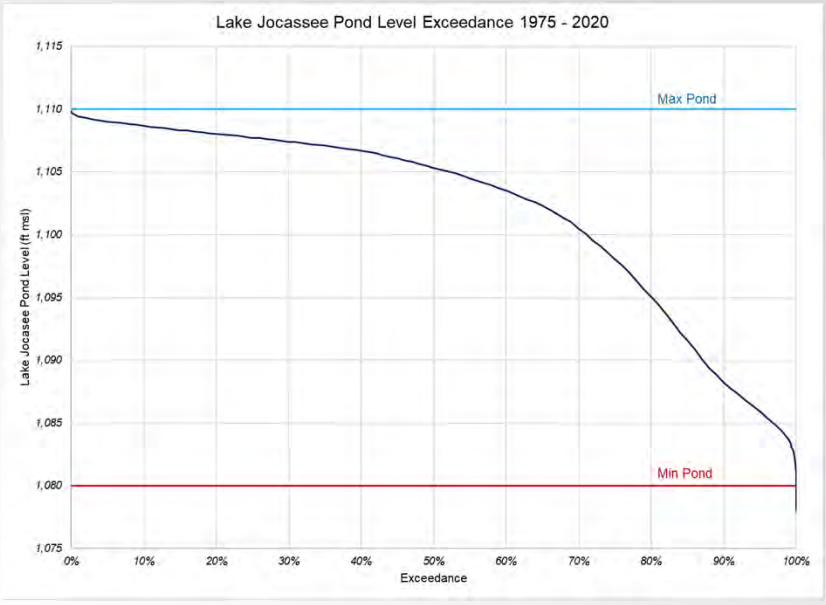
Task 3 Methods – CFD Model Geometries & Scenarios



39

Task 3 – Lake Jocassee Pond Level Exceedance Curve

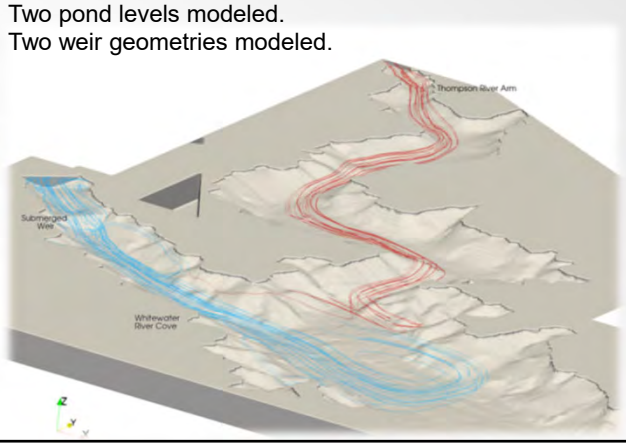
Note: all modeled scenarios are either at min or max pond elevation.

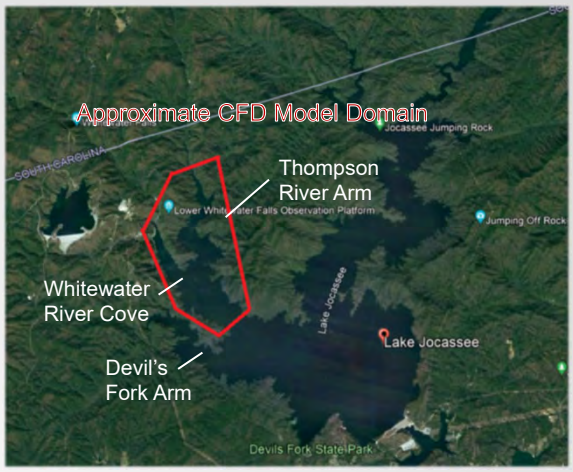


40

Task 3 Methods – CFD Model Development

- Model domain extends just upstream of confluence with Devil's Fork Arm.
- Inflows and water surface elevations held constant at the inflow boundary.
- Maximum generating/pumping capacity simulated.
- Thompson River flow included (long term average flow).
- Two pond levels modeled.
- Two weir geometries modeled.





41

CFD Results

42

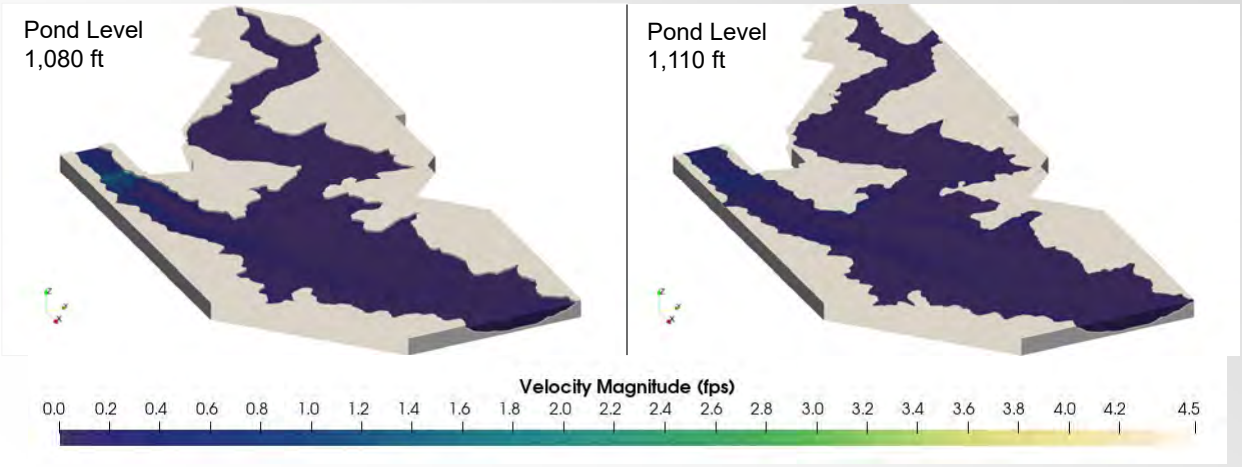
Task 3 Results – Existing Generation

Minimum Pond

Pond Level
1,080 ft

Full Pond

Pond Level
1,110 ft



43

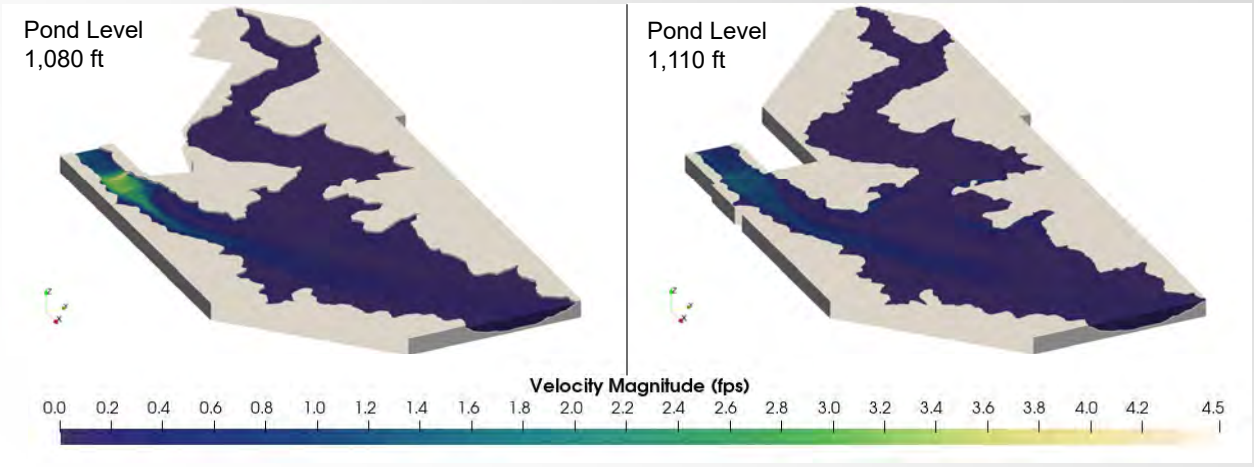
Task 3 Results – Proposed Generation

Minimum Pond

Pond Level
1,080 ft

Full Pond

Pond Level
1,110 ft

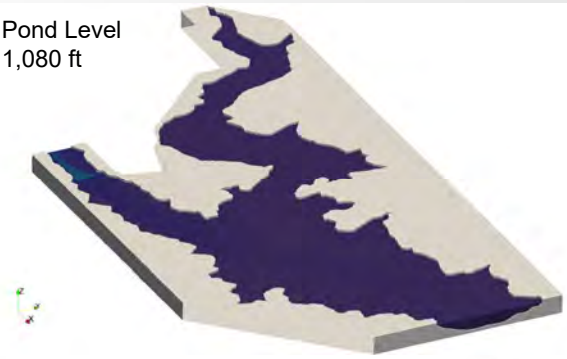


44

Task 3 Results – Existing Pumping

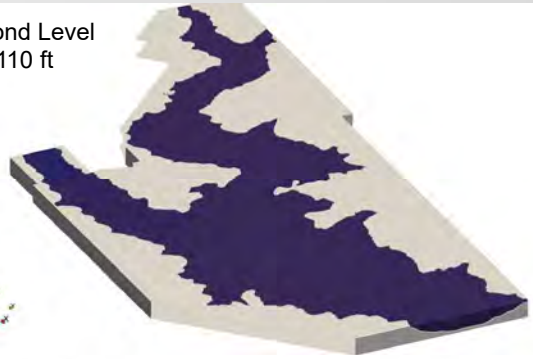
Minimum Pond

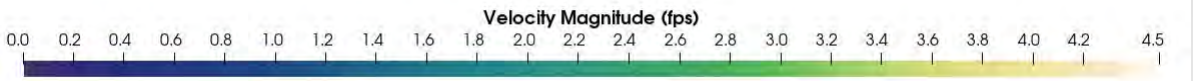
Pond Level
1,080 ft



Full Pond

Pond Level
1,110 ft





45

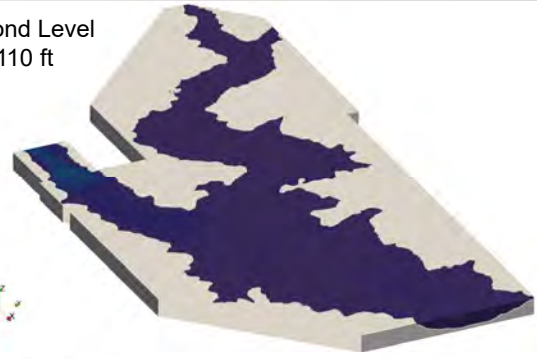
Task 3 Results – Proposed Pumping

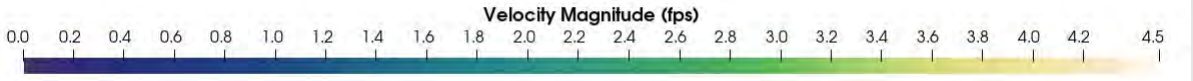
Minimum Pond

Pond Level
1,080 ft

Full Pond

Pond Level
1,110 ft



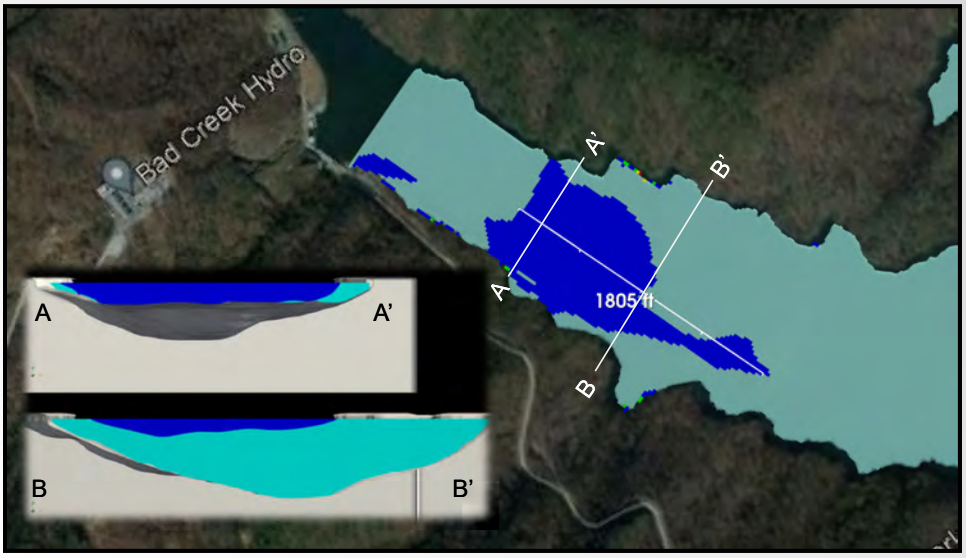


46

Task 3 Results – Proposed Generation

Results – Proposed Generation at **Full Pond**

- Max velocity approx. 1.3 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps

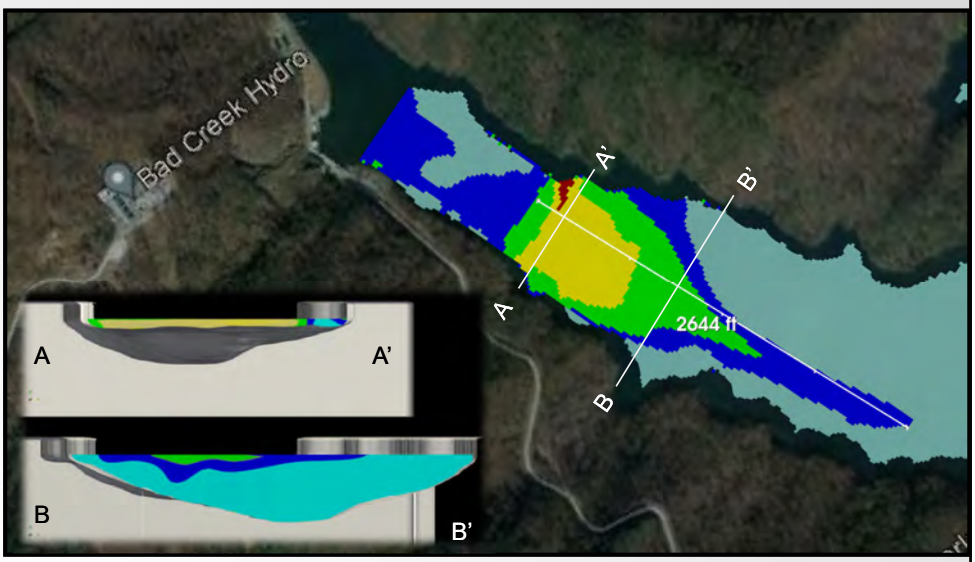


47

Task 3 Results – Proposed Generation

Results – Proposed Generation at **Minimum Pond**

- Max velocity approx. 4.5 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps
- Green: 2.0 – 3.0 fps
- Yellow: 3.0 – 4.0 fps
- Red: > 4.0 fps

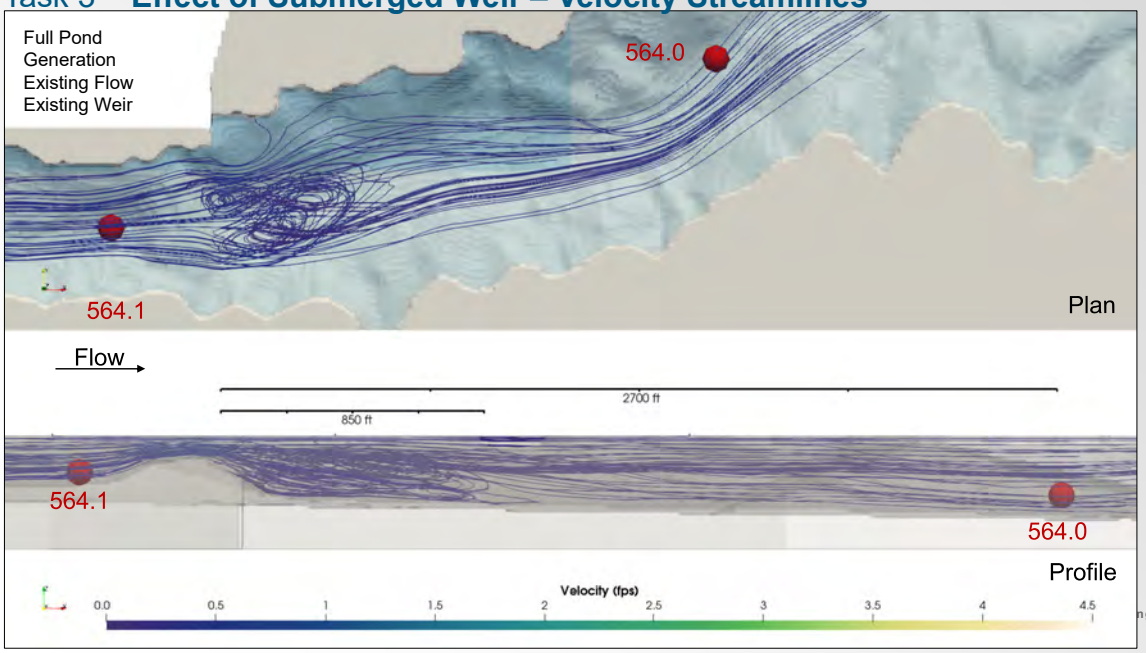


48

Effect of Submerged Weir

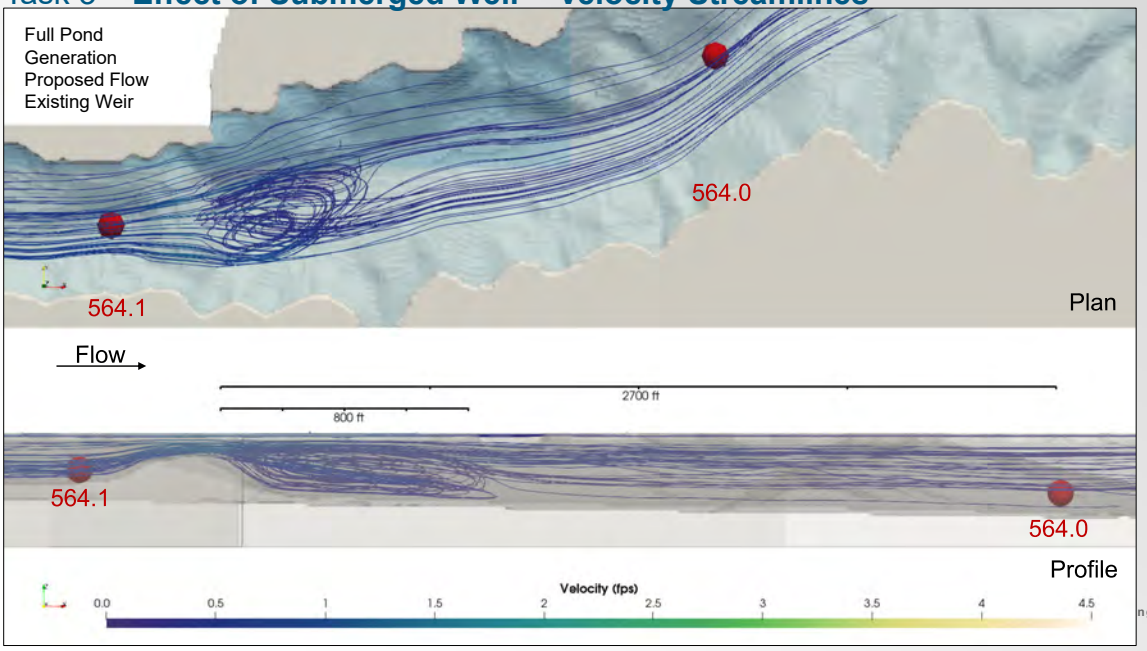
49

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



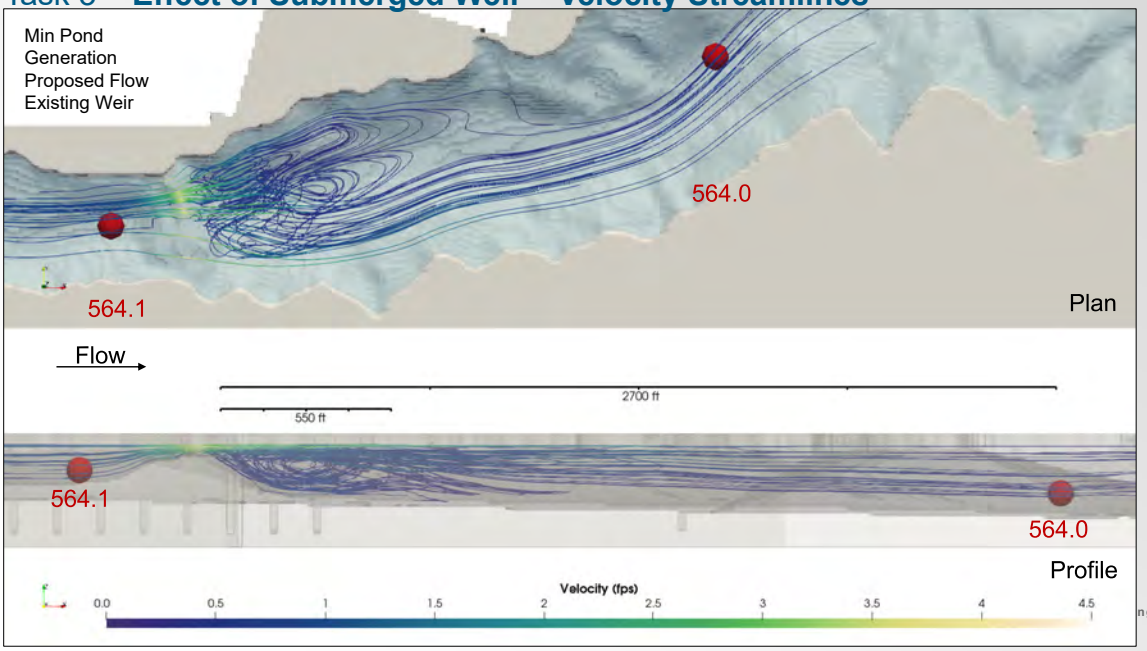
50

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



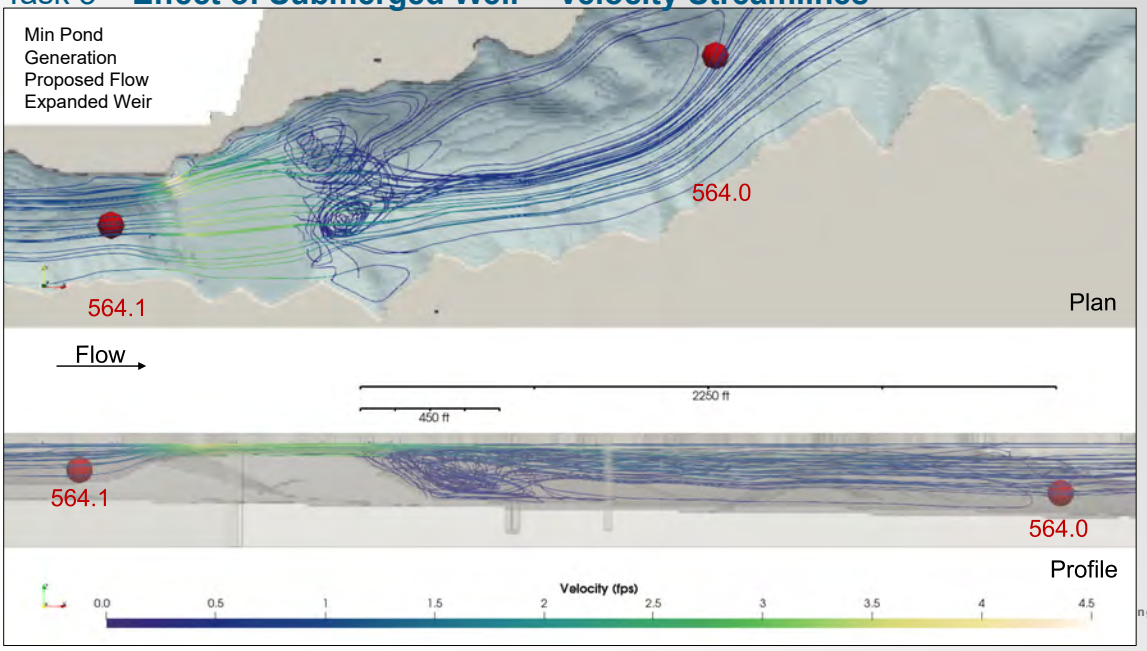
51

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



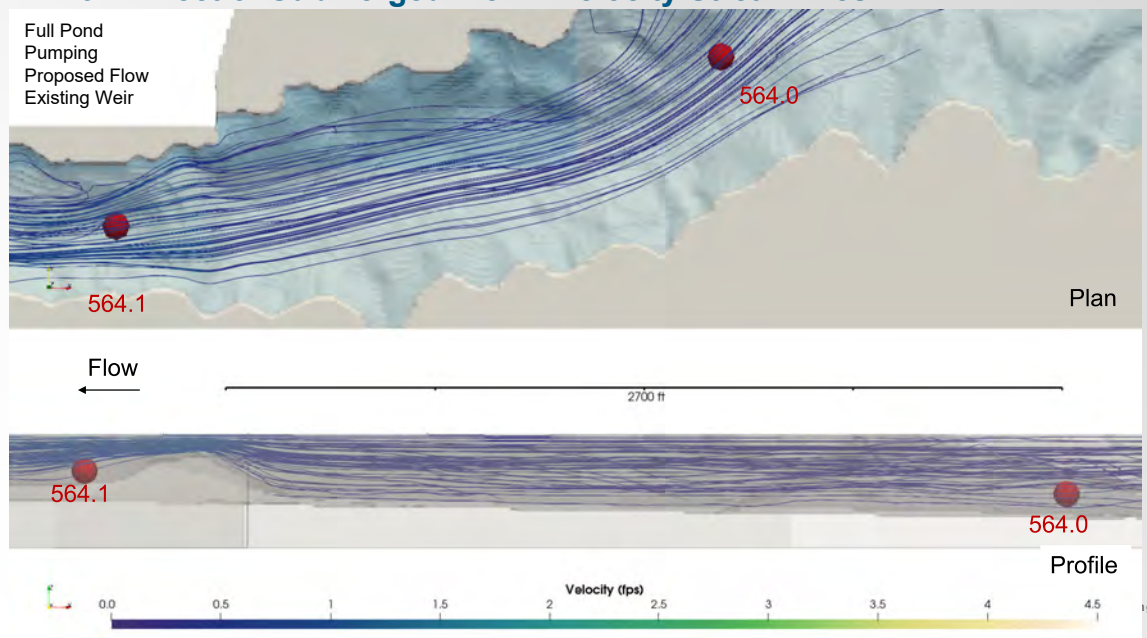
52

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



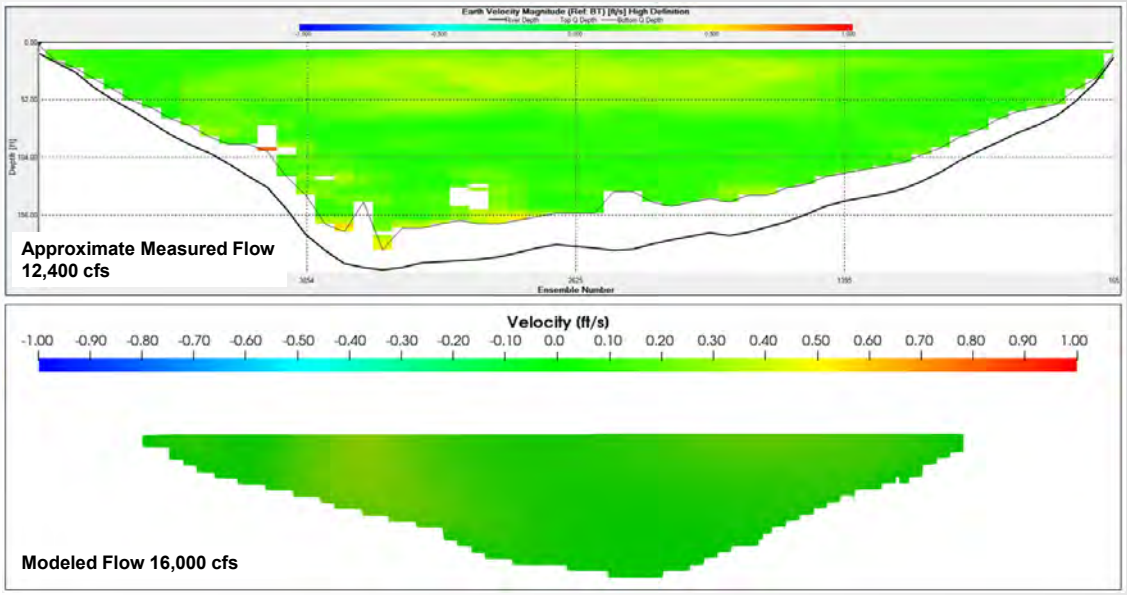
53

Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



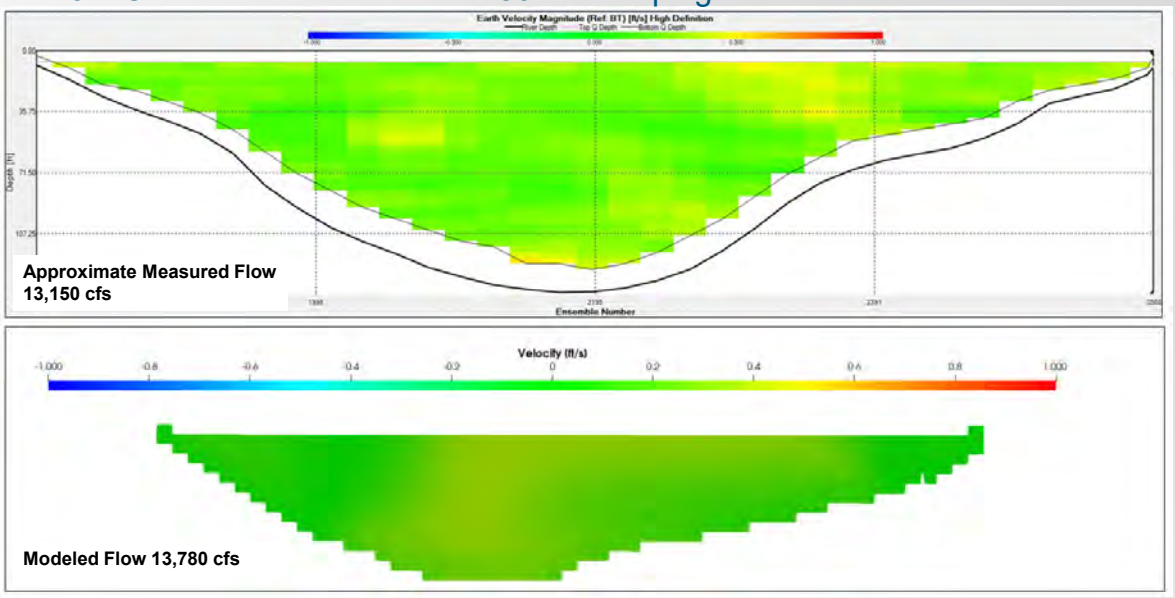
54

Task 3 – CFD Verification – Station 564.0 Generation



55

Task 3 – CFD Verification – Station 564.1 Pumping



56

Task 3 - Conclusions

Generation

- The energy of the water discharged from Bad Creek is dissipated as it flows over the existing submerged weir.
- Similar vertical mixing and flow patterns result from flows over existing and expanded weir.
- Similar vertical mixing and flow patterns result from Bad Creek II powerhouse operations.
- Results indicate Bad Creek II powerhouse operations will not alter existing stratification patterns observed at Station 564.0 (downstream of weir).

Pumping

- Hydraulic impacts due to Bad Creek II pumping impacts limited to Whitewater River Cove upstream of submerged weir.
- Pumping in any configuration does not create mixing downstream of submerged weir.

Take home message: Of the "bookend" scenarios analyzed, combined Bad Creek and Bad Creek II operations (39,200 cfs) with Lake Jocassee at minimum pond elevation (1,080 ft msl) had the greatest effect on Whitewater River cove hydraulics (as expected), however at the downstream model boundary **that effect was negligible**.

57

Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

- **Objectives:**
  - Use the existing CHEOPS model to evaluate the difference in water **exchange rate, frequency, and magnitude** between Bad Creek Reservoir and Lake Jocassee due to the addition of a second powerhouse.
  - Identify and evaluate impacts, if any, to Lake Keowee as a result of operating an additional powerhouse at the Project.
- **Status:** Ongoing

CHEOPS™
Operations and Planning Model

58

Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

Performance Measures Worksheet (Excerpt) – Report distributed in Spring 2024

Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	BCII
	Lake Jocassee						
	Elevation - Storage Availability						
1	Maximize adherence to reliably meet all Project-related water demands	Number of years reservoir level at or above 1,108 ft AMSL on May 1	1-May	1-May	5		
	Elevation - Recreation						
2	Minimize restricted recreation	Number of years where cove access (reservoir level below 1,090 ft AMSL) is restricted for more than 25 days (Note 3)	1-Jan	31-Dec	2		
3		Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) during higher use months in any calendar year (Note 3)	1-Mar	31-Oct	5		
4		Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) in any calendar year (Note 3)	1-Jan	31-Dec	5		
5	Minimize restricted boat launching	Number of years where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months for more than 25 days (Note 4)	1-Mar	31-Oct	2		
6		Greatest number of days where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months in any calendar year (Note 4)	1-Mar	31-Oct	5		
7	Minimize effects on recreational boating	Number of days where reservoir level changes more than 1.0 ft in one hour	1-Jan	31-Dec	10		
	Elevation - Natural Resources						
8	Maximize spawning success for black bass and blueback herring (2.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
9		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
10		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
11		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 30 consecutive days at least once (Note 5)	1-Apr	31-May	5%		
12		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 45 consecutive days at least once (Note 5)	1-Apr	31-May	5%		

59

Task 5 – Future Water Quality Monitoring Plan Development

- Will be carried out in consultation with Resource Committees in 2024 and in coordination with Section 404/401 activities.

60

Recreational Resources Study

61

Recreational Resources Task Refresher

Study Task	Status
Task 1 – Foothills Trail Corridor Recreation Use and Needs Study	**Ongoing**
Task 2 – Foothills Trail Corridor Conditions Assessment	**Ongoing**
Task 3 – Whitewater River Cove Existing Recreational Use Evaluation	**Complete**
Task 4 – Whitewater River Cove Recreational Public Safety Evaluation	**Begin in 2024**

62

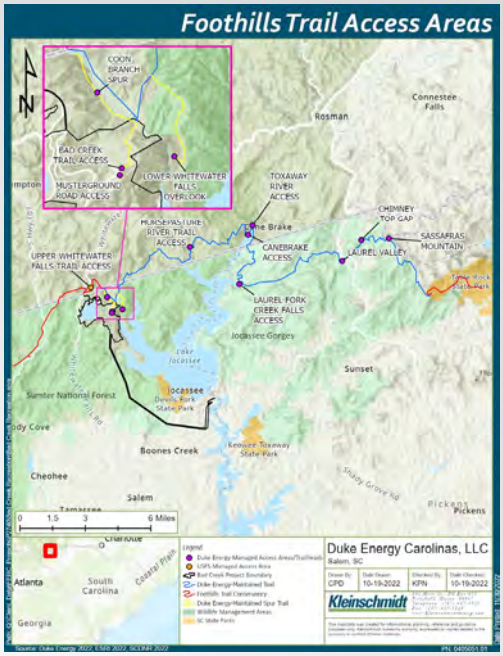
Task 1 – Foothills Trail Corridor Recreation Use and Needs Study

- **Objective(s):** The goals of the RUN Study are to assess current recreation use and identify any future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy.
- **Status:** Ongoing

63

Task 1 – RUN Study Methods Summary

Study Area:
- the 43-mile-long segment of the Foothills Trail and associated access areas on non-Project lands maintained by Duke Energy; the entrance road to Musterground Road; Upper Whitewater Falls Trail Access (US Forest Service)
- 4 trailheads provide vehicular access (Sassafras Mountain, Chimney Top Gap, Laurel Valley, and Bad Creek Hydro Project Trail Accesses)
- 4 trailheads provide boat-in and hike-in only trail access (Horsepasture, Toxaway River, Canebrake, and Laurel Fork Creek Trail Accesses)



64

Task 1 – RUN Study Methods

Data Collection Methods:

- Data collection methods include recreation site inventory, traffic counters, trail counters, in-person user surveys, and user surveys accessed via QR Code
- Spot counts were also conducted at Laurel Valley Trail Access to supplement the traffic counter data
- In-person surveys were collected on 30 days (4-hour shifts) between March and November at Laurel Valley, Toxaway River, Horsepasture River, and Bad Creek Hydro Project Trail Accesses
- Signs with QR codes that linked to an online version of the survey were posted at all trail access areas

Table 6-1. Summary of Data Collection Methods

Access Area	Data Collection Methods				
	Recreation Site Inventory	Traffic Counter	Trail Counter	In-Person User Surveys	User Surveys Accessed Via QR Code
Table Rock State Park[a]			*		
Sassafras Mountain Trail Access	*	*	*		*
Chimney Top Gap Trail Access	*		*		*
Laurel Valley Trail Access	*	*	*	*	*
Laurel Fork Creek Falls Spur Trail Access	*		*		*
Toxaway River Trail Access[b]	*		*	*	*
Canebrake Trail Access	*		*		*
Horsepasture River Trail Access	*		*	*	*
Lower Whitewater Falls Overlook	*		*		*
Bad Creek Hydro Project Trail Access[c]	*	*	*	*	*
Coon Branch Spur Trail			*		*
Musterground Road[d]		*			
Upper Whitewater Falls Trail Access[a]		*			

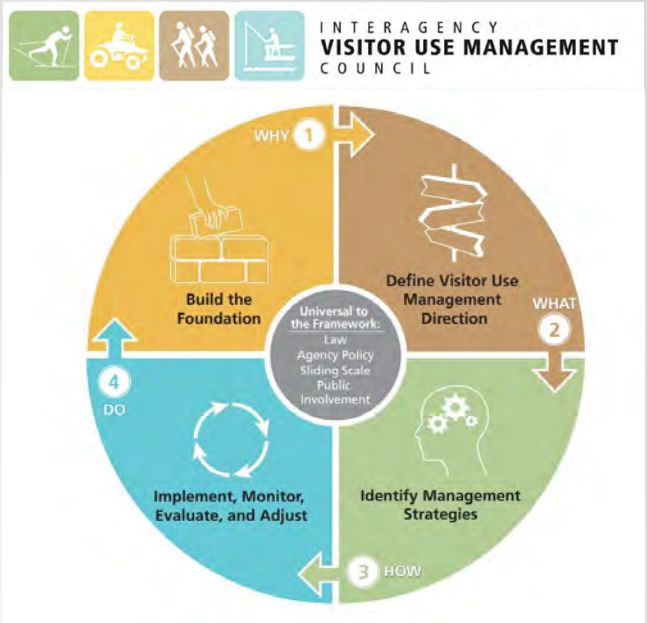
[a] This site is not maintained by Duke Energy.
[b] If water levels on Lake Jocassee do not allow for boat-in access to the Toxaway River Trail Access, surveys will be conducted at an alternative boat-in access point as identified in consultation with the Recreational Resource Committee.
[c] Two traffic counters will be installed near Bad Creek Hydro Project Trail Access, including one south of the parking area and one north of the parking area.
[d] This access road is managed via the Jocassee Gorges Road Management MOA between SCDNR and Duke Energy.

65

Task 1 – RUN Study Methods Summary

Data Analysis:

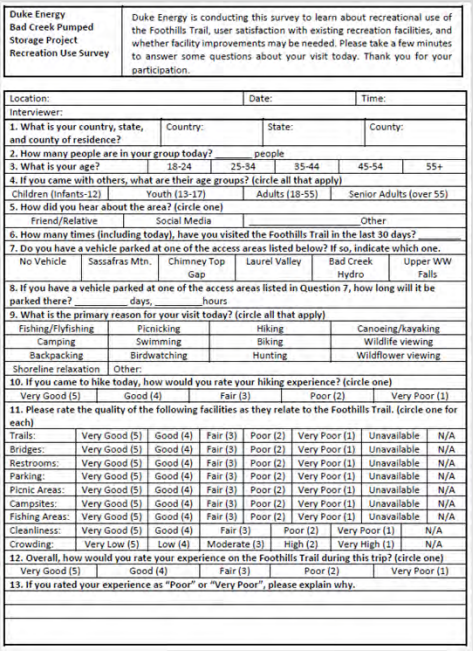
- Parking Demand Analysis
- Trail Carrying Capacity Analysis (conducted by Applied Trails Research)
- Future Recreation Use Analysis
- Recreation Needs Assessment



66

Task 1 – RUN Study Progress

- Data collection is complete
  - Musterground Road counter was removed January 15th
- Preliminary Survey Totals
  - 259 in-person surveys collected
  - 61 QR code surveys collected
  - 320 surveys total
- Data analysis is underway
- Draft report will be submitted for Resource Committee review in 2024
- Final report will be submitted with the USR



Duke Energy Bad Creek Pumped Storage Project Recreation Use Survey	Duke Energy is conducting this survey to learn about recreational use of the Foothills Trail, user satisfaction with existing recreation facilities, and whether facility improvements may be needed. Please take a few minutes to answer some questions about your visit today. Thank you for your participation.

Location:	Date:	Time:
Interviewer:		

1. What is your country, state, and county of residence?	Country:	State:	County:

2. How many people are in your group today? _____ people					
3. What is your age?	18-24	25-34	35-44	45-54	55+

4. If you came with others, what are their age groups? (circle all that apply)		
Children (infants-12)	Youth (13-17)	Adults (18-55)	Senior Adults (over 55)

5. How did you hear about the area? (circle one)		
Friend/Relative	Social Media	Other

6. How many times (including today), have you visited the Foothills Trail in the last 30 days? _____					
7. Do you have a vehicle parked at one of the access areas listed below? If so, indicate which one.					
No Vehicle	Sassafras Mtn.	Chimney Top Gap	Laurel Valley	Bad Creek Hydro	Upper WW Falls

8. If you have a vehicle parked at one of the access areas listed in Question 7, how long will it be parked there? _____ days, _____ hours			
9. What is the primary reason for your visit today? (circle all that apply)			
Fishing/Flyfishing	Picnicking	Hiking	Canoeing/kayaking
Camping	Swimming	Biking	Wildlife viewing
Backpacking	Birdwatching	Hunting	Wildflower viewing
Shoreline relaxation	Other:		

10. If you came to hike today, how would you rate your hiking experience? (circle one)				
Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)

11. Please rate the quality of the following facilities as they relate to the Foothills Trail. (circle one for each)							
Trails:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Bridges:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Restrooms:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Parking:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Picnic Areas:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Campsites:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Fishing Areas:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)	Unavailable	N/A
Cleanliness:	Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)		N/A
Crowding:	Very Low (5)	Low (4)	Moderate (3)	High (2)	Very High (1)		N/A

12. Overall, how would you rate your experience on the Foothills Trail during this trip? (circle one)				
Very Good (5)	Good (4)	Fair (3)	Poor (2)	Very Poor (1)

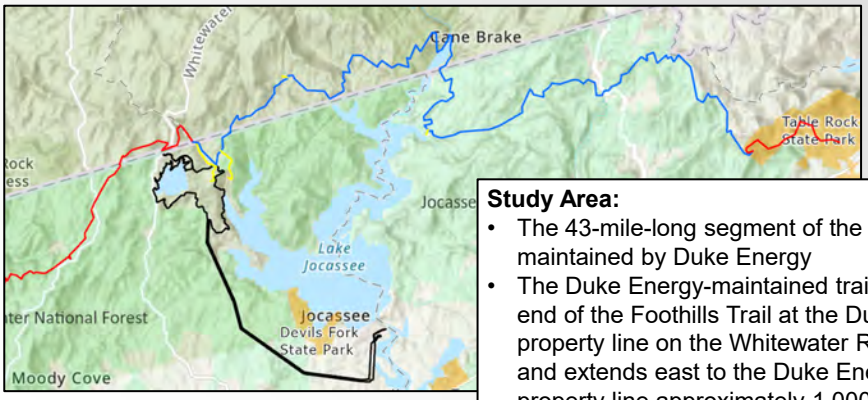
13. If you rated your experience as "Poor" or "Very Poor", please explain why.

Task 2 – Foothills Trail Corridor Conditions Assessment

- **Objective(s):** To evaluate the current condition of the trail surface and corridor included in the 43-mile segment and associated spur trails of the Foothills Trail maintained by Duke Energy and identify key areas of future maintenance needs or improvements.

- **Status:** Ongoing

Task 2 – Foothills Trail Corridor Conditions Assessment



Study Area:

- The 43-mile-long segment of the Foothills Trail and five spur trails maintained by Duke Energy
- The Duke Energy-maintained trail segment begins on the western end of the Foothills Trail at the Duke Energy/US Forest Service property line on the Whitewater River near the Bad Creek Project and extends east to the Duke Energy/Table Rock State Park property line approximately 1,000 feet southwest of the top of Pinnacle Mountain
- The five spur trails include Laurel Fork Falls, Hilliard Falls, Lower Whitewater Falls Overlook, Bad Creek, and Coon Branch

69

Task 2 –Trail Conditions Assessment - Methods

- **Methods:**
  - Locate issue/structure along the trail and record GPS waypoint
  - Take photos of significant issues/features for documentation
  - Identify type of issue/structure using categories
  - Measure issue/structure (i.e., bridges, culverts, eroded sections, washouts, wet areas, and diameters of fallen trees)
  - If excessive grade is present (greater than 15 percent slop) in conjunction with erosion, utilize clinometer to measure percent slope
  - Provide additional description/comments about issues/structures identified
- Assessment was completed by Long Cane Trails
- Foothills Trail Guidebook was used as a reference for location descriptions

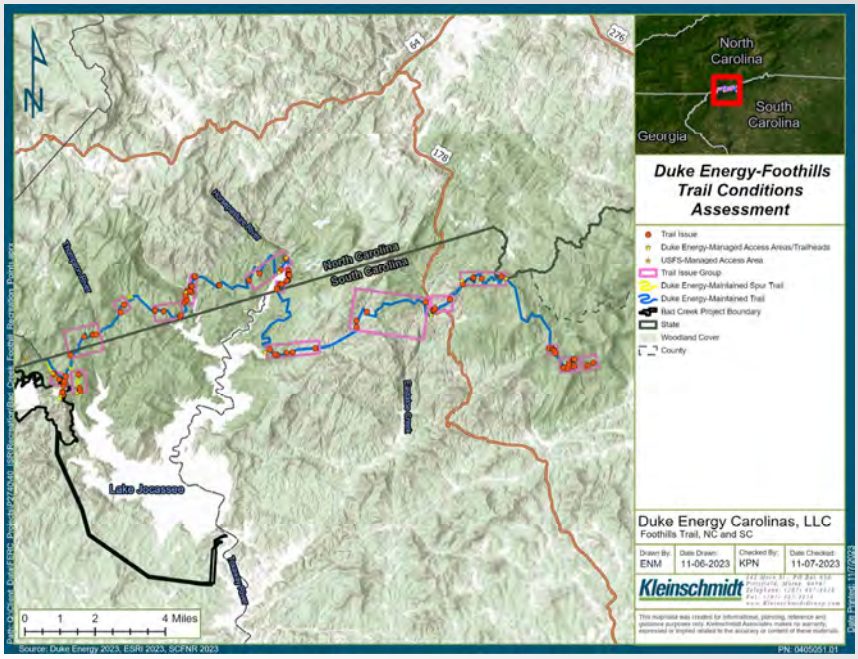
Trail Assessment Descriptions:

Code	Description
B	Bridges, puncheon, bog bridges, turnpikes. ***Note construction material, length/width (feet) and condition of bridge.***
UC	Unimproved Crossing (stream crossing). ***Note if wading or rock steps and any maintenance required (unstable stepping stones). Note the width of the stream at the crossing point.***
C	Culvert – open or closed drain across the trail. ***Note condition of culvert, length/diameter and if sufficient size for situation.***
E	Erosion - look for exposed roots, rocks, or gullies on trail. ***Describe situation (exposed roots, gullies on tread, located on fall line (going straight down a hill regardless of grade) and length of eroded section (if greater than 25 ft, approximate distance).*** ***If excessive grade (>15% slope) in conjunction with erosion: measure steep slopes with clinometer (if numerous steep rocky slopes, no need to measure each one – note that trail has numerous steep rocky sections)***
EC	Erosion Control Devices – check dams, water bars. ***Note type and condition of structure.***
WO	Washout - section of trail has been mostly/completely washed away. ***Note length/width/depth and any hazards associated with washout. Take photo.***
WA	Wet Area/standing water (larger than 3ft diameter). ***Note length/width. Note any adjacent water feature.***
OB	Obstacle – fallen tree or other obstacle blocking treadway (include broken branches or trees leaning above/across the trail ("widow makers"). ***Note diameter of fallen tree.***
IB	Insufficient Blazing/Marking – if can't see next blaze/marker as you are moving past a blaze/marker or hard to locate next blaze/marker. ***Note if blazes/markers missing or worn off.***
SI	Signage – ***Identify if Trailhead, Directional or Interpretive and if in need of repair. Note type of repair.***
AC	Additional Comment – specific locations that warrant noting such as a scenic vista, unique feature (caves, mines, rock wall) and locations of invasive species. ***Note type of feature and associated details (such as name of invasive species and amount of plants (number, area).***

70

Task 2 –Trail Conditions Assessment - Results

- **Results:**
  - Long Cane Trails identified 89 areas needing maintenance or improvement within the study area.



71

72

Trail Issue #	Figure #	Date Assessed	Trail Name	Mile Marker	Latitude	Longitude	Assessment Type	Description/Details
1	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.1	35.01273631	-82.99787808	Culvert, Open Drain	Concrete culvert needs cleaning. Sediment has gathered and is sitting, not allowing water to run down the drain.
2	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.1	35.01296829	-82.99759536	Wet Area / Standing Water	Gravel needs to be added to the section of the trail to raise it approximately 2 inches. This is a very low area with standing water most of the time. In fact, there is some drainage that seems to be serving a purpose in this area also.
3	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.2	35.01339791	-82.9977754	Wet Area / Standing Water	Low part of the trail, and gravel needs to be brought in. Easily accessible from the parking lot. This trail has had gravel on it in the past. It just needs a topping.
4	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.3	35.01449413	-82.99786919	Erosion Control Devices, Other	Someone is putting barricades on the side of the trail, and these need to be removed. There are several in this section of the trail. These, in fact, hold water on the trail versus letting water off the trail. There should be a series of knicks or grade reversals in this section to divert water.
5	Figure 4-2	9/14/2023	Bad Creek Access Spur	0.3	35.01413933	-82.99811383	Steps	The step is rotten and needs to be replaced.
6	Figure 4-3	9/14/2023	Bad Creek Access Spur	0.6	35.01723673	-82.99744404	Signage, Interpretive	Approximately 100 feet of trail has been rerouted. The user can still see the old relays in the corner as well as the old trail. The new trail is working great! The old trail needs to be closed, and the new trail needs to be blazed in the corner, so users know this is the trail. In this particular area, you have not seen a blaze in a while. Blue color is needed to apply a new blaze
7	Figure 4-3	9/14/2023	Bad Creek Access Spur	0.7	35.01869053	-82.99718057	Obstacle, Fallen Tree	A fallen tree across the trail needs to be removed.
8	Figure 4-3	9/18/2023	Coon Branch	0.2	35.01956213	-82.99972003	Bridge, Bridge	The upper railing needs to be replaced on both sides, and two decking boards need to be replaced.
9	Figure 4-3	9/18/2023	Coon Branch	0.2	35.01966168	-82.9999907	Bridge, Bridge	Two 2x4x12 railings need to be replaced.
10	Figure 4-3	9/18/2023	Coon Branch	0.4	35.02183009	-83.00243764	Bridge, Buncheon	Bog Bridge, two feet wide by four feet long, needs to be installed
11	Figure 4-3	9/18/2023	Coon Branch	0.4	35.02160249	-83.00233517	Erosion, Gullie	A major drain needs to be unclogged. It is overflowing and going down the trail. The solution is to simply open the drain up more and get rid of the sediment that is raising the drain up.
12	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	0.4	35.02155442	-82.99014034	Washout	Trail needs water diversion in the form of grade dips or knicks.
13	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	0.9	35.01623192	-82.98947331	Washout	Trail needs some steps and grade dips or water diversion features added. Approximately 20 steps needed.
14	Figure 4-4	9/14/2023	Lower Whitewater Falls Spur	1	35.01476505	-82.98918722	Erosion, Gullie	Trail is using an old roadbed that has a gully on each side and very few drains. all drains are clogged and need to be rerouted. New trail limit is very close to the old just elevated on the banks versus in the middle of the old roadbed.
15	Figure 4-3	9/14/2023	Foothills Trail	31.6	35.02092083	-82.99665677	Washout	The trail needs some grade reversals or knicks. Water has gotten on the trail and does not leave for some time, causing a gully if not fixed.
16	Figure 4-5	9/30/2023	Foothills Trail	32.4	35.02958049	-82.99437631	Steps	Replace three steps
17	Figure 4-5	9/30/2023	Foothills Trail	33.3	35.03730923	-82.98769713	Steps	Replace three steps
18	Figure 4-5	9/30/2023	Foothills Trail	33.9	35.03812814	-82.98336354	Steps	One step needs to be replaced.
19	Figure 4-5	9/30/2023	Foothills Trail	34.2	35.03822699	-82.98165951	Steps	Steps need to be replaced.
20	Figure 4-6	9/30/2023	Foothills Trail	35.5	35.04768531	-82.96974848	Obstacle, Fallen Tree	Tree across trail and needs to be removed.
21	Figure 4-6	9/18/2023	Foothills Trail	35.8	35.05077596	-82.96808629	Steps	Two steps need to be replaced.

73

Task 2 –Trail Conditions Assessment – Results Summary

- **Summary:**
  - Long Cane Trails identified 89 items within the study area primarily related to trail maintenance and safety
    - 75 on the Foothills Trail
    - 7 on the Bad Creek Access Spur Trail
    - 4 on the Coon Branch Spur Trail
    - 3 on the Lower Whitewater Falls Spur Trail
  - Items identified include culvert cleaning, erosion control, steps replacement, signage improvement, bridge maintenance, fallen tree removal, and trail washout repair
  - The draft report was issued to the RC for review on November 21, 2023, and comments were received from the following entities:
    - Foothills Trail Conservancy
    - SCDNR
    - FOLKS
  - Duke Energy will meet with the RC to discuss study results
  - The final report will be filed with the USR

Key Findings of Foothills Trail Conditions Assessment

Trail	Mile	Key Findings
Bad Creek Access Spur	0.1-0.7	• Culvert Maintenance: A culvert with a clogged drain spanning 80 feet requires cleaning to allow proper water flow. • Wet Areas: Low areas on the trail with standing water need gravel addition to raise and level the path, covering 60 feet and 30 feet sections. • Erosion Control: Removal of barricades placed on the side of the trail to address water retention issues. • Steps Replacement: Several steps need replacement due to rot. • Interpretive Signage: Approximately 100 feet of trail has been rerouted, and new blazes are needed to guide hikers.
Coon Branch Spur	0.2	• Bridge Maintenance: Railing and decking replacement for a bridge, involving handrails and decking boards. • Railing Replacement: Two handrails need replacement.
Coon Branch Spur	0.4	• Bog Bridge Installation: Installation of a bog bridge measuring 4 feet x 2 feet. • Drain Clearing: Major drain unclogging is required to prevent overflow onto the trail.
Foothills Trail	31.6-72.8	• Erosion Control: Multiple sections of the Foothills Trail require erosion control measures such as grade reversals, knicks, or drainage improvements. • Steps Replacement: Various steps along the trail need replacement or repair due to damage. • Fallen Trees: Several fallen trees across the trail need removal. • Bog Bridges: Installation of new bog bridges. • Signage: Adding new trail blazes and interpretive signage. • Brush Removal: Clearing overgrown sections of the trail. • Washout Repair: Addressing trail washouts and water diversion. • New Trail Sections: Creating new trail segments to address erosion and trail conditions.
Lower Whitewater Falls Spur	0.4-1.0	• Washout and Erosion: Trail washouts, the need for stairs, and grade dips have been identified, impacting a significant portion of this spur.

74

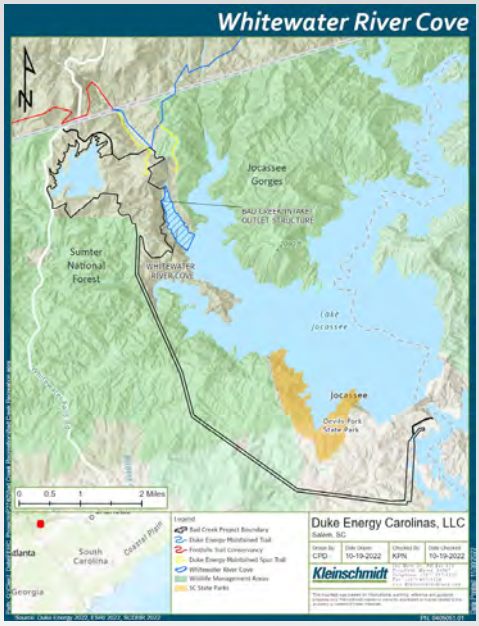
Task 3 – Whitewater River Cove Existing Recreational Use Evaluation

- **Objective(s):** Establish baseline recreational use within the study area, specifically the level of boating use in Whitewater River cove; and quantify recreational impacts of temporary closures of Whitewater River cove during construction of Bad Creek II Complex.
- **Status:** **Complete**

75

Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Study Area:**
  - Whitewater River Cove of Lake Jocassee from 35.00.00.40N, 82.59.29.29W to 35.00.04.69N, 82.59.15.57W



76

Task 3 – Whitewater River Cove Recreation Evaluation - Methods

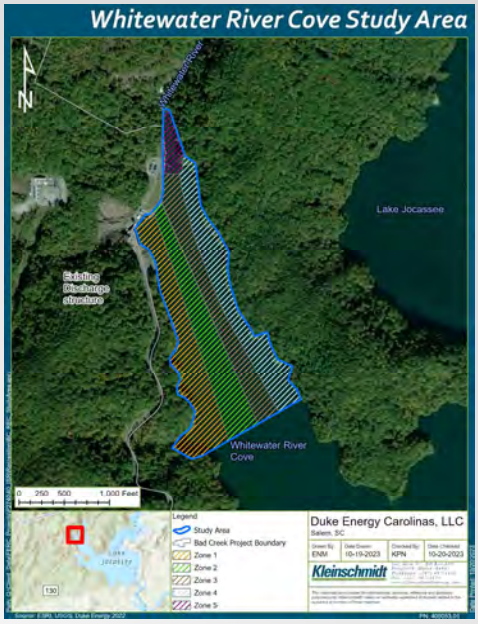
- **Objective 1 Methods:**
  - Duke Energy deployed a drone over the Whitewater River cove to capture aerial images of recreation use and determine the number, type, and location of boats within the study area.
  - Drone flights occurred on 20 individual days between Memorial Day weekend and Labor Day weekend
  - Flights occurred on a mix of weekdays, weekends, and holidays
  - Images were collected approximately every hour generally between 9:00 AM and 4:00 PM.
  - Boats were categorized as:
    - Motorboat
    - Non-motorized boat (such as canoe or kayak)
    - Personal watercraft (such as Jet-Ski)
    - Paddleboard

Flight/Survey Date	Daily High Temperature (°F)	Notes
Sunday, May 28, 2023	63	
Wednesday, May 31, 2023	75	
Friday, June 2, 2023	86	
Saturday, June 3, 2023	88	
Tuesday, June 13, 2023	79	
Saturday, June 24, 2023	82	
Wednesday, June 28, 2023	89	
Saturday, July 1, 2023	93	
Tuesday, July 4, 2023	89	
Friday, July 14, 2023	92	Due to lightning, flights ended at 2:30 pm
Saturday, July 15, 2023	95	Due to storms, flights ended at 3:00 pm
Thursday, July 20, 2023	82	
Saturday, July 29, 2023	90	
Monday, July 31, 2023	89	
Sunday, August 6, 2023	92	
Monday, August 7, 2023	92	
Wednesday, August 23, 2023	86	
Sunday, August 27, 2023	94	Due to weather, flights ended at 2:30 pm
Sunday, September 3, 2023	87	
Monday, September 4, 2023	91	

77

Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 1 Methods:**
  - Aerial imagery was analyzed to estimate:
    - Total number of boats present each day
    - Number of boat types captured each day
    - Approximate duration of time each boat spent in Whitewater River cove
  - Study area was divided into five distinct zones to further classify location of boats within Whitewater River cove



78

Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 2 Methods:**
  - Data were extrapolated to draw conclusions related to the rate and patterns of recreation use in Whitewater River cove
  - Estimates for nighttime and off-season use determined during the 2012 Keowee-Toxaway RUN Study were applied.
  - Estimates for nighttime and off-season use were combined with estimates for peak season daytime use to determine estimate for total use in the Whitewater River cove for 2023
  - Data were escalated based on population projections for 2030 in Oconee County, SC

79

Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

Table 4-2 Total Number of Boats and Boat Types per Flight

Flight/Survey Date	Day Type	Total # of Boats	Total # of Each Boat Type			
			Kayak	Personal Watercraft	Canoe	Motorboat
Sunday, May 28, 2023	Holiday	4	0	2	0	2
Wednesday, May 31, 2023	Weekday	4	0	0	0	4
Friday, June 2, 2023	Weekday	8	4	1	0	3
Saturday, June 3, 2023	Weekend	25	7	0	1	17
Tuesday, June 13, 2023	Weekday	13	3	0	0	10
Saturday, June 24, 2023	Weekend	34	2	1	0	31
Wednesday, June 28, 2023	Weekday	20	0	0	1	19
Saturday, July 1, 2023	Weekend	38	2	3	0	33
Tuesday, July 4, 2023	Holiday	35	1	1	0	33
Friday, July 14, 2023	Weekday	15	0	3	0	12
Saturday, July 15, 2023	Weekend	47	0	10	0	37
Thursday, July 20, 2023	Weekday	12	4	0	0	8
Saturday, July 29, 2023	Weekend	41	0	1	1	39
Monday, July 31, 2023	Weekday	21	1	0	0	20
Sunday, August 6, 2023	Weekend	14	3	6	0	5
Monday, August 7, 2023	Weekday	1	0	0	0	1
Wednesday, August 23, 2023	Weekday	8	0	1	0	7
Sunday, August 27, 2023	Weekend	22	0	1	0	21
Sunday, September 3, 2023	Holiday	48	0	13	0	35
Monday, September 4, 2023	Holiday	30	2	0	0	28
Total		**440**	**29**	**43**	**3**	**365**

80

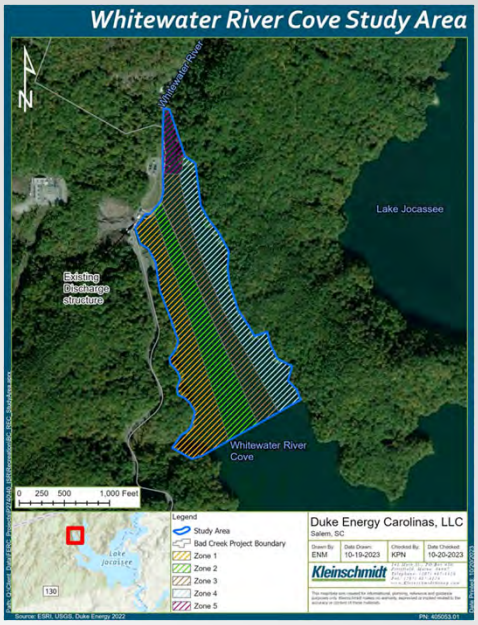
Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - During the study period, boats in Whitewater River cove were:
    - Motorboats (83 percent)
    - Personal watercraft (10 percent)
    - Kayaks (7 percent)
    - Canoes (less than 1 percent)
    - No paddleboards observed
  - Majority of use was on weekends/holidays (day type) and July (month)
  - Duration of time in cove:
    - 90 percent were <1 hour
    - 9 percent were 1-2 hours
    - 1 percent were >2 hours

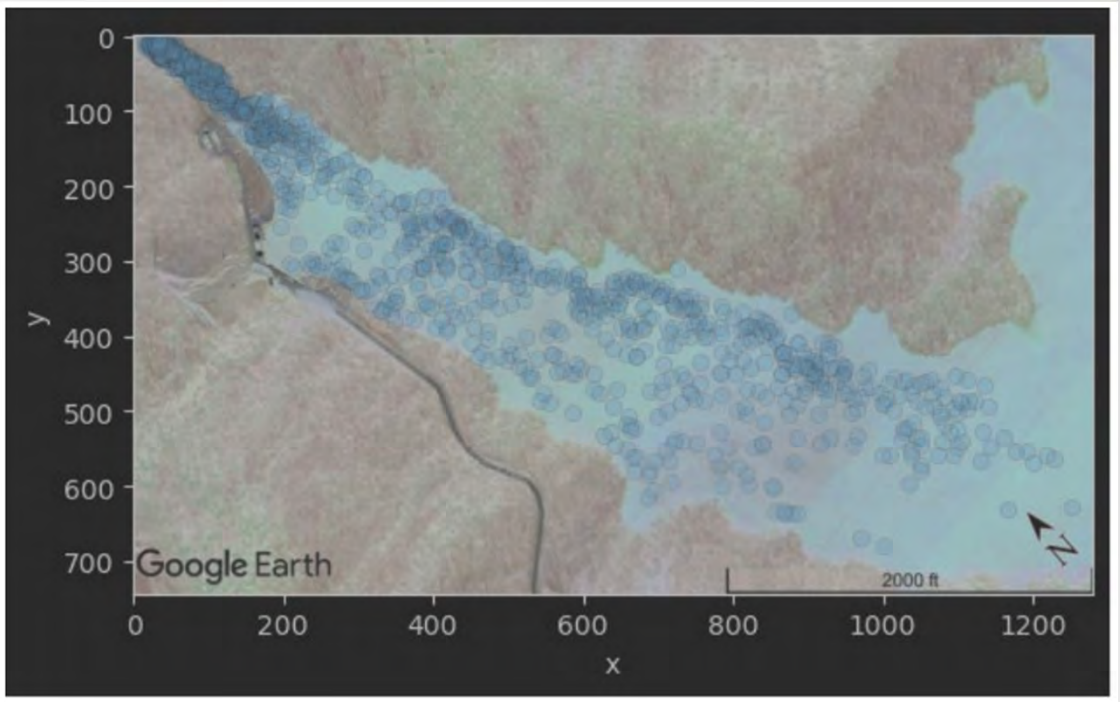
81

Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - Boats were observed in the following zones:
    - **Zone 5** (49 percent)
    - **Zone 3** (20 percent)
    - **Zone 4** (17 percent)
    - **Zone 1** (9 percent)
    - **Zone 2** (5 percent)



82



83

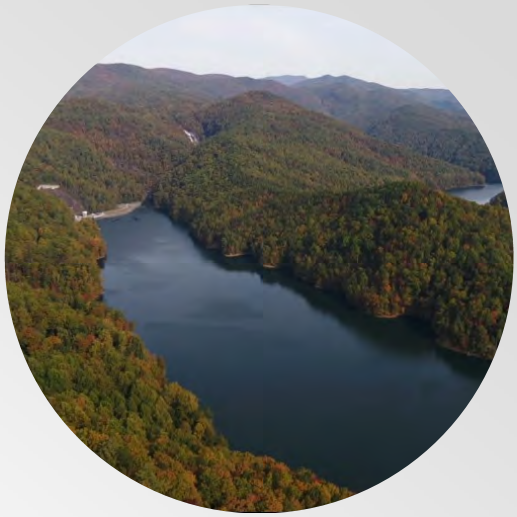
Task 3 – Whitewater River Cove Recreation Evaluation – Objective 2 Results

- **Objective 2 Results:**
  - Estimated Recreation Use in Whitewater River Cove
    - ~3,647 boats between April-October 2023
    - ~3,756 boats in 2023
  - During construction of Bad Creek II Complex, the cove would be closed to the public for 5-7 years
  - Closure of the cove could displace between approximately 19,895 and 27,852 boats during the construction period

84

Task 3 – Whitewater River Cove Recreation Evaluation – Summary

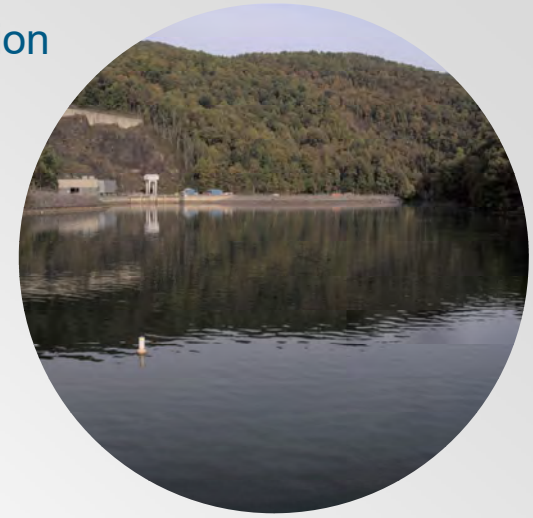
- **Summary:**
  - Whitewater River cove is primarily visited by recreators in motorboats
  - Boats tend to follow the eastern shoreline of the cove and congregate in the northern tip of the cove near the waterfall
  - Visitors are assumed to be primarily sightseers (viewing the waterfall) and secondarily fishermen
  - Recreation impacts from Bad Creek II Complex construction:
    - Between 19,895 and 27,852 boats displaced during 5–7-year construction period (approximately 4,000 boats per year)
    - Approximately **1-2 percent of recreation** days at Lake Jocassee lost each year



85

Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Objective(s):** Evaluate potential public safety risks that may be created or exacerbated by the Bad Creek II Complex during both the construction and operation phases. The evaluation will include but not be limited to identification of areas where access will be temporarily or permanently restricted to the public as well as a boater safety evaluation for the Whitewater River arm of Lake Jocassee.
  - The desktop study will evaluate impacts of operation of the expanded Project (i.e., two powerhouses) on water velocities released to the Whitewater River cove and impacts to water-based recreation using the CFD model.
- **Status: Future**



86

Aquatic Resources Study

87

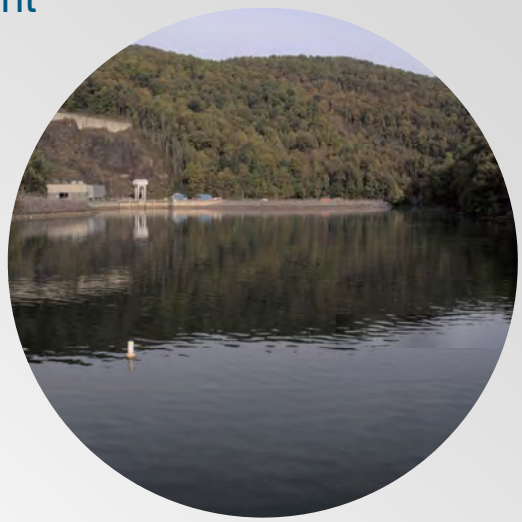
Aquatic Resources Study Task Refresher

Study Task	Status
Task 1 – Consultation on Entrainment	**Complete**
Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat	**Ongoing**
Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna	**Ongoing**

88

Task 1 – Consultation on Entrainment

- **Objective(s):** Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II Complex and consult with agencies and other Project stakeholders regarding results of the recent desktop Entrainment Study (Kleinschmidt 2021).
- **Status:** **Complete**



89

Task 1 – Consultation on Entrainment - Outline

1. Consultation with Stakeholders and Agencies
   a. Resource Committee Discussions held April 6, 2023 Guided Analysis
2. Data & Methods
3. Results
   1. Exploratory data analysis
   2. Simulation Results
   3. Risk
4. Discussion

90

Task 1 – Consultation on Entrainment - Data Sources

- 1973 – 2020 Lake Jocassee Water Quality
  - date\time\elevation\pH\DO\temperature\conductivity
- 1990 – 1994 Jocassee Hydro Plant Log
  - date\time\forebay elevation
- 1991 – 1993 Bad Creek Entrainment Observations
  - date\time\# of contacts
- 2012 – 2014 Operations Period of Record
  - date\time\Unit 1 MW\Unit 2 MW\Unit 3 MW\ Unit 4 MW

Kleinschmidt

91

Existing Entrainment Estimators

- Traditional methods multiply entrainment rate (fish/Mft^3) by the total volume of water discharged through a facility within some unit of time
- Produce single point estimate with no uncertainty
- Entrainment rates are highly variable with infrequent, but large events…

Two Potential Problems:

1. If a large episodic event occurs while sampling, the estimate will be biased as this high rate is applied across an entire interval of time

2. Likewise, if no large event occurs while sampling the estimate may incorrectly characterize the facility as having little to no impact

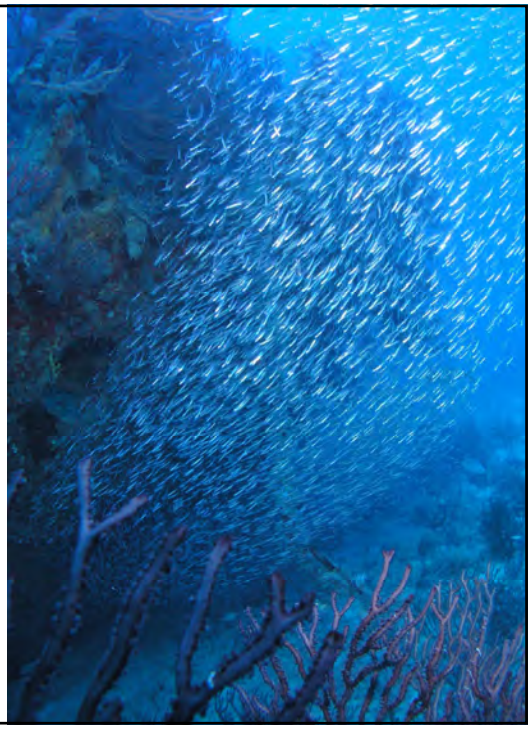
Kleinschmidt

92

stryke.py

- Individual based model – follows the fate of individual fish in a simulated population as they migrate through a hydroelectric facility
- Population size, entrainment rates, individual lengths, movement, and survival are simulated with Monte Carlo methods
- Python 3.7.x with MS Excel interface

https://github.com/knebiolo/stryke



93

Impacts Analysis: Describing Entrainment Events

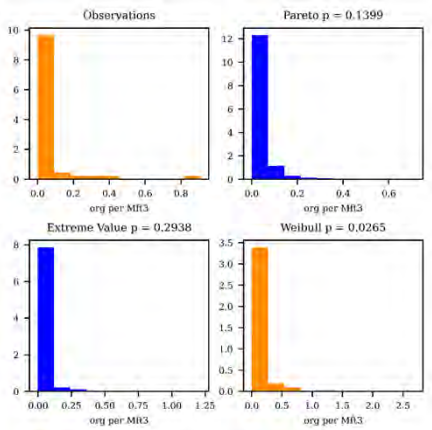
stryke simulates the *magnitude* and *frequency* of entrainment events by sampling from distributions fit to empirical observations

Database of monthly observations from 73 facilities (EPRI 1997)

- Normalized for discharge: fish per Mft^3

Pattern repeated across species and regions

EVT not CLT

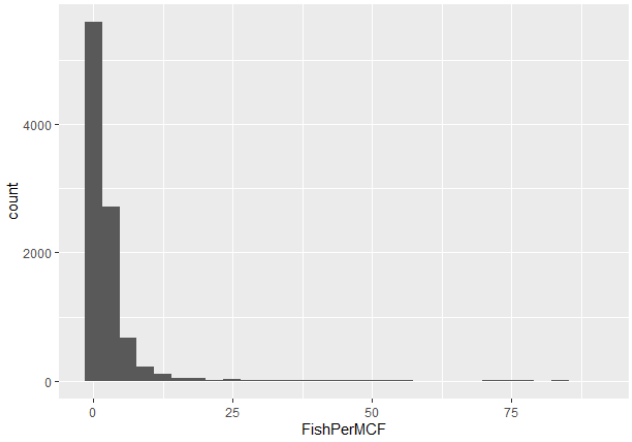


how big can an event get and how frequently do they occur?

Kleinschmidt

94

Bad Creek Entrainment 1991 - 1993

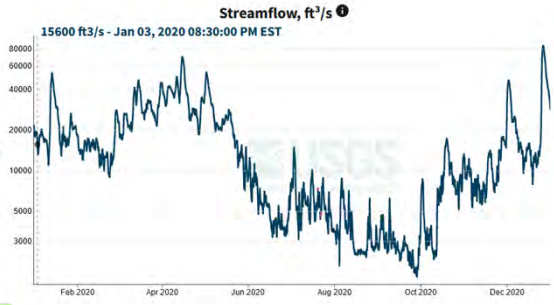


Fish Mft^3 – acoustic imaging camera at Bad Creek Pumped Storage

Kleinschmidt

95

Yearly Entrainment Estimate (Impact)



For every day in a hydrograph → Simulate presence → If present simulate entrainment event → For every fish in event, simulate movement and survival → Σ

X 1000's

Kleinschmidt

96

Effects Analysis – Population Resiliency

- Population is resilient if it can replace those lost
- Used population growth rates or doubling rates (FishBase)
- Assume population depleted relative to carrying capacity

$$N_{t+1} = N_t(1 + r) - (E_t + M_t)$$

Where:

- N_t = population in year t
- r = discrete population growth rate
- E_t = entrainment mortality in year t
- M_t = natural mortality in year t

Kleinschmidt

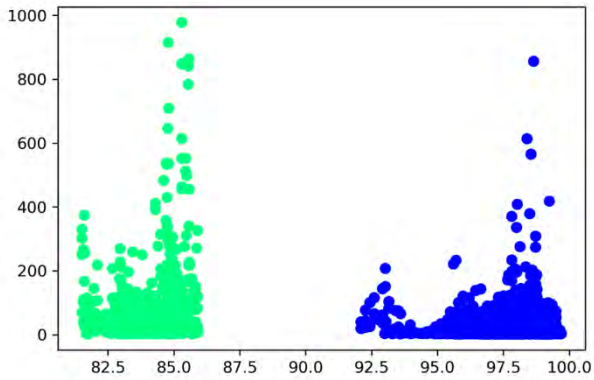
97

Exploratory Data Analysis: Forebay Elevation

Forebay elevation collected 3 – 4x per day

Low variability within a day allows us to interpolate a forebay observation for every entrainment observation

2 observational modes identified with GMM



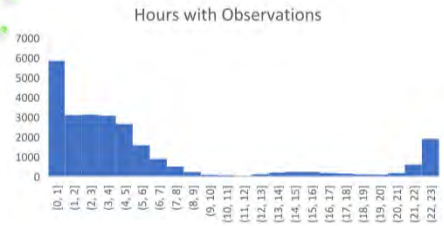
Low forebay elevations occurred during meteorological fall (Sep, Oct, Nov)

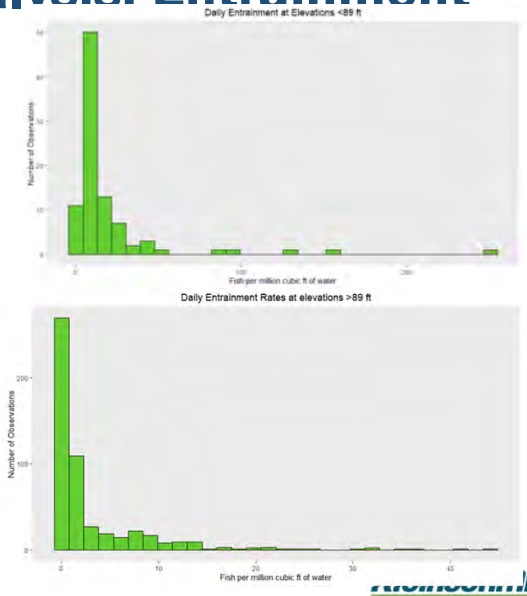
Kleinschmidt

98

Exploratory Data Analysis: Entrainment Observations

- Separate observations into two datasets (> 89', <= 89')
- Fit seasonal entrainment to log normal distributions



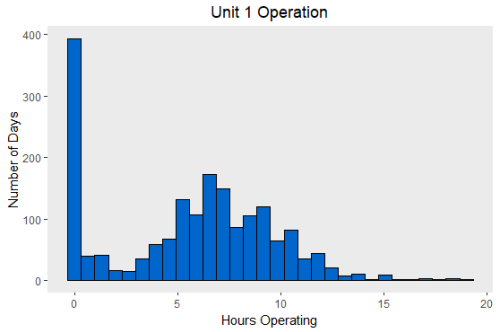


99

Exploratory Data Analysis: Hours Operated per Unit

- Operations data from period of record indicative of future operations at Bad Creek
- Assume Bad Creek II operated in same manner as Bad Creek I
- Fit seasonal data to log normal distribution for simulation

Season	Minimum	Maximum	Mean	Standard Deviation	Median
Winter	0	19.00	5.34	4.09	5.25
Spring	0	16.80	4.41	3.89	5.25
Summer	0	13.00	7.65	2.95	8.25
Fall	0	17.80	5.13	4.12	5.75

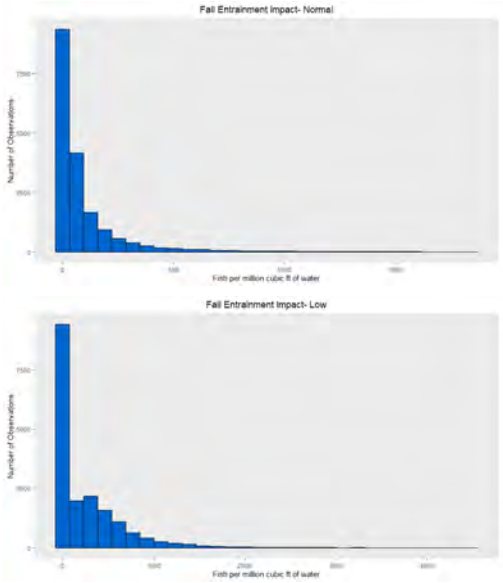


100

Simulation Results

- Highest probability of entraining fish occurs in fall when forebay levels are low

Season	Forebay level	Median Entrained	Probability 10 entrained	Probability 100 entrained	Probability 1000 entrained
Winter	High	18,344	0.512	0.445	0.380
Spring	High	23,389	0.19	0.09	0.04
Summer	High	32,684	0.56	0.48	0.40
Fall	High	16,977.5	0.54	0.43	0.33
Fall	Low	46,052.5	0.56	0.51	0.45



Kleinschmidt

101

Population Vulnerability

- Potentially, up to 12% of threadfin shad population lost to entrainment every year
- < 1% of blueback herring population lost

Species	Categorical discrete growth rate (min)	Species-specific discrete growth rate (min)	Estimated Population 2001-2020 (millions)	Annual Entrainment Loss Estimate	Proportion of Annual Population Lost to Entrainment (PL)	Annual population multiplier including entrainment (categorical)	Annual population multiplier including entrainment (species-specific)
Blueback Herring	1.17	1.20	3.7	0.03	0.00	1.16	1.19
Threadfin Shad	1.17		0.52	0.06	0.12	1.05	

Kleinschmidt

102

Conclusions

- **Exploratory data analysis shows that if Lake Jocassee operates at a lower elevation (< 89') probability of entrainment increases**
- ***"The expected entrainment rate of 12% for Threadfin Shad is close to the expected annual increase for the slowest recovery surrogate, American Shad, indicating that entrainment mortality may keep the population from substantial increase, but is not likely to cause the population to decrease, unless combined with other impacts."***

Kleinschmidt

103

Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

- **Objective(s):** Assess changes to (1) pelagic and (2) littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and Keowee-Toxaway Hydroelectric Project (KT Project) relicensing.
- **Status:** Ongoing

104

Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- **Objective(s):** Evaluate potential direct impacts to aquatic habitat (including wetlands) related to Bad Creek II Complex construction activities and weir expansion by quantifying and characterizing surface waters, including resource quality.
- **Status:** Ongoing

105

Task 3 – SCDNR Consultation

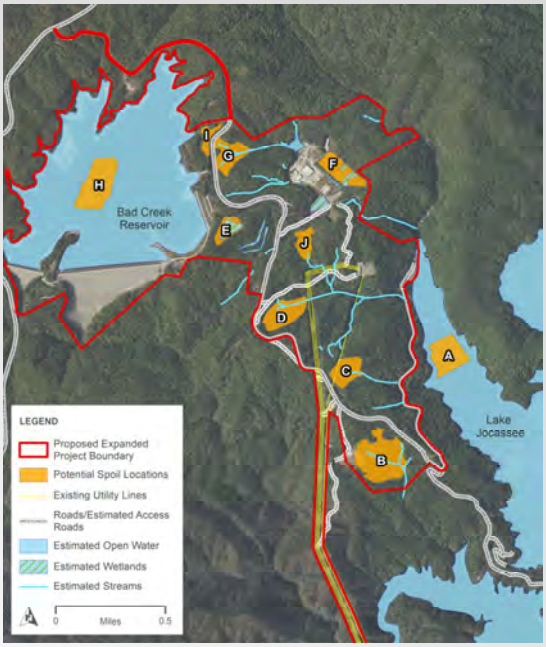
- **May 2023**: SCDNR requested that Duke Energy use the Stream Quantification Tool (SQT) to evaluate streams potentially impacted by Bad Creek II Complex construction activities
- **May 24 and June 21, 2023**: consultation calls held with SCDNR regarding SQT methodology and memo of proposed survey approach
- **July 12, 2023**: site visit with Lorianne Riggin (SCDNR) to streams within two representative potential spoil locations
- **August 3, 2023:** finalized stream survey approach memo shared with SCDNR and the Aquatic Resources Resource Committee

Note: consultation is ongoing

106

Task 3 Methods – Potential Spoil Locations

- Stream habitat assessments
  - NC Stream Assessment Method (NCSAM) and USEPA Rapid Bioassessment Protocol (RBP)
- Mussel surveys
  - Streams within spoil locations
  - Lake Jocassee shoreline in the vicinity of Bad Creek II inlet/outlet and submerged weir

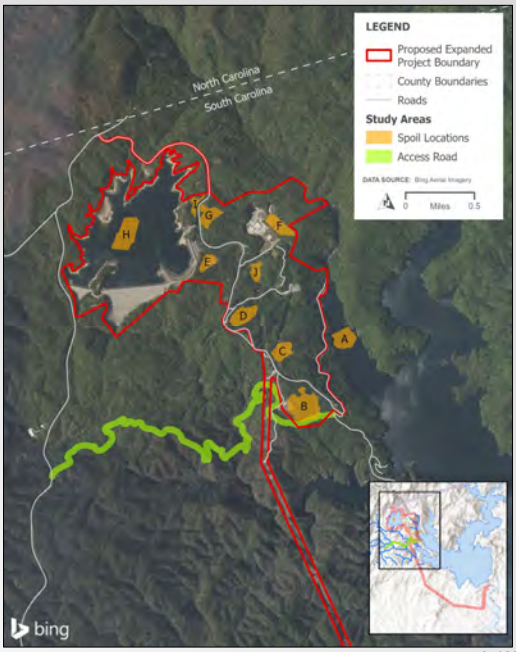


107

Task 3 Methods – Potential Temporary Access Road

- Stream habitat assessments – all stream crossings
  - NCSAM & USEPA RBP
  - SC SQT
- Biological surveys - Howard Creek and Limber Pole Creek (in support of SQT)
  - Electrofishing surveys
  - Macroinvertebrate sampling

Sampling completed for reaches upstream and downstream of the potential temporary access road crossing.



108

Task 3 Results

Completed Field Studies

Location	Task	Timeframe			
		July	August	September	October
Spoil Locations	Stream habitat assessments (NCSAM + USEPA RBP)			■	
	Mussel surveys	■			
Temporary Access Road	Stream habitat assessments (NCSAM + USEPA RBP)				■
	Stream geomorphic and riparian vegetation surveys (SQT)				■
	Fish community sampling (SQT)	■		■	■
	Macroinvertebrate sampling (SQT)		■		
	Mussel surveys	■		■	

109

Task 3 Draft Results – Stream Habitat Assessments

USEPA Rapid Bioassessment Protocol

Stream Name / Location	Stream Type	Total Score	Condition Category*
Streams within Potential Spoil Locations			
Stream 4 - Spoil Location G	Intermittent	105	Suboptimal
Stream 4a - Spoil Location G	Perennial	137	Suboptimal
Stream 17 - Spoil Location C	Perennial	143	Suboptimal
Stream 19 (Devils Fork) - Spoil Location B	Perennial	155	Optimal
Streams potentially crossed by the Temporary Access Road			
Stream 1 (Limber Pole Creek)	Perennial	170	Optimal
Stream 7 (Howard Creek)	Perennial	183	Optimal
Stream 12	Intermittent	112	Suboptimal
Stream 15	Perennial	119	Suboptimal
Stream 16	Intermittent	117	Suboptimal
Stream 17 (Devils Fork)	Perennial	140	Suboptimal

*Condition categories include Poor, Marginal, Suboptimal, and Optimal

110

Task 3 Draft Results – Stream Habitat Assessments

North Carolina Stream Assessment Method

Stream Name / Location	Stream Type	Overall Functional Rating
Streams within Potential Spoil Locations		
Stream 4 - Spoil Location G	Intermittent	Medium
Stream 4a - Spoil Location G	Perennial	Medium
Stream 17 - Spoil Location C	Perennial	High
Stream 19 (Devils Fork) - Spoil Location B	Perennial	High
Streams potentially crossed by the Temporary Access Road		
Stream 1 (Limber Pole Creek)	Perennial	High
Stream 7 (Howard Creek)	Perennial	High
Stream 12	Intermittent	Medium
Stream 15	Perennial	High
Stream 16	Intermittent	High
Stream 17 (Devils Fork)	Perennial	High

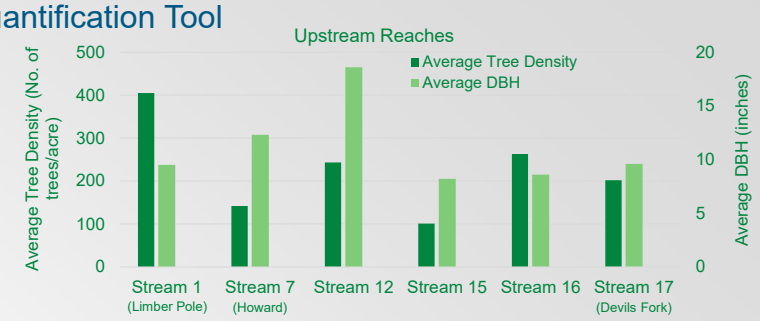
*Functional ratings include Low, Medium, or High

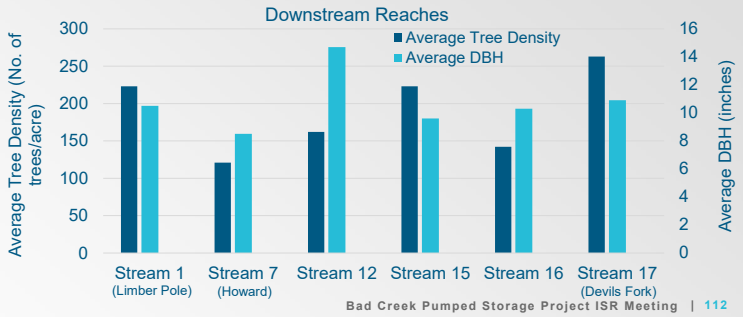
111

Task 3 Draft Results – Stream Quantification Tool

Riparian Vegetation Surveys

- Stream buffers well vegetated
  - Mature trees
  - Some areas of dense shrubs (e.g., rhododendron)
- Average Tree Density
  - Upstream: 101 to 405 trees/ac.
  - Downstream: 121 to 263 trees/ac.
- Average DBH
  - Upstream: 8.2 to 18.6 inches
  - Downstream: 8.5 to 14.7 inches





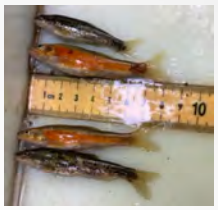
112

Task 3 Draft Results – Stream Quantification Tool

Fish Community Sampling

- Limber Pole Creek
  - No fish collected
- Howard Creek

Reach	Average Density (No. fish/100 m)	
	Rainbow Trout	Western Blacknose Dace
Upstream	17.2	57.7
Downstream	11.5	54.5



113

Task 3 Draft Results – Stream Quantification Tool

Macroinvertebrate Sampling

Metrics	Limber Pole Creek		Howard Creek	
	Upstream	Downstream	Upstream	Downstream
Total No. of Organisms	163	161	319	246
Total No. of Taxa	35	29	39	39
EPT Index	27	21	30	28
South Carolina Bioclassification	**Excellent/Fully Supporting**			

Habitat Type	Limber Pole Creek		Howard Creek	
	Upstream	Downstream	Upstream	Downstream
Root Banks	Good	Good-Fair	Good-Fair	Good
Logs, Sticks, Snags	Good	Good-Fair	Good-Fair	Good-Fair
Rock/Gravel Riffle	Good	Excellent	Excellent	Excellent
Mature Leaf Pack	Poor	Poor	Poor	Poor
Aquatic Vegetation	Good-Fair	Nonexistent	Poor	Poor
Braided Channel	Nonexistent	Nonexistent	Nonexistent	Nonexistent
Pine Needles in Stream	Nonexistent	Nonexistent	Nonexistent	Nonexistent
Velocity/Flow	Good	Good	Good	Good
Sedimentation	Little or none	Moderate	Little or none	Little or none

114

Task 3 Draft Results – SQT Analysis*

SQT Results

Stream/Creek	Reach	Rosgen Classification	Catchment Assessment	SQT Existing Condition Score	Maximum SQT Existing Condition Score	Percent Stream Functionality
Stream 1 (Limber Pole Creek)	Upstream	B4c	Good	0.58	0.8	73%
	Downstream	B4c	Good	0.53	0.8	66%
Stream 7 (Howard Creek)	Upstream	B4c	Good	0.60	0.8	75%
	Downstream	B4a	Good	0.58	0.8	73%
Stream 12 (UT to Howard Creek)	Upstream	A4	Good	0.39	0.6	65%
	Downstream	B4a	Good	0.47	0.6	78%
Stream 15 (UT to Devils Fork)	Upstream	G5	Good	0.36	0.6	60%
	Downstream	A1a+	Good	0.35	0.6	58%
Stream 16 (UT to Devils Fork)	Upstream	A4	Good	0.40	0.6	67%
	Downstream	G4	Good	0.37	0.6	62%
Stream 17 (Devils Fork)	Upstream	A4	Good	0.38	0.6	63%
	Downstream	B5a	Good	0.43	0.6	72%

*Consultation with the SCDNR is ongoing and final results will be presented in the USR.

Task 3 – Mussel Surveys

- Upland spoil locations
  - No suitable mussel habitat present
- Potential Temporary Access Road - Howard Creek + Limber Pole Creek
  - No mussels observed
- Lake Jocassee – shoreline in the vicinity of the proposed Bad Creek II inlet/outlet structure and in the vicinity of the underwater weir
  - No mussels observed

Task 3 Conclusions

- **Stream Habitat Assessments**
  - Streams within spoil locations and those potentially crossed by the temporary access road generally represent *stable, fully functioning conditions.*
  - Characteristics across stream habitat quality rating methods which reduced overall scores included lack of baseflow (i.e., intermittent streams), natural entrenchment, streambank erosion, and/or limited quantities of large woody debris.
- **Mussel Surveys**
  - No mussel habitat present in upland spoil locations
  - No mussels observed in Howard Creek, Limber Pole Creek, or Lake Jocassee

117

Environmental Justice Study

118

Environmental Justice Study

Objective(s): There are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope

- **Status: Complete**

119

Environmental Justice Study

FERC has identified that an Environmental Justice review is pertinent to its NEPA analysis for the relicensing and proposed Complex development.

120

What is Environmental Justice?

Environmental Justice (EJ) - The fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies.

121

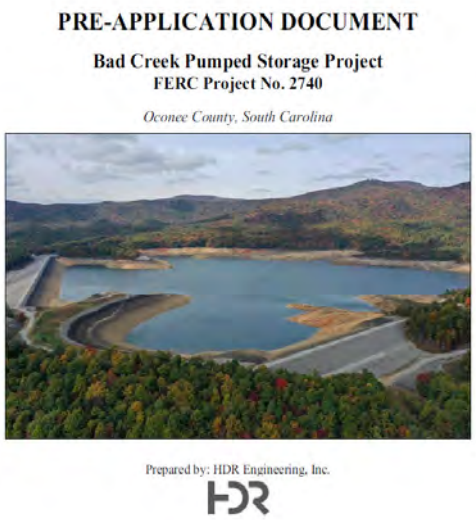
Additional Terms Included in the Analysis

Fair Treatment - The principle that **no group of people**, including a racial, ethnic or a socioeconomic group, **should bear a disproportionate share of the negative environmental consequences** from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies.

Disproportionate Effects - Term used in Executive Order 12898 to describe situations of concern **where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples**.

Sensitive Receptor Locations - Sensitive receptors include, but are not limited to, **hospitals, schools, daycare facilities, elderly housing and convalescent facilities**. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants.

122



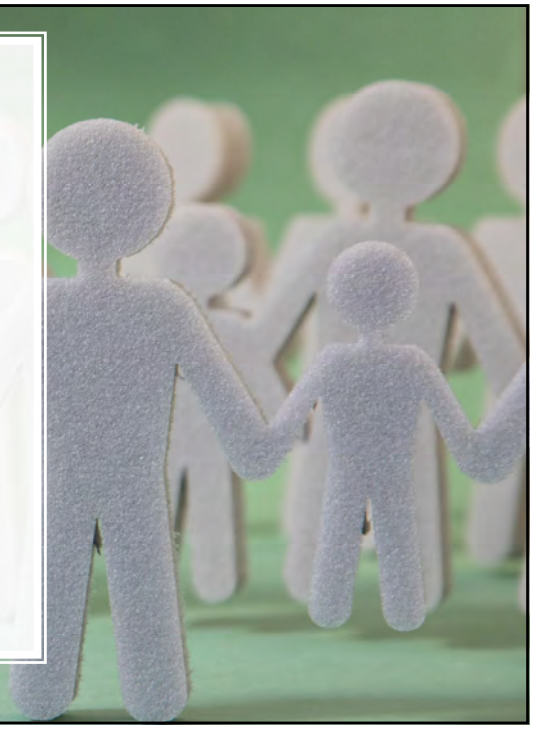
Background and Existing Information

123

Study Goals and Objectives

As previous noted, there are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope



124

Study Area

125

Project Nexus

- Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities.
- Examples of resource impacts may include, but are not necessarily limited to, project-related effects on: subsistence fishing, hunting, or plant gathering; access for recreation; and construction-or operation-related air quality, noise, and traffic.

126

Methodology

Consistent with Environmental Protection Agency's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016), the EJ Report will include the following:

Step 1: A table of racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic scope of analysis. (Source: U.S. Census Bureau Data).

127

	RACE AND ETHNICITY DATA										LOW-INCOME DATA
Geography	Total Population (count)	White Alone Not Hispanic (count)	African American (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority (%)	Below Poverty Level (%)
State											
County or Parish											
Census Tract X, Block Group X											

128

Methodology (cont.)

Step 2: Utilizing data within Step 1 to identify environmental justice populations by block group by applying the following methods to minority populations:

- 50% Analysis Method
- Meaningfully Greater Analysis Method

Step 3: Utilizing data within Step 1 to use the "low-income threshold criteria" method to identify environmental justice communities based on the presence of low-income populations.

- the percent of the population below the poverty level in the identified block group must be equal to or greater than that of the reference population (county)

129

Methodology (cont.)

Step 4: Identify non-English speaking groups within the geographic scope of analysis **that would be affected by the project**.

Describe planned outreach efforts if these groups exist within the geographic scope.

130

Reporting: Map Development

Map Components

- FERC Project Boundary
- Project construction areas
- Identify block groups of EJ communities based on the presence of minority population, low-income population, or both
- Sensitive receptor locations (e.g., schools, day care centers, hospitals, etc.)

131

Reporting: Sensitive Receptor Locations

A table of distances of sensitive receptor locations from project facilities and proposed facilities.

Discussion of project-related effects on these locations.

Discussions of PM&E measures to avoid or minimize potential effects.

132

Reporting: Potential Project Effects Discussion

A discussion of potential project-related effects on any environmental justice communities, non-English speaking groups and sensitive receptor locations for all resources where there is a potential nexus between effects and communities/locations.

For any identified effects, describe whether or not any of the effects would be disproportionately high and adverse on environmental justice communities.

133

Public Outreach

134

Protection Mitigation and Enhancement Measures

To avoid and/or minimize project effects on identified communities:

- Environmental justice communities
- Non-English speaking groups
- Sensitive receptor locations

135

RESULTS

136

Results

One EJ community based on race identified in Transylvania County (NC) – primarily within the 5-mile buffer zone, with southwest portion in 1-mile buffer zone

Two EJ communities based on low income identified in Oconee County (SC) and Transylvania County (NC) – both within 5-mile buffer zone

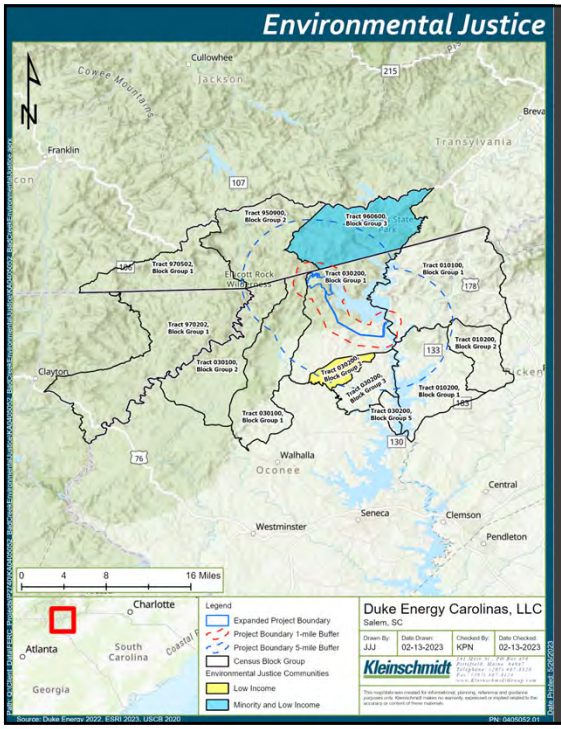
137

Table 6.1 Race and Ethnicity, Low Income, and English-Speaking Data for the 5-Mile Radius Around the Bad Creek Project

Geographic Area	Total Population (count)	White Alone, not Hispanic (count)	African American/ Black (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority Population (%)	Below Poverty Data (%)	Non-English Speaking Persons Aged 5 Years and Greater (%)
Georgia	10403847	5485855	3244348	19382	410705	5164	32810	213189	992394	47%	14%	1%
Rabun County	16645	14598	316	55	188	0	41	113	1334	12%	16%	0%
Census Tract 970202, Block Group 1	1348	1335	0	0	0	0	0	0	13	1%	14%	0%
North Carolina	10264876	6474688	2165301	112504	290525	5640	22962	230591	962665	37%	14%	1%
Jackson County	42938	34635	928	3283	302	0	56	1182	2552	19%	18%	0%
Census Tract 950900, Block Group 2	1425	1410	0	0	0	0	0	0	15	1%	9%	0%
Macon County	34813	30998	541	240	302	0	91	201	2440	11%	14%	0%
Census Tract 970502, Block Group 1	2128	2023	6	0	18	0	0	0	81	5%	9%	0%
Transylvania County	33775	30528	1560	89	47	17	0	410	1124	10%	13%	0%
Census Tract 960600, Block Group 3	1143	1019	0	0	19	0	0	0	105	11%	18%	0%
South Carolina	5020806	3196421	1333876	14748	78102	3784	9139	99278	285458	36%	15%	0%
Oconee County	77528	65463	5288	231	570	11	44	1686	4235	16%	16%	0%
Census Tract 030200, Block Group 1	1340	1261	0	0	0	0	15	36	28	6%	9%	0%
Census Tract 030100, Block Group 2	679	671	0	0	0	0	0	0	8	1%	12%	0%
Census Tract 030100, Block Group 1	1167	1142	7	0	0	0	0	4	14	2%	8%	0%
Census Tract 030200, Block Group 5	872	872	0	0	0	0	0	0	0	0%	6%	0%
Census Tract 030200, Block Group 2	1109	1090	16	0	0	0	0	3	0	2%	25%	0%
Census Tract 030200, Block Group 3	1201	1201	0	0	0	0	0	0	0	0%	8%	0%
Pickens County	124029	106292	8392	306	2424	26	178	1854	4557	14%	17%	0%
Census Tract 010200, Block Group 2	2267	2216	24	0	0	0	0	0	27	2%	9%	0%
Census Tract 010100, Block Group 1	1443	1331	76	0	16	0	0	20	0	8%	4%	0%
Census Tract 010200, Block Group 1	2279	2164	27	0	0	0	0	20	68	5%	14%	1%

Source: U.S. Census Bureau 2020a, 2020b, 2020c

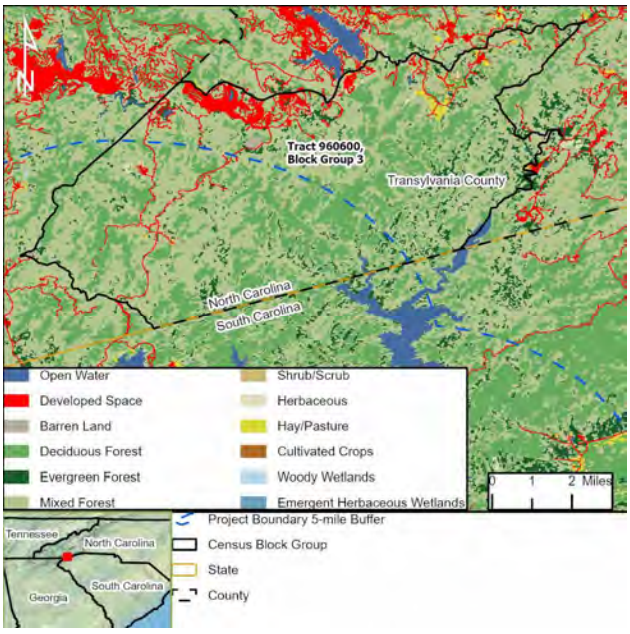
138



Environmental Justice Communities

139

Land Cover Data Surrounding EJ Census Block – Transylvania County



140

Development Surrounding Oconee County Low Income Census Block

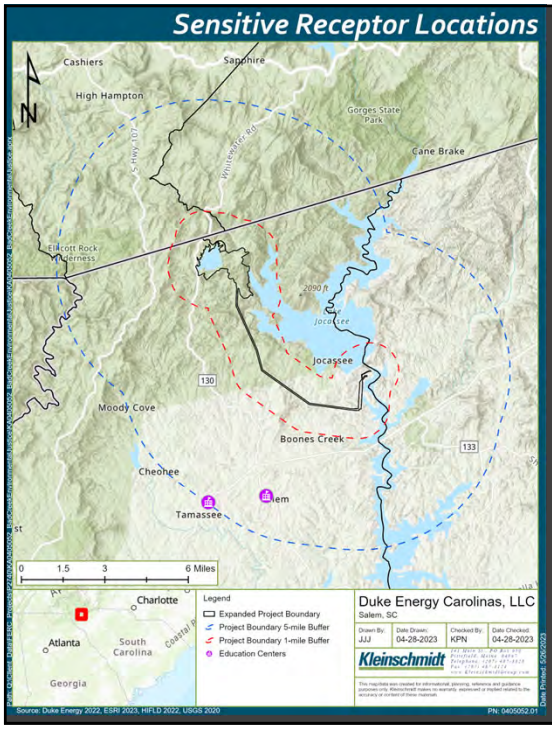
141

Results (cont.)

One block group includes a small population of non-English speaking individuals in Pickens County (SC) representing 1% of the population (23 people).

Two sensitive receptor locations within the 5-mile buffer zone; none within the 1-mile radius

142



Sensitive Receptor Locations

143

Analysis of Relicensing the Project as it Currently Operates on EJ Communities

- No substantive impacts from noise.
- No impacts to air quality, subsistence fishing, traffic, or aesthetics.
- No impacts to non-English-speaking communities and sensitive receptor locations.

144

Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities

NOISE

- Direct impacts from noise isolated to upper reservoir inlet/outlet construction.
- Land use surrounding upper reservoir within identified EJ community indicates little to no residential development.
- Indirect and cumulative impacts not anticipated.

AIR QUALITY

- Short-term construction-related air pollution has the potential to impact EJ communities in the vicinity of the upper reservoir inlet/outlet work.
- The distance between EJ populations and the construction site, generally greater than one mile, will serve to mitigate potential direct and indirect impacts.
- Not likely that short duration of exposure from construction will contribute to cumulative impacts.

145

Subsistence Fishing

Fishing not permitted within upper reservoir but nearby sites within the buffer zone provide potential opportunities.

No direct, indirect, or cumulative impacts anticipated.

146

Effects of Project Construction on Local Traffic, Road Networks, and Aesthetics

- Unlikely EJ communities impacted by work at the powerhouse location due to the distance between construction and identified EJ populations.
- Impact to traffic and local roads from work conducted at the upper reservoir inlet/outlet location within identified EJ census blocks is anticipated to be minimal.
- Disposal of excavated soils may temporarily impact aesthetics, streams and lands in the expanded Project Boundary, local water quality in and immediate downstream of the Whitewater River cove, or construction traffic.
- Following construction there will be no impact to local roads or traffic.

147

Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities (cont.)

NON-ENGLISH-SPEAKING COMMUNITIES

- One small population located in Pickens County (SC) representing one percent of the population block group (approx. 23 people).
- Primarily outside of the 5-mile radius – impacts not anticipated to this group.

SENSITIVE RECEPTOR LOCATIONS

- Nearest sensitive receptor location is a school located approximately four miles from proposed construction site.
- Unlikely that construction would have an effect on the sensitive receptor location due to the distance between the two sites.

148

Summary

- The existing Bad Creek Project's continued operation is not expected to cause any effects on the parameters analyzed.
- The impacts to EJ communities from construction of the Bad Creek II Complex would be minimal due to the distance between construction activities and the nearest residential areas with EJ populations.
- No need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as a part of the relicensing process.

149

Cultural Resources Study

150

Task 1 – Area of Potential Effects Determination

- **Objective:** In consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, and other stakeholders, Duke Energy will determine and document the Area of Potential Effects (APE).
- Initial consultation letter submitted on November 28, 2022. Revised letter submitted on September 25, 2023, that expanded the APE to include Fisher's Knob Access Road.
- In consultation with the above, the APE is defined as all lands within the project boundary
- **Status:** **Complete**

151

Task 2 – Cultural Resources Survey

- **Objective:** Identify historic properties within the APE.
- Archaeological and architectural surveys conducted between April 17 and June 10, 2023.
- Archaeological methods included the excavation of 3,026 shovel tests in areas containing slopes of less than 15%.
- This was supplemented by pedestrian survey in areas where slopes were not dangerous, as well as drone and helicopter surveys to look for rockshelters and large outcrops that could contain petroglyphs.
- Phase II testing conducted at site 38OC249.
- **Results:** Identified one isolated find – a Middle Archaic projectile point, tested site 38OC249, and identified five historic-age architectural resources in the APE.

152

Task 2 – Cultural Resources Survey

Table 1. Cultural Resources within the APE.

Resource No.	Description	NRHP Eligibility	Management Recommendation
38OC249	Early Archaic through Mississippian rockshelters	Eligible	Avoidance or Mitigation
38OC250	Mississippian habitation site	Not Relocated	No Effect
IF-1	Morrow Mountain point	Not Eligible	No Additional Work
0156	Bad Creek Reservoir	Not Eligible	No Additional Work
0157	Bad Creek Powerhouse	Not Eligible	No Additional Work
0158	Control Room Building	Not Eligible	No Additional Work
0159	Laydown Yard Building	Not Eligible	No Additional Work
0198	Jocassee Hydroelectric Station	Eligible	No Effect

153

Task 2 – Cultural Resources Survey

- Site 38OC249 – Paleoindian(?) through Mississippian Period series of rockshelters.
- Excavated six 1-x-1-meter units.
- A total of 585 artifacts were found in stratigraphically intact deposits up to 120 cm deep (the maximum depth we were allowed to excavate).
- Botanical samples submitted to the University of Tennessee. Wood samples identified as yellow pine, red oak, chestnut, hemlock, and interestingly spruce/larch that is indicative of colder climates. Also recovered hickory nutshell and one plum pit.
- **Results:** Site is eligible for inclusion in the National Register of Historic Places. Site will be avoided by any ground disturbing activities but periodically monitored for unlawful artifact collecting.

Photo Redacted

(CUI/PRIV)

154

Visual Resources Study

155

Visual Resources Study Task Refresher

Study Task	Status
Task 1 – Existing Landscape Description	Complete
Task 2 – Seen Area Analysis	Complete
Task 3 – Field Investigation	Complete
Task 4 – Key Views Selection	Ongoing
Task 5 – Existing Visual Quality Assessment	Ongoing
Task 6 – Visual Analysis	Ongoing
Task 7 – Visual Management Consistency Review	Ongoing
Task 8 – Mitigation Assessment	Ongoing
Task 9 – Conceptual Design of the Bad Creek II Complex	Ongoing

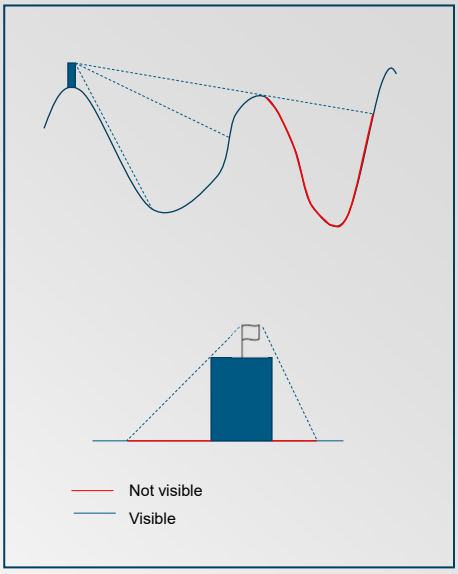
156

Tasks 2 - Seen Area Analysis

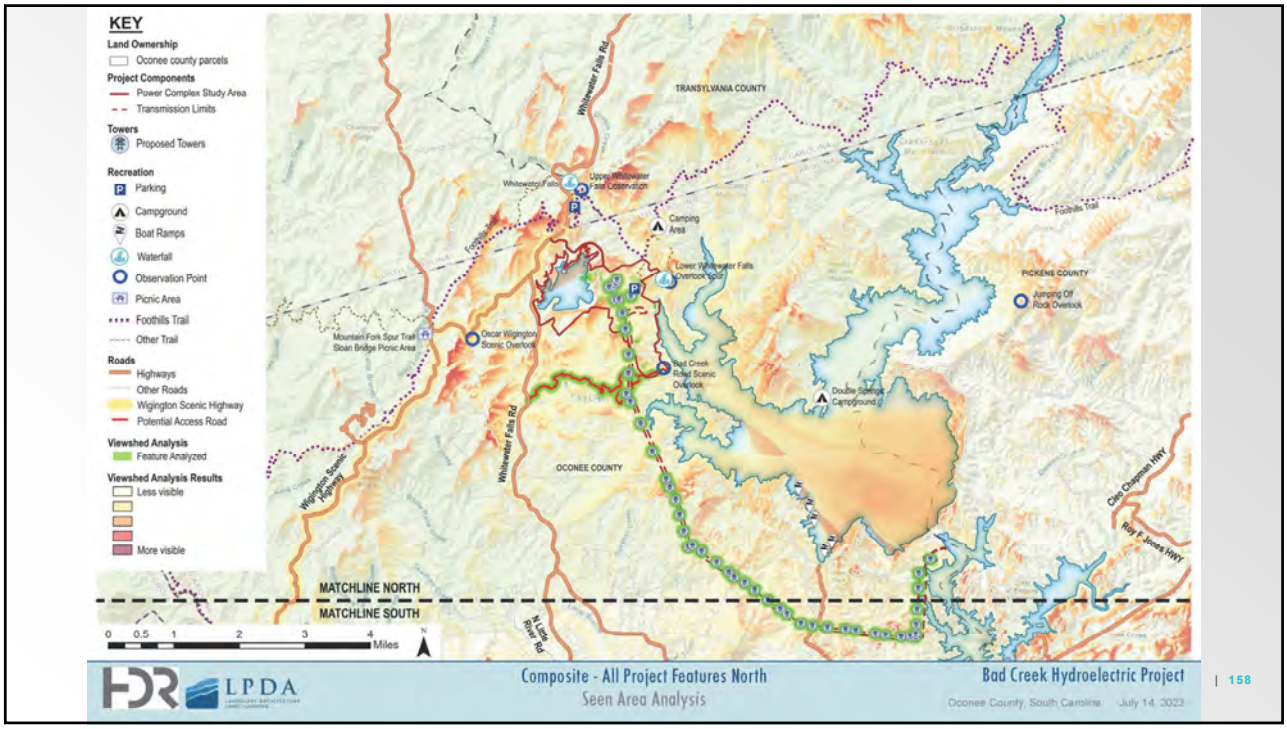
Objective: Identify areas from which Bad Creek II would be visible

Methodology:

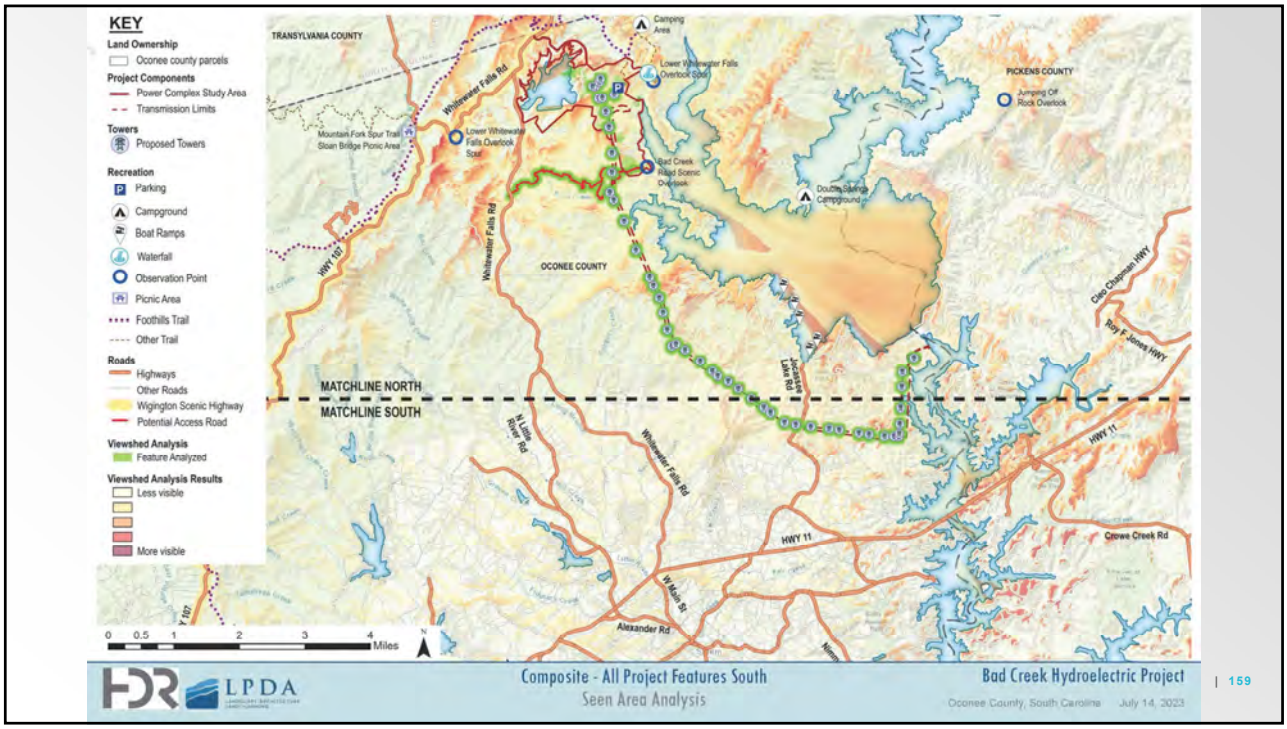
- Geographic Information System (GIS): ESRI ArcGIS Pro Viewshed Analysis Spatial Analyst Tool
- USGS Digital Elevation Model (DEM)
- Conservative analysis
  - Bare earth basis (trees, structures)
  - Atmospheric effects (clouds, humidity, fog)
  - Revegetation of spoils area
  - Structure design



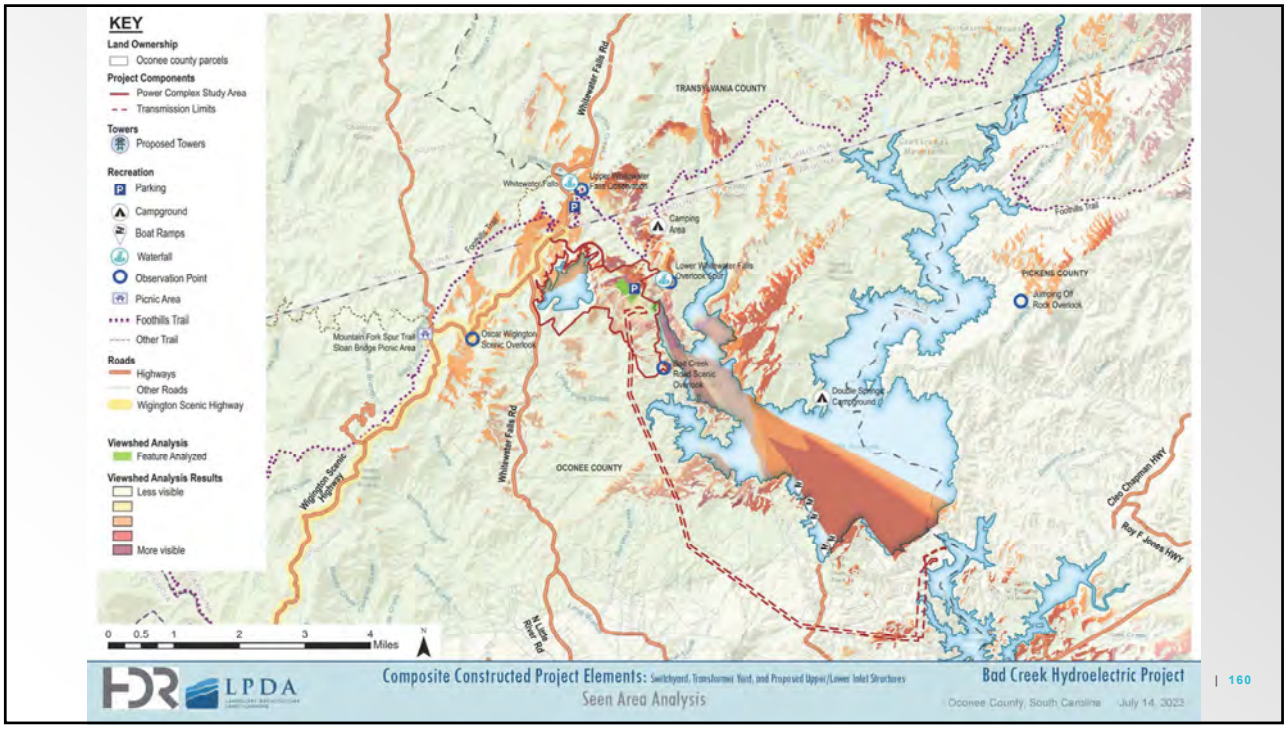
157



158


KEY
Land Ownership
Oconee county parcels
Project Components
Power Complex Study Area
Transmission Limits
Towers
Proposed Towers
Recreation
Parking
Campground
Boat Ramps
Waterfall
Observation Point
Picnic Area
Foothills Trail
Other Trail
Roads
Highways
Other Roads
Wigington Scenic Highway
Potential Access Road
Viewshed Analysis
Feature Analyzed
Viewshed Analysis Results
Less visible
More visible
TRANSYLVANIA COUNTY
PICKENS COUNTY
OCONEE COUNTY
MATCHLINE NORTH
MATCHLINE SOUTH
Whitewater Falls Rd
HWY 11
Crowe Creek Rd
Alexander Rd
Cleo Chapman HWY
Roy F. Jones HWY
0 0.5 1 2 3 4 Miles
LPDA
Composite - All Project Features South
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
159

159


KEY
Land Ownership
Oconee county parcels
Project Components
Power Complex Study Area
Transmission Limits
Towers
Proposed Towers
Recreation
Parking
Campground
Boat Ramps
Waterfall
Observation Point
Picnic Area
Foothills Trail
Other Trail
Roads
Highways
Other Roads
Wigington Scenic Highway
Viewshed Analysis
Feature Analyzed
Viewshed Analysis Results
Less visible
More visible
TRANSYLVANIA COUNTY
PICKENS COUNTY
OCONEE COUNTY
Whitewater Falls Rd
Camping Area
Oscar Wigington Scenic Overlook
Mountain Fork Spur Trail
Sloan Bridge Picnic Area
Jumping Off Rock Overlook
Double Springs Campground
Cleo Chapman HWY
Roy F. Jones HWY
0 0.5 1 2 3 4 Miles
LPDA
Composite Constructed Project Elements: Switchyard, Transformer Yard, and Proposed Upper/Lower Inlet Structures
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
160

160

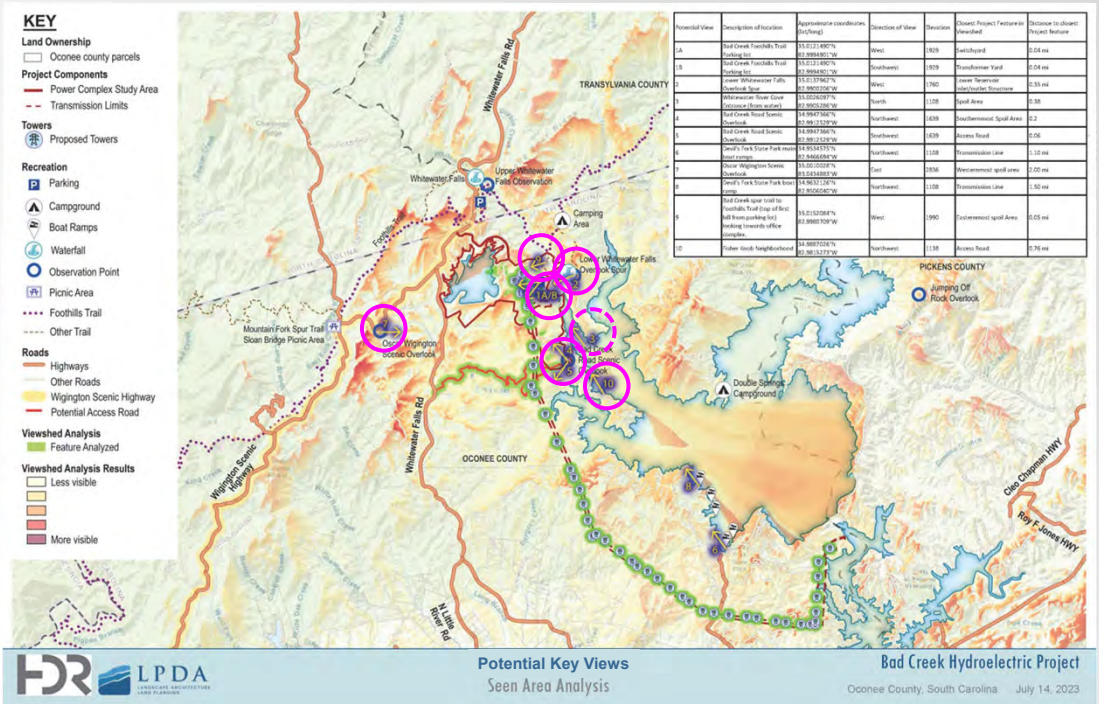
Task 4 – Key Views Selection

2-Step Process

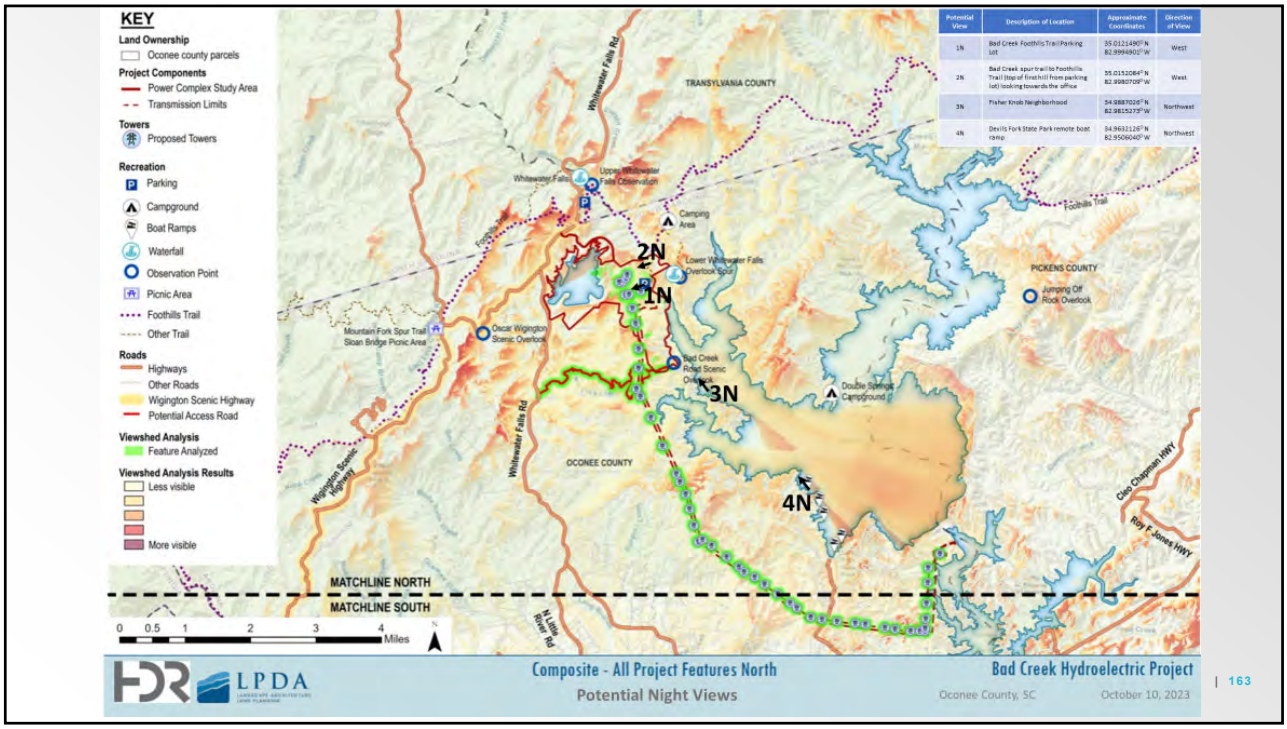
- Initial pre-selection by Resource Committee (July 27, 2023)
- Finalized following fieldwork (January 11, 2024)

"The objective will be to identify a set of Key Views (**up to four**) that adequately covers the range of visibility and potential scenic and visual impacts for the Project. Considerations that will be used in selecting specific Key Views **include viewing distance, to ensure adequate representation of potential foreground, middleground, and background views of the Project features; viewing direction; and the types of viewer groups** (typically including residents, recreational users and motorists) that might experience views of the Project facilities."

161



162



163

Task 3 – Field Investigations

- **Date: December 6, 2023**
- Time:
  - Daytime session 10:00 am – 1:30 pm
  - Night session 6:00 pm – 9:30 pm
- Conditions:
  - Daytime session: Sunny with scattered cloud cover; 50-60% humidity; winds 10-20 mph
  - Night session: Clear with thin clouds; 60-70% humidity; winds 7-8 mph; no moonlight

164

164

Visual Resources Study: Next Steps

- Task 5 – Existing Visual Quality Assessment
- Task 6 – Visual Analysis
  - Develop visualizations
- Task 7 – Visual Management Consistency Review
- Task 8 – Mitigation Assessment
- Task 9 – Conceptual Design of Bad Creek II Complex
- Task 10 – Report (2nd quarter, 2024)

165

Additional Field Surveys

166

Proposed Spoil Area Herptile Surveys

167

Proposed Spoil Area Herptile Surveys

Based on a request from the SCDNR and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy and HDR evaluated the terrestrial reptile and amphibian (i.e., herptile) resources that may experience direct impacts from the proposed construction of an additional power plant complex adjacent to the existing facility (i.e., Bad Creek II Power Complex). These impacts would be associated with spoil placement of excavated material from construction of the Bad Creek II Complex.

- **Objective(s):** The objective of the herptile survey is to document any South Carolina Wildlife Action Plan (SWAP) Herptile Species of Concern and other reptile and amphibian species that occur within the proposed spoil areas and in the project vicinity.
- **Status:** **Complete**

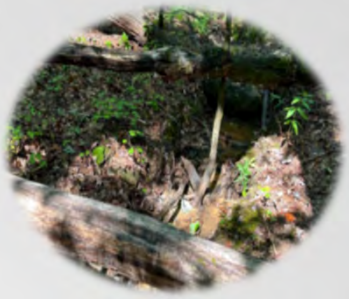
Southern Gray-Cheeked Salamander-Area I

168

Proposed Spoil Area Herptile Surveys

Methodology

- Terrestrial herptile field surveys of the eight proposed terrestrial spoil areas (Proposed Spoil Areas B, C, D, E, F, G, I, and J) were conducted from September 11-13, 2023.
- The survey methodology consisted of traversing transects through the specified areas to ensure that sufficient visual coverage was obtained. The herptile surveys were conducted through visual encounter or patch sampling at specific microhabitats (e.g., rock ledges, rock piles, logs, wet depressions). Transects were generally spaced 75-feet apart depending on habitat type and/or visibility.



Representative Habitat-Area C

169

Proposed Spoil Area Herptile Surveys

Methodology

- Observed species and their locations were recorded using a handheld GPS. Vegetation cover type and specific habitats/substrates were noted for individual spoil areas, as well as incident observations of other wildlife species.
- Observed specimens that could be captured were taxonomically identified with photographic documentation. No voucher specimens were collected as part of this survey.
- Herps were also documented during the aquatic surveys conducted in the summer and fall of 2023. Survey study plan and results were reviewed by the SCDNR and the Wildlife & Botanical Committee.

Representative Habitat-Area B

170

Proposed Spoil Area Herptile Surveys

Results: Over the three-day survey period, all eight terrestrial potential spoil sites were surveyed by Duke Energy and HDR personnel. The only herptile species observed on the SWAP Priority Herptile Species List was the Eastern Box Turtle. The table below provides all 14 amphibian and reptile species observed and the proposed spoil area in which they were observed.

Common Name	Scientific Name	Spoil Areas*
Green Anole	*Anolis carolinensis*	B and G
Eastern Fence Lizard	*Sceloporus undulatus*	B
Red-spotted Newt	*Notophthalmus viriascens*	D
Red Salamander	*Pseudotriton ruber*	G
Southern Gray-cheeked Salamander	*Plethodon metcalfi*	C, D, G, and I
Southern Appalachian Salamander	*Plethodon teyahalee*	E
Chattooga Dusky Salamander	*Desmognathus perlapsus*	C and G
Seal Salamander	*Desmognathus monticola*	B and I
Black-bellied Salamander	*Desmognathus quadramaculatus*	G and I
Eastern Copperhead	*Agkistrodon contortrix*	B
Black Racer	*Coluber constrictor*	E
Eastern Box Turtle	*Terrapene carolina*	B and I
Fowler's Toad	*Anaxyrus fowleri*	I
Green Frog	*Rana [Lithobates] clamitans*	G

Chattooga Dusky Salamander- Area G

171

Additional Comments for Discussion

172

Additional Comments for Discussion

Agency	Date	Comment
SC Wildlife Federation	12/4/2023	Has Duke Energy determined the impact of any potential seismic activity (non earthquake type disturbances such as blasting for the new turbine project). concern was impact on birds, aquatic critters, mammals, etc. The concern is regarding disruption during the critical springtime mating and nesting season.

Response sent December 19, 2023 to Wildlife and Botanical RC

Potential impacts to wildlife resources as a result of seismic activity from underground blasting for the proposed Bad Creek II Complex were not directly identified by the FERC in their Scoping Document 1 or Study Plan Determination. In Scoping Document 1, FERC staff did identify effects of noise during Bad Creek II construction, and Project operation and maintenance activities on wildlife as a Terrestrial Resources potential impact. **The environmental report (18 CFR §5.18(b)) to be filed with the license application will contain information about the affected environment; analysis of anticipated continuing or new environmental impacts due to operation or proposed changes thereto; proposed environmental measures and measures recommended by relicensing participants; and unavoidable adverse impacts that may occur despite recommended or proposed environmental measures.**

Blasting associated with construction of the new underground powerhouse would be a **temporary impact** and will be evaluated through review of relevant published research on the effects of noise on wildlife (e.g., Shannon et al. 2016), anticipated noise levels (decibels) associated with the type of blasting expected at the Project, projected frequency of blasting, and considering of time of year.

Effects of Bad Creek II construction on seismic activity in the project area was identified by FERC as a potential Geology and Soil Resources impact in Scoping Document 1. Duke Energy notes that prior to construction, detailed construction plans in conformance with FERC's dam safety regulations and guidelines will be prepared for review by FERC's Division of Dam Safety and Inspections.

Graeme Shannon, Megan F. McKenna, Lisa M. Angeloni, Kevin R. Crooks, Kurt M. Fristrup, Emma Brown, Katy A. Warner, Misty D. Nelson, Cecilia White, Jessica Briggs, Scott McFarland and George Wittemyer. 2016. A Synthesis of two decades of research documenting the effects of noise on wildlife. Biol. Rev. 91, pp. 982-1005. Doi: 10.1111/brv.12207.

173

Additional Comments for Discussion

Agency	Date	Comment
AQD	12/5/2023	Was there any assessment of the terrain around the spoils areas and the temporary roads that would identify higher risk area (e.g., extremely steep drops and/or channels that would cause high velocity of water risking erosion and silt entering the streambeds)? For such high-risk area, would there be additional measures installed to prevent disturbance or damage to the streambeds and the aquatic life?

Response for discussion:

- The majority of excavated material will be rock, which will be deposited in potential spoil areas and designed to decrease the potential for runoff and sedimentation to adjacent waters. Materials will not be placed on slopes with high gradient due to instability. French drains will be installed over aquatic resources impacted (filled) by overburden materials to maintain downstream flows.
- Hydrologic analyses will be conducted to accurately size pipes and implement outfall protection measures to reduce velocities during storm events and disturbance to downstream streambeds to help protect instream habitats for aquatic life.

174

FERC ILP Schedule Next Steps

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 18, 2025
Deadline to File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Comments on PLP or DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

175

Questions and Action Items

176

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

From: Stuart, Alan Witten
Sent: Friday, February 23, 2024 8:14 AM
To: Elizabeth Miller <MillerE@dnr.sc.gov>
Cc: sarah.salazar@ferc.gov
Subject: RE: [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

Hi Elizabeth,

March 1 is the deadline for comments. See the table below for additional details. Questions, please let me know.
Thanks !
Alan

FERC ILP Schedule Next Steps

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 18, 2025
Deadline to File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Comments on PLP or DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

From: Elizabeth Miller <MillerE@dnr.sc.gov>
Sent: Thursday, February 22, 2024 11:16 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: sarah.salazar@ferc.gov
Subject: [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Hi Alan,

When is the deadline for comments on the meeting summary?

Thank you,

Elizabeth

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Thursday, February 1, 2024 2:21 PM
To: Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Shannon Bobertz <BobertzS@dnr.sc.gov>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew

Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <RigginL@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Wood, Chris J. <chris.wood@ncwildlife.org>; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; Al Shadwick <shadwick@hotmail.com>

Subject: Bad Creek Initial Study Report Meeting Summary

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants. On February 1, 2024, Duke Energy filed the ISR Meeting summary and a copy of the meeting presentation with FERC. The transmittal letter for this filing is attached. Please note that, due to file size restrictions, the meeting summary and presentation are not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Regards,

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
526 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

April 1, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 4

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. This Fourth Quarterly Study Progress Report describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2024 and activities expected to be conducted in quarter 2 (Q2) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Study Progress report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public

throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Bernhart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
abrock@oconeesc.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Bad Creek Pumped Storage Project
Relicensing Study Progress Report No. 4
April 1, 2024

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

In addition, Duke Energy provided the following clarifications regarding the Discussion and Staff Recommendations included in the SPD in Study Progress Report No. 1:

- FERC recommended that Duke Energy modify the Recreation Study Plan to include the additional counties that will be used during the future recreation use analysis. Duke Energy will include Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC and additional counties in SC, NC, and GA that are reported on the recreation user surveys. Since recreation user surveys had not yet been completed yet, Duke Energy was unable to list what counties would be reported at that time.
- FERC recommended that Duke Energy include the 14.8 miles of trail that follows logging and access roads in the Conditions Assessment. Duke Energy is evaluating the entire 43

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

miles of trail, including 28.2 miles of single-track trail segments and 14.8 miles of trail that follow logging and access roads in the Conditions Assessment.

- FERC recommended that the Recreation Use and Needs (RUN) Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy. Duke Energy will prepare detailed maps of the Duke Energy-maintained, 43-mile portion of the Foothills Trail that identify parcel boundaries, current property owner(s), access locations, spur trails, structures, and facilities/amenities. Two traffic counters have been installed at the Bad Creek Hydro Project Trail Access (i.e., Bad Creek Parking Access Area and Bad Creek Road) and user surveys are being collected at this site.
- FERC requested additional details on the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. Duke Energy held a Recreational Resources Study Resource Committee (RC) meeting on March 28, 2023, to discuss the carrying capacity methodology.

As discussed in Study Progress Report No. 2 and No. 3, Duke Energy provided information on a potential temporary access road to the Fisher Knob community. The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been expanded to incorporate the areas potentially affected by the temporary road.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024 and the ISR Meeting Summary was filed with FERC on February 1, 2024. In response to comments provided on the ISR and ISR Meeting Summary, Duke Energy is submitting its reply concurrent with this Study Progress Report.

The following sections summarize progress implementing the relicensing studies since the ISR was filed.

3.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: No additional work for this study task is anticipated; the final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for study year 2 will commence in Q2 (June 2024) with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information now that all four Bad Creek units have been upgraded.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling is being carried out to incorporate these updated hydraulic capacities. Since the increased hydraulic capacity during generation is less than 2 percent overall (Bad Creek plus Bad Creek II combined) and would result in flows comparable to previously modeled generation flows, only operations under pumping will be evaluated (the updated pumping capacity is increased approximately 9 percent overall). A summary report presenting the effects of updated pumping capacities on Whitewater River flows will be developed and distributed for stakeholder review. This evaluation will implement the same CFD model used during the feasibility study to estimate near-field (i.e., immediately downstream of inlet/outlet structures) changes in flows due to Bad Creek II operations. The final report will be attached as an addendum to the CFD study report (Appendix A, Attachment 3) in the Updated Study Report (USR).
- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model has been used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee and Lake Keowee reservoir level fluctuations. Duke Energy has a scheduled a meeting with the Water Resources, Aquatic Resources, Operations, and Recreational & Visual Resources RCs in April to review model

results. Following the meeting, Duke Energy will provide a draft report to the RCs for review and comment.

- **Future Water Quality Management Plan (WQMP) Development:** Work to develop the WQMP will begin in Q2 of 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate a temporary access road. Potential water quality effects associated with construction of the temporary access road will be addressed in the WQMP.

4.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The desktop entrainment study report was revised to include historical operations data, an assessment of the influence of operations with the increase of renewable energy production, pumping periods (2, 4, 6, 8, 10, and 12 hours), diurnal periods (day versus night), lake levels, and water temperature. The final report was reviewed by stakeholders and provided in the Initial Study Report as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling is being carried out to incorporate these updated hydraulic capacities and an addendum to the final report will be included in the USR (Appendix B, Attachment 1). Also, per the Commission's request in their ISR comments, a literature review will be carried out for the intrinsic population growth rate of threadfin shad. If recent literature is identified with this information, it will be considered for inclusion in the entrainment analysis and presented in the USR.
- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** This effort will use results of the CFD and CHEOPS modeling from the Water Resources Study. CFD modeling results will be used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results will be used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. See Section 3.0 for an update on the CFD and CHEOPS

modeling. Preliminary work on the analysis and study report has begun; a draft report will be provided to the Aquatic Resources RC in Q2 2024.

- **Impacts to Surface Waters and Associated Aquatic Fauna:** The third and final fish survey at Limber Pole and Howard creeks was completed on October 9 and 10, 2023. Hydrology, hydraulics, and geomorphology surveys in support of the Stream Quantification Tool, including riparian vegetation surveys, and stream habitat data forms consisting of the North Carolina Stream Assessment Method and U.S. Environmental Protection Agency Rapid Bioassessment Protocol were completed at all streams crossed by the proposed temporary access road on October 2 and 3, 2023. Results of the mussel, fish, and stream habitat surveys were summarized in a draft report and shared with the Aquatic Resources RC on November 11, 2023, and included as Appendix B, Attachment 3 of the ISR filed with FERC on January 4, 2024. Comments on the draft report were received from the South Carolina Department of Natural Resources (SCDNR) on December 21, 2023. The draft results were also presented at the January 17, 2024, ISR meeting. A final report was distributed to the Aquatic Resources RC on February 14, 2024, and is being filed as Attachment A of this progress report.

Variance from Approved Study Plan

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the temporary access road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

5.0 VISUAL RESOURCES STUDY

Duke Energy has completed the visualizations identified in the study plan and is finalizing the draft study report for RC review. As has been discussed with the RC and at the ISR meeting, a lighting evaluation will be included in the study report. This will include an overview of the International Dark Sky program and guidelines but will not include an evaluation of Bad Creek II against International Dark Sky standards since Duke Energy has been unable to locate such standards for power generating facilities. The draft study report will be provided to the Recreation & Visual Resources RC during Q2 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan. The temporary access road route has been incorporated into the viewshed model.

6.0 RECREATIONAL RESOURCES STUDY

The Recreational & Visual Resources RC met on February 29, 2024, to discuss the status of the Recreational Resources Study as described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data collection including traffic and trail counts, in-person and online user surveys, and spot counts was completed in 2023. The data are currently being processed. The Foothills Trail carrying capacity analysis is under development. The draft study report will be provided to the RC in Q2 2024.
- **Foothills Trail Condition Assessment**: Fieldwork was completed in 2023 and the draft study report was submitted to the RC in November 2023 as well as included in the ISR. Duke Energy received comments on the draft report from the Foothills Trail Conservancy, SCDNR, and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. All comments will be considered and included in the consultation documentation with the final report. The final report will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. This effort is dependent upon updated CFD modeling of surface velocities in the Whitewater River Cove (see Section 3.0) which is on-going. The draft report will be distributed to Recreational & Visual Resources RC members in Q2 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

7.0 CULTURAL RESOURCES STUDY

The draft report was filed as Appendix E of the ISR and on January 22, 2024, the final report was distributed to the SC State Preservation Historic Office and the Catawba Indian Nation. On March 6, 2024, the Catawba Indian Nation responded with their concurrence with the final report. The final report is attached as Attachment B of this progress report[2]. This study has been completed in accordance with the approved study plan.

Variance from Approved Study Plan

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed temporary access road.

8.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Duke Energy will continue to evaluate the need for additional outreach activities prior to the filing of the final license application.

Variance from Approved Study Plan

The study was conducted in accordance with the study plan as modified by FERC.

9.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy has proposed to develop a bat study plan and carry out additional surveys for bats at the Project due to potential clearing associated with the proposed temporary access road, spoil areas, transmission line, and other areas of proposed power complex infrastructure. This will also support Clean Water Act 404 permitting to avoid and minimize impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the U.S. Fish and Wildlife Service (USFWS) [to comply with Section 7 of the Endangered Species Act] for the 404 permitting. Duke Energy will target finalizing the study plan in line with the summer survey guidance in April 2024. Duke Energy will submit the study plan to the USWFS, FERC, SCDNR, and the Wildlife & Botanical RC.

[2] Consistent with FERC policy, the Cultural Resources report is being submitted as Controlled Unclassified Information (CUI)/Privileged information.

10.0 PERMITTING ACTIVITIES

Initial work in support of Clean Water Act Section 404 / 401 permitting has begun; a pre-application meeting request was submitted to the U.S. Army Corps of Engineers (USACE) on February 23, 2024 and the meeting was held on March 28, 2024, in Columbia, South Carolina. Attendees includes representatives from USACE, USFWS, SCDNR, S.C. Department of Health and Environmental Control (SCDHEC), Catawba Indian Nation, Duke Energy, and Duke Energy's consultant (HDR Engineering, Inc.).

Attachment A: Impacts to Surface Waters and Associated Aquatic Fauna (Final Report)

CUI/Privileged

Attachment B: Cultural Resource Investigations at the Bad Creek Hydroelectric Project (Final Report Filed Separately)

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Monday, April 1, 2024 6:14 PM
To: Adams, Jennifer - Oconee County; Alexander, D - seneca.sc; Alexander, Thomas - SC Senate; Amedee, Morgan D.; Andrade, Kristin - USACE Greenville; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; Boss, Jeff - Greenville Water; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance; Carter, Jerry - SC House of Representatives; Case, Mike; Cato, Van - US Senate; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Mayor, Clemson - cityofclemson; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Farrell, Christine - NC State Parks; Adin T Fell; Gestwicki, Tim - NC Wildlife Federation; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gledhill-Earley, Renee - NCSHPO; Gordon, Jeffrey - SC Office of Reg Staff; sara; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Hall, Tim - City of Walhalla, SC; Charles (Rowdy) B Harris; Hawkins, Ray - Jocassee Outdoor Center; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hreha, Lisa - USACE; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Johnson, Elizabeth - SCDAH; JohnsonHughes, Christy; Keene, Terry - AQD; Kulpa, Sarah; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; lputnammitchell; Ntale, Kajumba - Chief - USEPA; Olds, Melanie J; growens@gmail.com; Perry, Fletcher - City of Pickens; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Lorianne Riggin; Rimkunas, Matt - US Senate; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Sandifer, Bill - SC House of Representatives; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; MacStone; Strong, Brian - NC State Parks; Stuart, Alan Witten; Tarver, Fred - NCDEQ; Clemsonla; Thayer, Anne - SC House of Representatives; Liz Thomas; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation elizabeth-toombs@cherokee.com; Elizabeth - Cherokee Nation elizabeth-toombs@cherokee.com; Townsend, Russell - Eastern Band of Cherokee Indians; US Bureau of Land Management BLM_ES_SSDO_Comments@blm.gov; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130@gmail.com; Wood, Chris J.; Yantis, Gerry - AQD gcyantis2@yahoo.com; Gerry - AQD gcyantis2@yahoo.com; Salazar, Maggie
Subject: P-2740 Bad Creek Relicensing – Filing of ILP Progress Report and Response to Comments on Initial Study Report

Categories: Stakeholder

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission

(FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of two new ILP submittals, both of which were electronically filed with FERC by Duke Energy on April 1, 2024:

- Relicensing Study Progress Report No. 4 - describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2024 and activities expected to be conducted in quarter 2 (Q2) of 2024.
- Response to Comments on the Initial Study Report – provides Duke Energy's responses to comments provided by FERC staff and stakeholders on the Initial Study Report (ISR) and ISR Meeting Summary.

These documents are available from FERC's eLibrary system, and the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project). Please note that for the ILP Study Progress Report, Attachment B (Final Cultural Resources Survey Report) has been filed with FERC as CUI\\Privileged and is not publicly available.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
525 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

April 1, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Response to Comments on the Initial Study Report

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11, on December 5, 2022, Duke Energy filed the Revised Study Plan (RSP) describing the studies the Licensee is proposing to conduct in support of relicensing the Project. The Commission approved the RSP with modifications on January 4, 2023, in its Study Plan Determination (SPD). In accordance with 18 CFR §5.15, Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission. As required by the ILP rules, Duke Energy hosted the ISR meeting on January 17, 2024, within 15 days following submittal of the ISR. The ISR Meeting summary was filed on February 1, 2024. Stakeholder comments on the ISR Meeting summary, requests for modifications to the RSP, and proposals for new studies were due by March 4, 2024.

FERC staff, the South Carolina Department of Natural Resources (SCDNR), and Upstate Forever filed written comments by the deadline. Duke Energy appreciates the comments provided by relicensing stakeholders and has carefully considered its responses below. Duke Energy is hereby providing its responses to those comments relating to implementation of the RSP or recommendations for new

studies. Duke Energy has summarized the comments it received and provided its responses to those comments in Attachment 1.

SCDNR provided comments regarding bat and small whorled pogonia surveys that are not included in the RSP but will be implemented in support of U.S. Army Corps of Engineers (USACE) Section 404 permitting. The methodology for these surveys is still under development in collaboration with the USACE, SCDNR, U.S. Fish and Wildlife Service (USFWS), South Carolina Department of Health and Environmental Control, and the Wildlife & Botanical Resource Committee (RC); therefore, Duke Energy will consider these recommendations during study development. Duke Energy will also provide the final bat study plan and methodology to FERC staff as discussed during the ISR meeting.

Duke Energy notes that SCDNR and Upstate Forever provided recommended protection, mitigation, and enhancement (PM&E) measures in their comments. Duke Energy is not responding to such recommendations in this filing other than to note these recommendations will be considered during the development of the Bad Creek Relicensing Agreement and Draft License Application.

ISR Meeting Action Items and Status

The status of each action item identified during the ISR Meeting is as follows:

- Duke Energy to submit updated GIS data depicting the expanded Project Boundary to FERC.

  Status: Requested data will be included in the Updated Study Report (USR).

- Duke Energy to provide updated GIS data depicting new spoil areas, the temporary Fisher Knob Road, and other updated GIS information to FERC and relicensing participants (via the SharePoint site):

  Status: Requested data will be included in the USR.

- Duke Energy and SCDNR to continue discussing SCDNR access to the Musterground Road recreation area during Bad Creek II construction, SCDNR's prescribed burn schedule for the Musterground area, and SCDNR management activities in the Musterground Road area.

  Status: Discussions between Duke Energy and SCDNR are ongoing.

- Duke Energy to evaluate a rock shelter near the Project (identified during the Cultural Resources Study) for use by bats as part of the 2024 proposed bat study.

  Status: Evaluation of the rock shelter will be included in the bat study plan and survey.

- Duke Energy to schedule a meeting with the Recreation and Visual Resources RC to discuss the Foothills Trail Conservancy's comments on the Foothills Trail Conditions Assessment.

  Status: Complete. The meeting was held on February 29, 2024.

- The Recreation and Visual Resources RC to discuss the potential use of Foothills Trail culverts by bats.

Status: Complete. RC members discussed this issue during the February 2024 RC meeting and determined most of the culverts are smaller than the minimum size SCDNR uses for recommending bat use evaluations.

- Duke Energy to provide raw water quality data to FERC.

  Status: Requested data will be included in the USR.

- Duke Energy to identify a plan and timing to rerun the Environmental Justice analysis with updated census data.

  Status: An updated Environmental Justice report will be submitted with the USR using updated census data. Additionally, Duke Energy will explore the need for environmental justice-related public outreach associated with the construction of Bad Creek II subsequent to the review of updated census data submitted with the USR.

- Duke Energy to include a table of spoil pile heights in the draft Visual Resources report.

  Status: The information will be provided in the draft study report which is currently under development.

- Duke Energy to file a bat study plan with the USFWS and FERC targeting April 15, 2024.

  Status: The USFWS's 2024 Range-wide Indiana Bat and Northern long-eared bat Guidelines is anticipated to be released at the end of March. The bat study plan will incorporate processes detailed in the 2024 guidance protocols.

Closing

Duke Energy appreciates the detailed review of the ISR by relicensing process participants and looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Bernhart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Lisa Hreha
U.S. Army Corps of Engineers
1835 Assembly St
Room 8658-1
Columbia, SC 29201
lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
abrock@oconeesc.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire / Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
Executive Director
Friends of Lake Keowee Society
1209 Stamp Creek Rd
Ste A
Salem, SC
dwilde@keoweefolks.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Sarah Kulpa
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

ATTACHMENT 1 - BAD CREEK INITIAL STUDY REPORT STAKEHOLDER COMMENTS AND DUKE ENERGY RESPONSES

Comment	Duke Energy Response
Federal Energy Regulatory Commission (letter dated March 1, 2024)	
Within 30 days of the date of this letter, describe: 1) how many samples were collected versus not collected in the five streams mentioned above; 2) the names and locations of the streams where sampling did not occur because of inclement weather; 3) how these streams were determined to be fully functioning; and 4) whether these sites will be sampled in the 2024 sampling season.	The purpose of the stream habitat quality surveys was to provide a physical assessment of the existing conditions of streams that have the potential to be impacted in spoil locations. The assessments were conducted by completing data forms describing the existing functional conditions of the streams- specifically, USEPA Rapid Bioassessment Protocol - Habitat Assessment for High Gradient Streams, and NC Stream Assessment Method forms. No sampling is conducted to complete these stream habitat evaluations. One data form for each method is completed per stream. 1) As stated in the Impacts to Surface Waters and Associated Aquatic Fauna Draft Report (ISR Appendix B, Attachment 3), assessments were conducted at 10 stream locations, four (4) within the proposed spoil area alternative locations and six (6) at stream locations potentially crossed by the Fisher Knob temporary access road. 2) The streams for which data forms were not completed include Stream 11 (spoil area J), Streams 13 and 14 (spoil area D), or 20 and 21 (spoil location B). *See Attachment 2 for spoil area locations as provided in the ISR.* 3) In July 2023, Duke Energy and HDR conducted a site visit to streams within two spoil locations with the South Carolina Department of Natural Resources (SCDNR). The locations visited were considered representative of stream and riparian conditions in most spoil areas and consisted of spoil areas B and D (which contain streams 13, 14, 20, and 21 mentioned above). As stated in the Stream Survey Approach Memo distributed to stakeholders on August 3, 2023, and filed with the ISR, the SCDNR and Duke Energy "agreed that the streams with spoil locations are generally high functioning with limited (if any) anthropogenically caused degradation" based on site visit observations. 4) Duke Energy is not proposing to conduct assessments in 2024 since these features are similar to those evaluated in 2023 and will assume a fully functional existing condition rating to determine stream mitigation credits for avoidable impacts to these resources during the Clean Water Act permitting process. This information will also be included in the USR.
For the USR, conduct a broader literature review (including both peer reviewed and gray/agency literature) to ensure the best available scientific data is being used for each species of interest to derive accurate population growth rate estimates for the entrainment analysis.	Duke Energy will provide the requested information in the USR.

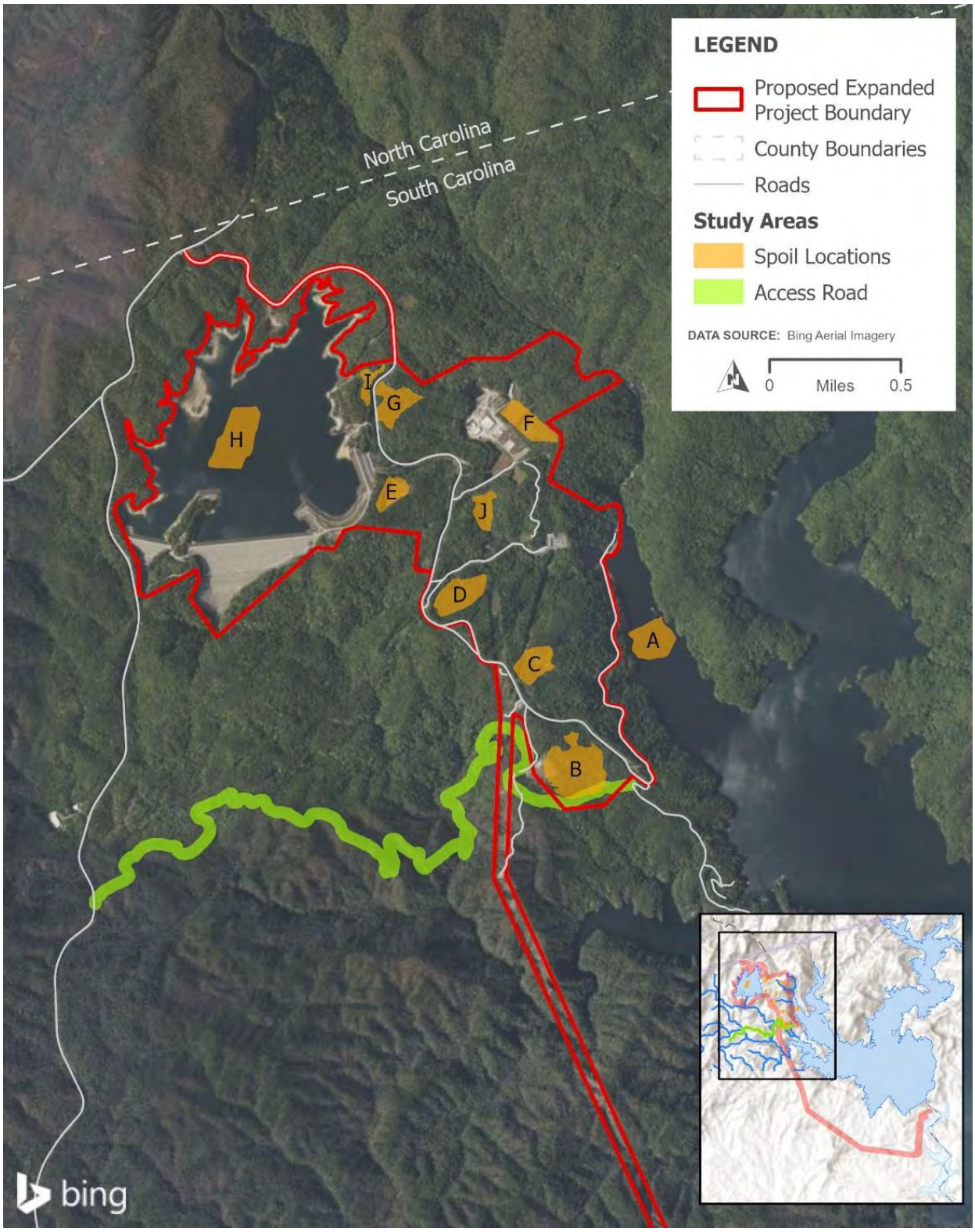
Comment	Duke Energy Response
Provide a map of the waterbodies listed in Table 4-2 with their surface water classifications in the USR. Include the corresponding georeferenced datasets (GIS shapefiles) that show these features.	Duke Energy will provide the requested information in the USR.
With the USR submission, provide un-summarized raw data of all water quality data in electronic format (e.g., Microsoft Excel spreadsheet, or delimited text file), and include all associated metadata.	Duke Energy will provide the requested information in the USR.
Replace Figures 6.1 through 6.7 with higher resolution images in the USR.	The final Summary of Existing Water Quality and Standards Report was filed with ILP Progress Report in September 2023 and incorporated stakeholder feedback. Figures 6-1 through 6-7 of this report are water quality figures taken directly from Abernathy et al. 1994 to support general water quality descriptions in Howard Creek, a tributary to Lake Jocassee. Figure 6-1 is a map showing historical monitoring locations and Figures 6-2 through 6-7 are simple color point graphs from Abernathy et al. (1994) showing compiled data over five years from individual historical study reports (work performed by Clemson University). Duke Energy included these graphs to show general trends from previous studies and while the figure quality is indicative of a report from the early 1990s, Duke Energy believes the information is clearly conveyed and no changes to these figures are necessary to support the main findings of the relicensing study task.
Incorporate computer-edited representative photographs into the Foothills Trail Carrying Capacity evaluation because it is a widely used and accepted method and would show the recreation resource committee members conditions at potential use levels, such as the number of people per viewscape, to help determine how much use is acceptable.	Duke Energy recognizes the use of computer simulated photos for evaluating crowding, conflict, and visitor preferences related to carrying capacities within public lands as appropriate in many recreational settings. However, the Foothills trail corridor managed by Duke Energy lacks strong anchor sites where measures of people per viewshed or people at one time would be appropriate at this time. Duke Energy is relying on measures and estimates of use distribution and related facilities (campsites, trailheads, etc.) along the trail corridor and review of natural resource impacts at camping locations to provide carrying capacity guidance. Estimates of facility utilization, encounters (solitude), and camping capacity along the corridor will be reviewed and integrated with trail condition assessment and survey response data.
South Carolina Department of Natural Resources (letter dated February 28, 2024)	
Duke Energy should provide additional protective measures to prevent the unlawful take of a state endangered species including the known occurrence of the state-endangered American peregrine falcon less than two miles from the Project's proposed transmission ROW expansion project.	This comment identifies a potential protection, mitigation, and enhancement (PM&E) measure. Duke Energy will consider recommended PM&E measures during development of the Bad Creek Relicensing Agreement (BCRA) and the Draft License Application.
Duke Energy should provide additional protective measures to prevent impacts to migrating birds from artificial lighting during the construction and operation of Bad Creek II.	This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application.

Comment	Duke Energy Response
Duke Energy should expand the scope of the 2021 bat survey to evaluate the presence of bat species and their utilization of habitat by conducting acoustic monitoring and mist net surveys in the expanded transmission line corridor and temporary Fisher Knob access road.	Duke Energy is in the process of developing a bat study plan to support the development of spoil areas, construction of the temporary Fisher Knob access road, construction of the new Bad Creek II transmission line, and improvements to existing transmission tower access roads. Survey findings will be used for Endangered Species Act compliance as part of the USACE Section 404 permitting process but will also inform the FERC licensing process. Study methodology is being developed in consultation with the USFWS and SCDNR.
Survey the rock shelter identified during the Cultural Resources survey during the bat survey.	Duke Energy to evaluate the referenced rock shelter near the Project for use by bats as part of the proposed 2024 bat study.
Conduct a visual survey to determine bat usage of the powerhouse access tunnel.	The Powerhouse Access Tunnel was inspected on March 4, 2024, and found to not offer suitable habitat for bat roosting or hibernacula. The tunnel is artificially illuminated, generally loud due to vehicle and equipment operation, and warmer and dryer than typically preferred by bats. No evidence of bat usage of the tunnel was identified; no further evaluation is warranted.
Bat surveys should be timed surveys conducted during appropriate time windows. Bat surveys be conducted from November 15 to March 15 (December or January are preferred for the increased likelihood of detection) and May 1 to July 31 (June or July are preferred). The SCDNR requests a survey plan be provided to SCDNR for review prior to the bat survey being conducted.	Duke Energy will continue to work with SCDNR and the USFWS to refine the bat study methodology.
Impacts related to the closure of Musterground Road for the proposed seven-year construction period were not adequately accounted for in the Recreation Study Plan.	Duke Energy agrees that evaluating the effects of eliminating public access to the Musterground Road through the Bad Creek site during the entire construction period was not identified as a possibility during development of the RSP. However, the Recreational Use and Needs (RUN) Study did capture vehicular use of the Musterground Road access through use of traffic counters; these data can be used to inform potential effects of limiting public access to Musterground Road. Duke Energy does not believe additional data collection efforts are necessary to assess the potential effects of limiting public access to Musterground Road during construction of Bad Creek II. However, Duke Energy welcomes SCDNR's input on potential PM&E measures to address such effects.
SCDNR's ability to manage prescribed burns at the property should be assessed.	Duke Energy fully recognizes SCDNR's need to access its lands for management activities including prescribed burns. As Duke Energy stated during the ISR Meeting and subsequent meetings, Duke Energy will accommodate SCDNR access to Musterground Road during Bad Creek II construction.
SCDNR requests additional measures to mitigate for impacts to public access associated with the closure of Musterground Road.	This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application.

Comment	Duke Energy Response
Conduct an additional survey for the presence of small whorled pogonia mid-May through early July prior to any ground disturbing activities take place. Report additional incidental observations of plants identified in the SC State Wildlife Action Plan as priority species to SCDNR.	Duke Energy will conduct presence/absence field surveys for small whorled pogonia during this species optimal survey window (mid-May to early July) along the Fisher Knob Access Road corridor and will report additional incidental observations of plants identified in the SC State Wildlife Action Plan during 2024 field surveys.
Upstate Forever (letter dated March 1, 2024)	
Insufficient detail on potential spoil areas was made available for stakeholders to further assess the spoil locations and potential impacts to resources at those sites. Duke Energy has stated some spoils would be used for stream restoration, revetment, and other maintenance, but off-site material disposal for excavated materials should be the only consideration and other disposal methods or uses considered only after proper justification.	Duke Energy acknowledges the number and location of spoils areas has been revised since development of the RSP. However, all spoil disposal sites that would affect waters or other sensitive resources will be evaluated in conjunction with the USACE permitting as well as development of the proposed Biological Assessment in consultation with the USFWS. These evaluations will include an assessment of the effects of alternative disposal locations. Based on present evaluations, due to the quantity of materials for disposal, Duke Energy does not believe that off-site disposal is a practical, environmentally protective, or cost-effective alternative, but such alternatives will be evaluated in association with the USACE permitting.
The Visual Resources Study lighting evaluation should evaluate effects including but not limited to bird migration, aquatic species behavior, and noise disturbances.	The FERC-approved Visual Resources study plan does not include an evaluation of lighting effects on bird migration, aquatic species behavior, and noise disturbance. As Upstate Forever notes in its comments, potential lighting effects that may attract fish to the existing inlet/outlet portal when Jocassee Lake levels fall below 1099 ft msl are already addressed. These measures are included in the Fishery Resources Work Plan (2017-2027) between SCDNR and Duke Energy.
The Visual Resources Study lighting evaluation should conduct these evaluations based on International Dark Sky standards	The FERC-approved Visual Resources study plan does not specify evaluations should be based on "International Dark Sky standards" and Duke Energy has been unable to locate such standards. Regardless, the study report will provide a high-level overview of International Dark Sky concepts, identify potential sources of additional lighting associated with the construction and operation of Bad Creek II, and discuss potential PM&E measures that could address lighting impacts.
Enabling the Foothills Trail to continue to grow to meet additional demand should be paramount in this licensing as should increasing options for meaningful recreation experiences on adjoining lands.	This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application.
Duke Energy should: 1. Designate the Project through the International Dark Sky Places conservation program 2. Grant Conservation easements on lands owned by Duke Energy, including the 6,700-ac tract surrounding the Project, which would protect the Foothills Trail corridor and allow for additional recreation opportunities	These comments identify potential PM&E measures. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application.

Comment	Duke Energy Response
3. Donate land to be included in the Foothills Trail system, or to State resource agencies for various purposes 4. Expand the Foothills Trail system to connect with other trail systems 5. Endow the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system 6. Provide funding to the Oconee County Conservation Bank for land conservation near the Project boundary Develop a land management plan that supports recreation activities	

ATTACHMENT 2 - POTENTIAL SPOIL AREA LOCATIONS



FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
May 9, 2024

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA FERC SERVICE

Alan Stuart
Duke Energy Carolinas, LLC
525 S Tryon St, Mail Code DEP-35B
Charlotte, NC 28202

Subject: Additional Information Request

Dear Mr. Stuart:

Based on our review of Duke Energy Carolina, LLC's (Duke Energy) Initial Study Report (ISR) and associated study reports for the Bad Creek Pumped Storage Project (Bad Creek Project) and Duke Energy's responses to comments on the Initial Study Report, we have questions regarding your project proposal, the answers to which are needed to bring clarity to the remainder of the ILP pre-filing process. Therefore, please file responses to the additional information requests in the enclosed Schedule A within 45 days.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Attachment: Schedule A – Request for Additional Information

SCHEDULE A
REQUEST FOR ADDITIONAL INFORMATION

Temporary Access Road

1. In section 1.3 of the Initial Study Report (ISR), Duke Energy states that it is evaluating the need to construct a 3.7-mile-long gravel access road to the Fisher Knob community for use during the Bad Creek II Complex construction. Duke Energy states that the access road would: (1) "…*necessarily be constructed* in advance of the start of construction for Bad Creek II and *prior to the new license issuance*…" [emphasis added]; (2) primarily follow an existing, unmaintained logging road on Duke Energy-owned property; (3) only be maintained during construction of Bad Creek II; and (4) *not become part of the expanded FERC project boundary* [emphasis added]. Duke Energy provided maps of the proposed access road in Appendix B, Attachment 3 of the ISR. Based on the information provided in the ISR, it is not clear what project purposes the existing project access road provides, which of those purposes the proposed temporary access road would replace, and any other project purposes the temporary road would serve before, during, or after construction of Bad Creek II, if any. Therefore, please clarify:

(1) the current uses, users, and purposes of the existing project access road;
(2) the proposed uses, users, and purposes of the proposed temporary access road before, during, and after Bad Creek II construction; and
(3) please indicate whether there would be any recreation access or property access limitations due to the proposed temporary access road and construction of the Bad Creek II Project. If so, please submit, in tabular form, a list of private properties (such as any along Fisher Knob Road), recreational trails, including any Foothills Trail spur trails, and/or recreation access areas that would be closed and the period of closure(s).

Please note that Commission regulations require that all land and water necessary for the operation and maintenance of the project be included in the project boundary[1] and therefore, if the temporary access road would serve a project purpose, it would need to be included in the proposed project boundary and would have to be approved in a license.

[1] Project boundaries must enclose the project works that are to be licensed and are to include "only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources." *See* 18 C.F.R. § 4.41(h)(2) (2023).

Musterground Road Closure

2. During the ISR Meeting, the Foothills Trail Conservancy and the South Carolina DNR expressed concerns with the closure of Musterground Road for the entire construction period of the proposed Bad Creek II Project (approximately 6-7 years). In its response to ISR comments, Duke Energy describes ongoing access discussions with South Carolina DNR for the Musterground Road Recreation Area. Noting that there seems to be no alternate means of access to the Musterground Road Recreation Area, including to Hunt Camp 5, please indicate if Duke Energy plans to explore periodic open access to Musterground Road Recreation Area during the construction period (e.g., perhaps associated with a phased construction period).

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
526 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

June 12, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Initial Study Report Additional Information Request

Dear Acting-Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC No. 2740) (Project), located in Oconee County, South Carolina. The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission), and the current operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. As an alternative relicensing proposal, Duke Energy is evaluating the addition of a second underground powerhouse (Bad Creek II Power Complex or Bad Creek II) adjacent to the existing facility to increase renewable energy storage and generation in the region.

In accordance with 18 CFR §5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. On May 9, 2024, FERC issued a letter requesting additional information (within 45 days) related to the ISR. Duke Energy is hereby providing the additional information requested by FERC. FERC's requests are repeated below for reference.

Additional Information Request 1

1. ***Temporary Access Road***: In section 1.3 of the Initial Study Report (ISR), Duke Energy states that it is evaluating the need to construct a 3.7-mile-long gravel access road to the Fisher Knob community for use during the Bad Creek II Complex construction. Duke Energy states that the access road would: (1) "…*necessarily be constructed* in advance of the start of construction for Bad Creek II and *prior to the new license issuance*…" [emphasis added]; (2) primarily follow an existing,

unmaintained logging road on Duke Energy-owned property; (3) only be maintained during construction of Bad Creek II; and (4) *not become part of the expanded FERC project boundary* [emphasis added]. Duke Energy provided maps of the proposed access road in Appendix B, Attachment 3 of the ISR. Based on the information provided in the ISR, it is not clear what project purposes the existing project access road provides, which of those purposes the proposed temporary access road would replace, and any other project purposes the temporary road would serve before, during, or after construction of Bad Creek II, if any. Therefore, please clarify:

(1) the current uses, users, and purposes of the existing project access road;

(2) the proposed uses, users, and purposes of the proposed temporary access road before, during, and after Bad Creek II construction; and

(3) please indicate whether there would be any recreation access or property access limitations due to the proposed temporary access road and construction of the Bad Creek II Project. If so, please submit, in tabular form, a list of private properties (such as any along Fisher Knob Road), recreational trails, including any Foothills Trail spur trails, and/or recreation access areas that would be closed and the period of closure(s).

Please note that Commission regulations require that all land and water necessary for the operation and maintenance of the project be included in the project boundary and therefore, if the temporary access road would serve a project purpose, it would need to be included in the proposed project boundary and would have to be approved in a license.

Duke Energy's Response:

(1) The existing Project access road is used to access both Project facilities and non-Project resources including residences at the Fisher Knob community, the South Carolina Department of Natural Resources' (SCDNR) Musterground Wildlife Management Area (WMA), and visitors accessing the Foothills Trail. Road users include:
- Duke Energy personnel and contractors,
- Fisher Knob community property owners and their guests,
- SCDNR for accessing Musterground WMA for management activities,
- Foothills Trail Conservancy for Foothills Trail maintenance activities,
- First responders, and
- The public while accessing the Foothills Trail and Musterground WMA for recreational purposes including hiking, hunting, and fishing.

(2) The proposed temporary access road would provide access to the Fisher Knob community during Bad Creek II construction. It is envisioned to be gated with access granted solely to property owners at Fisher Knob. Construction would be timed such that the road would be usable before intensive Bad Creek II construction activities commence and public use of Bad Creek Road is limited. At the conclusion of

construction activities following demobilization, the temporary access road would be abandoned and no longer available for use.

(3) There would be no recreational access or property access limitations due to the construction of the temporary access road since the road currently is not used for either purpose.

During construction of Bad Creek II, Bad Creek Road may be closed to public use. Trails and recreational features that would be affected by this closure are identified in the table below. As presently proposed, private properties would not be affected by the temporary closure due to the construction of the temporary access road. Duke Energy would continue to allow both SCDNR and Foothills Trail Conservancy access to support Musterground WMA and Foothills Trail maintenance activities. Duke Energy would also allow first responders to use the road to support emergency response.

Lands with Restricted Access	Owner	Closure Period
Bad Creek Hydro Access to the Foothills Trail	Duke Energy	During construction
Musterground Road Access	Duke Energy	During construction
Musterground WMA (Note 1)	Duke Energy (leased to SCDNR) and SCDNR	During construction
Bad Creek Project Overlook	Duke Energy	During construction

Note 1: The Musterground WMA would still be available to the public by foot from the Foothills Trail or by boat from Lake Jocassee.

As an update since the ISR, Duke Energy is no longer proposing or requesting to construct the temporary Fisher Knob access road prior to license issuance.

Additional Information Request 2

2. ***Musterground Road Closure****:* During the ISR Meeting, the Foothills Trail Conservancy and the South Carolina DNR expressed concerns with the closure of Musterground Road for the entire construction period of the proposed Bad Creek II Project (approximately 6-7 years). In its response to ISR comments, Duke Energy describes ongoing access discussions with South Carolina DNR for the Musterground Road Recreation Area. Noting that there seems to be no alternate means of access to the Musterground Road Recreation Area, including to Hunt Camp 5, please indicate if Duke Energy plans to explore periodic open access to Musterground Road Recreation Area during the construction period (e.g., perhaps associated with a phased construction period).

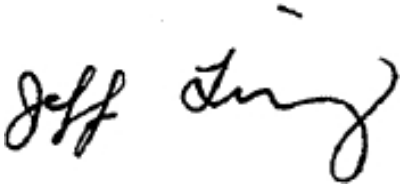
Duke Energy's Response

Duke Energy continues to consult with SCDNR and other relicensing stakeholders regarding potential alternatives for public access to the Musterground WMA during Bad

Creek II construction. These alternatives include potential alternative roads and could potentially include periodic open periods should an alternative route not be identified. Measures that may be agreed upon are expected to be described as part of Duke Energy's relicensing proposal in the draft and final license application.

If there are questions regarding this filing, please contact Alan Stuart, Senior Project Manager, at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy, Hydro Licensing & Lake Services
Duke Energy

cc: Alan Stuart, Duke Energy
Garry Rice, Duke Energy
Service List

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Laura Boos
U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919
Laura.M.Boos@usace.army.mil

Brice McKoy
U.S. Army Corps of Engineers
Peter.B.McKoy@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room lOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

Chip Ridgeway
U.S. Army Corps of Engineers
Irvin.C.Ridgeway@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Erica Beason
State Malacologist
South Carolina Department of Natural Resources
BeasonE@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof

Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Phillip Shirley
Parks, Recreation & Tourism Director
Oconee County
415 S. Pine St
Wahalla, SC 29691
PShirley@oconeeco.com

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
abrock@oconeesc.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com
Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
President
Friends of Lake Keowee Society
1201 N Fant Street
Anderson, SC 29672
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Trustee
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Executive Director
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Tuesday, June 18, 2024 12:30 PM
To: Alexander, Thomas - SC Senate; Amedee, Morgan D.; Andrade, Kristin - USACE Greenville; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; bereskind; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance; Carter, Jerry - SC House of Representatives; Case, Mike; Cato, Van - US Senate; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Mayor, Clemson - cityofclemson; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Edwards, Danny - City of Walhalla, SC; Farrell, Christine - NC State Parks; Adin T Fell; Gestwicki, Tim - NC Wildlife Federation; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gledhill-Earley, Renee - NCSHPO; Gordon, Jeffrey - SC Office of Reg Staff; Goudreau, Chris, NCWRC; sara; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Charles (Rowdy) B Harris; Hawkins, Ray - Jocassee Outdoor Center; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hreha, Lisa - USACE; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Johnson, Elizabeth - SCDAH; Keene, Terry - AQD; Kulpa, Sarah; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; lputnammitchell; Ntale, Kajumba - Chief - USEPA; Olds, Melanie J; Owen, Donna - City of Pickens; growens@gmail.com; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Lorianne Riggin; Rimkunas, Matt - US Senate; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Sandifer, Bill - SC House of Representatives; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; Strong, Brian - NC State Parks; Stuart, Alan Witten; Tarver, Fred - NCDEQ; Thayer, Anne - SC House of Representatives; Liz Thomas; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation; Townsend, Russell - Eastern Band of Cherokee Indians; US Bureau of Land Management BLM_ES_SSDO_Comments@blm.gov; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130@gmail.com; gcyantis2
Subject: P-2740 Bad Creek Relicensing – Filing of ILP Progress Report and Response to Comments on Initial Study Report
Attachments: 20240612_Bad Creek P-2740_ FERC AIRs_ISR.pdf

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Attached please find Duke Energy's response to FERC's Additional Information Requests resulting from the Initial Study Report and Initial Study Report meeting.

This submittal was also electronically filed with FERC and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
526 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

June 28, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 5

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. A fourth Quarterly Study Progress Report was filed on April 1, 2024, detailing activities performed since the ISR was filed. This fifth Quarterly Study Progress Report describes activities performed since the fourth Quarterly Study Progress Report, including activities that occurred in quarter 2 (Q2) of 2024 and activities expected to be conducted in quarter 3 (Q3) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Quarterly Study Progress Report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Laura Boos
U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919
Laura.M.Boos@usace.army.mil

Brice McKoy
U.S. Army Corps of Engineers
Peter.B.McKoy@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chip Ridgeway
U.S. Army Corps of Engineers
Irvin.C.Ridgeway@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Erica Beason
State Malacologist
South Carolina Department of Natural Resources
BeasonE@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Phillip Shirley
Parks, Recreation & Tourism Director
Oconee County
415 S. Pine St
Wahalla, SC 29691
PShirley@oconeeco.com

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
abrock@oconeesc.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Dale Wilde
President
Friends of Lake Keowee Society
1201 N Fant Street
Anderson, SC 29672
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Trustee
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Executive Director
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Bad Creek Pumped Storage Project

Relicensing Study Progress Report No. 5

June 28, 2024

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024 and the ISR Meeting Summary was filed with FERC on February 1, 2024. The following sections summarize progress implementing the relicensing studies since the April 1, 2024 Study Progress Report.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

3.0 ACCESS ROADS

In its Study Progress Report No. 2, Duke Energy provided information on a potential temporary access road to the Fisher Knob community (Fisher Knob Access Road). The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were expanded to incorporate the areas potentially affected by the road. Duke Energy initially proposed activities for Fisher Knob Access Road construction to occur prior to license issuance; however, early construction of the Fisher Knob Access Road is no longer part of the licensing proposal and road development, if proposed, will follow license issuance. Studies are unaffected by this change in schedule and still incorporate the areas potentially affected by the proposed Fisher Knob Access Road.

Primary site access for construction is provided by the existing Bad Creek Road. Duke Energy is presently evaluating and siting additional access roads on property owned by Duke Energy or under easement, or existing U.S. Forest Service roads that would be subject to authorization under a non-commercial/road use agreement, for construction of the proposed additional 9.3-mile-long 525-kV transmission line for Bad Creek II.

4.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: No additional work for this study task is anticipated; the final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for the second study year commenced in June 2024 with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information. A draft report will be distributed in Q4 and will include a summary of data for both study years.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II

instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling has been carried out to incorporate these updated hydraulic capacities. A summary report presenting the effects of updated pumping capacities in Whitewater River cove was developed for Duke Energy and distributed for 30-day stakeholder review on June 12, 2024. The final report will be attached as an addendum to the CFD study report (Appendix A, Attachment 3) in the Updated Study Report (USR).

- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model was used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee and Lake Keowee reservoir level fluctuations. Duke Energy held a joint meeting with the Water Resources, Aquatic Resources, Operations, and Recreational & Visual Resources RCs on April 4, 2024, to review model results. Following the meeting, Duke Energy provided a draft report to the RCs for review and comment (no comments were received). The final CHEOPS report was distributed to the RCs on April 27, 2024, and is provided as Attachment A to this Study Progress Report.
- **Future Water Quality Management Plan (WQMP) Development:** Initial work to develop the WQMP began in Q2 and a draft plan will be presented to the Water and Aquatics RCs for input in Q4 of 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate the proposed Fisher Knob Access Road. Additional CFD modeling was carried out to incorporate increased hydraulic pumping capacities associated with recently proposed variable-speed units at Bad Creek II, as described above.

5.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The final report was reviewed by stakeholders and provided in the ISR as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling

is being carried out to incorporate these updated hydraulic capacities and an addendum to the final report will be distributed to the Aquatic Resources RC by August 31, 2024, and included in the USR (Appendix B, Attachment 1). Also, per the Commission's request in their ISR comments, a literature review will be carried out for the intrinsic population growth rate of threadfin shad. If recent literature is identified with this information, it will be considered for inclusion in the entrainment analysis and presented in the USR.

- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** CFD modeling results were used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results were used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. The draft report was provided to the Aquatic Resources RC for review on May 3, 2024. No comments were received; the final report was issued to the RC on June 3, 2024 and is included as Attachment B to this Study Progress Report.
- **Impacts to Surface Waters and Associated Aquatic Fauna:** A final report was distributed to the Aquatic Resources RC on February 14, 2024, and was filed as Attachment A of the fourth Quarterly Study Progress Report.

Variance from Approved Study Plan

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the proposed Fisher Knob Access Road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

6.0 VISUAL RESOURCES STUDY

Duke Energy provided the draft study report to the Recreation and Visual Resources RC on May 22, 2024. No comments requiring revision to the study report were provided during the 30-day comment period. The final study report is attached to this report as Attachment C.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan. The proposed Fisher Knob Access Road has been incorporated into the viewshed model.

7.0 RECREATIONAL RESOURCES STUDY

The Recreational & Visual Resources RC met on May 9, 2024, to discuss the status of the Recreational Resources Study as described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data collection including traffic and trail counts, in-person and online user surveys, and spot counts was completed in 2023 and data were processed in early 2024. During the May 9, 2024 meeting, results of the study were discussed, and the draft study report was provided to the RC for review on May 16, 2024 with comments due on June 16, 2024. Comments were received from the Foothills Trail Conservancy (FTC) and will be addressed in the USR. The draft Foothills Trail carrying capacity analysis report (to be included with the RUN Study Report as Appendix F) is complete and was distributed to the RC for review on June 26, 2024.
- **Foothills Trail Condition Assessment**: Fieldwork was completed in 2023 and the draft study report was submitted to the RC in November 2023 as well as included in the ISR. Duke Energy received comments on the draft report from the FTC, SCDNR, and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. Additional information was collected by Long Cane Trails to address some of the RC comments. A memo summarizing the additional information was prepared and distributed to the RC for review on June 26, 2024. The final report, which will include the additional information memo as an appendix, will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. Development of the draft report is underway and distribution to Recreational & Visual Resources RC members will occur in Q3 2024.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

8.0 CULTURAL RESOURCES STUDY

The final report was attached as Attachment B of the fourth Quarterly Progress Report[2].

Variance from Approved Study Plan

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed Fisher Knob Access Road.

9.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Duke Energy will continue to evaluate the need for additional outreach activities prior to the filing of the final license application.

Variance from Approved Study Plan

The study was conducted in accordance with the study plan as modified by FERC.

10.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy has developed a bat study plan in consultation with the South Carolina Department of Natural Resources (SCDNR) and U.S. Fish and Wildlife Service (USFWS) to carry out additional surveys for bats at the Project due to potential clearing associated with the proposed Fisher Knob Access Road, spoil areas, transmission line, and other areas of proposed power complex infrastructure. The final bat study plan was distributed to the Wildlife and Botanical RC on May 31, 2024. Copies of the study plan were also distributed to the U.S. Department of Agriculture (J. Magniez) and FERC staff (S. Salazar), per individual requests. Surveys were carried out between June 1 and June 20 in proposed impact areas including potential spoil sites and the proposed Fisher Knob Access Road, as well as areas potentially impacted by the proposed transmission line construction and maintenance. The potential impact areas contain suitable summer habitat, as outlined by 2024 USFWS guidelines, that require bat surveys according to linear and non-linear project protocols since tree clearing needs to take place during the restricted cutting timeframes. Bat surveys followed the 2024 Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines.[3] The final Bat Study Plan prepared is provided with this Study Progress Report as Attachment D.

[2] Consistent with FERC policy, the Cultural Resources report was submitted as Controlled Unclassified Information (CUI)/Privileged information.
[3] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

In response to a written request from the SCDNR in comments submitted to the Commission on the ISR, Duke Energy developed a study plan for the federally threatened small whorled pogonia. This study was designed to determine the presence or absence of this protected species prior to land disturbance activities associated with the access road and overall construction of the Bad Creek II Power Complex and to aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species. This survey and other fieldwork components were completed in June, 20024. Additionally, field biologists recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey. The small whorled pogonia draft study plan was distributed to the SCDNR and USFWS for review and comment on May 24, 2024; neither agency had comment on the draft study plan, therefore, the final study plan was distributed to the Wildlife and Botanical RC on June 5, 2024 for review and comment. The final Small Whorled Pogonia Study Plan is provided with this Study Progress Report as Attachment E.

These studies will also support Clean Water Act 404 permitting to avoid and minimize impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the USFWS [to comply with Section 7 of the Endangered Species Act] for the 404 permitting and license application.

11.0 PERMITTING ACTIVITIES

Initial work in support of Clean Water Act Section 404 / 401 permitting has begun; a pre-application meeting request was submitted to the U.S. Army Corps of Engineers (USACE) on February 23, 2024, and the meeting was held on March 28, 2024, in Columbia, South Carolina. Attendees includes representatives from USACE, USFWS, SCDNR, S.C. Department of Health and Environmental Control (SCDHEC), Catawba Indian Nation, Duke Energy, and Duke Energy's consultant (HDR Engineering, Inc.). The final meeting summary, which incorporated comments and feedback from the SCNDR and USACE, was distributed to meeting participants on June 7, 2024. A follow-up meeting with additional USACE staff was held at the USACE office in Columbia, SC on April 11, 2024, to discuss permitting activities and strategies associated with Bad Creek II Complex.

Attachment A: Water Exchange Rates and Lake Jocassee Reservoir Levels

(Final Report)

Attachment B: Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

(Final Report)

Attachment C: Visual Resources Study Report

(Final Report)

Attachment D: Bat Study Plan

Attachment E: Small Whorled Pogonia Study Plan

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
526 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

October 2, 2024

Electronically Filed

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Relicensing Study Progress Report No. 6

Dear Acting Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Relicensing Studies

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. This sixth Quarterly Study Progress Report describes activities performed since the fifth Quarterly Study Progress Report, including activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Quarterly Study Progress Report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public

throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Berhnart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Laura Boos
U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919
Laura.M.Boos@usace.army.mil

Brice McKoy
U.S. Army Corps of Engineers
Peter.B.McKoy@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chip Ridgeway
U.S. Army Corps of Engineers
Irvin.C.Ridgeway@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

Bob Dach
U.S. Bureau of Indian Affairs, Natural Resources
911 N.E. 11th Ave
Portland, OR 97232-4169
robert.dach@bia.gov

U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CDS)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of Joe Wilson
U.S. House of Representatives (CO2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CO2)
116 Cannon House Office Building
Washington, D.C. 20515

Matt Rimkunas
Office of Senator Burr
U.S. Senate
290 Russell Senate Office Building
Washington, D.C. 20510
matt_rimkunas@lgraham.senate.gov

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

U.S. Senator Lindsey Graham
U.S. Senate
2 W Washinton St
Ste 800
Greenville, SC 29601-4897

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Renee Gledhill-Earley
Environmental Review Coordinator
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617
renee.gledhill-earley@ncdcr.gov

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Chris Wood
Hydropower Special Projects Coordinator
North Carolina Wildlife Resource Commission
645 Fish Hatchery Rd
Marion, NC 28752
Chris.Wood@NCWildlife.org

Office of the Attorney General of South Carolina
P.O. Box 11549
Rembert C. Dennis Office Building
Columbia, SC 29211-1549

Office of the Governor of North Carolina
20301 Mail Service Center
Raleigh, NC 27699-0301

Office of the Governor of South Carolina
1205 Pendleton St
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
S.C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
S.C. Office of Regulatory Staff
fsalter@ors.sc.gov

Elizabeth Johnson
Director
South Carolina Department of Archives and History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Morgan Amedee
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
amedeemd@dhec.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hightoCW@dhec.sc.gov

Jennifer Hughes
South Carolina Department of Health and Environmental Control
2600 Bull St
Columbia, SC 29201-1708
hughesjr@dhec.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Erica Beason
State Malacologist
South Carolina Department of Natural Resources
BeasonE@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Jerry Carter
South Carolina House of Representatives
P.O. Box 11867
Room 418C
Columbia, SC 29211
Jerrycarter@schouse.gov

Neal Collins
South Carolina House of Representatives
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

David Hiott
South Carolina House of Representatives
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Bill Sandifer
South Carolina House of Representatives
P.O. Box 11867
Room 407
Columbia, SC 29211
billsandifer@schouse.gov

Anne Thayer
South Carolina House of Representatives
P.O. Box 11867
Room 306C
Columbia, SC 29211
Annethayer@schouse.gov

Bill Whitmire
South Carolina House of Representatives
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Thomas Alexander
South Carolina State Senate
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Nanette Edwards
Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

J.C. Cook
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Fletcher Perry
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
fperry@pickenscity.com

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Phillip Shirley
Parks, Recreation & Tourism Director
Oconee County
415 S. Pine St
Wahalla, SC 29691
PShirley@oconeeco.com

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Amanda Brock
County Administrator
Oconee County
abrock@oconeesc.com

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynne Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire and Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Acee Watt
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
18263 W. Keetoowah Circle
Tahlequah, OK 74465
awatt@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Dale Wilde
President
Friends of Lake Keowee Society
1201 N Fant Street
Anderson, SC 29672
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Ray Hawkins
Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Trustee
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Executive Director
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Bad Creek Pumped Storage Project
Relicensing Study Progress Report No. 6
October 2, 2024

1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024, and the ISR Meeting Summary was filed with FERC on February 1, 2024. The following sections summarize progress implementing the relicensing studies since the June 28, 2024, Study Progress Report.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

3.0 ACCESS ROADS

In its Study Progress Report No. 2, Duke Energy first provided information on a potential temporary access road to the Fisher Knob community (Fisher Knob Access Road). The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were expanded to incorporate the areas potentially affected by the road. Duke Energy initially proposed activities for Fisher Knob Access Road construction to occur prior to license issuance; however, early construction of the Fisher Knob Access Road is no longer part of the licensing proposal and road development, if proposed, will follow license issuance. Studies are unaffected by this change in schedule and still incorporate the areas potentially affected by the proposed Fisher Knob Access Road.

Primary site access for construction is provided by the existing Bad Creek Road. Duke Energy is presently evaluating potential improvements to existing access roads for use during construction of the proposed additional 9.3-mile-long 525-kV transmission line for Bad Creek II. These non-project access roads are located outside the FERC Project Boundary, owned by Duke Energy, subject to Duke Energy-held easements, or are existing U.S. Forest Service roads that would be subject to federal authorization under a non-commercial/road use agreement.

4.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: The final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for the second study year commenced in June 2024 with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information. Field work is ongoing, and a draft report will be distributed in Q4, which will include a summary of data for both study years.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II

instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling has been carried out to incorporate these updated hydraulic capacities. A summary report presenting the effects of updated pumping capacities in Whitewater River cove was developed for Duke Energy and distributed for 30-day stakeholder review on June 12, 2024. The final report is provided with this Study Progress Report as Attachment A and will be included as an addendum to the CFD study report in the Updated Study Report (USR).

- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The final CHEOPS report was distributed to the RCs on April 27, 2024, and was provided as Attachment A of the fifth Quarterly Study Progress Report.
- **Water Quality Management Plan (WQMP) Development:** Development of the WQMP began in second quarter 2024. In early August, Duke Energy met directly with staff from the South Carolina Department of Environmental Services (SCDES, Clean Water Act Section 401 water quality certifying agency) to discuss the proposed Bad Creek II Complex and elements of the WQMP. Duke Energy provided a draft version of the WQMP directly to SCDES for review and comment. Following receipt of comments from SCDES, Duke Energy will revise the draft WQMP as appropriate and distribute it to the Water and Aquatics RCs for input in 2024. Duke Energy presently expects to complete this consultation and finalize the WQMP by the end of Q4.

Variance from Approved Study Plan

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate the proposed Fisher Knob Access Road. Additional CFD modeling was carried out to incorporate increased hydraulic pumping capacities associated with recently proposed variable-speed units at Bad Creek II, as described above.

5.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The final report was reviewed by stakeholders and provided in the ISR as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be constructed at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling

is being carried out to incorporate these updated hydraulic capacities and Addendum 1 to the final report will be distributed to the Aquatic Resources RC in November 2024 for a 30-day review and included in the USR. Also, per the Commission's request in their ISR comments, a literature review is currently being carried out for the intrinsic population growth rate of threadfin shad, as well as other species of interest, as appropriate. This review will be included as Addendum 2 to the final report and will be distributed to the Aquatic Resources RC for a 30-day review prior to being included in the USR.

- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** The final report was distributed to the RC on June 3, 2024, and was included as Attachment B of the fifth Quarterly Study Progress Report.
- **Impacts to Surface Waters and Associated Aquatic Fauna:** The final report was distributed to the RC on February 14, 2024, and was included as Attachment A of the fourth Quarterly Study Progress Report.

Variance from Approved Study Plan

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the proposed Fisher Knob Access Road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

6.0 VISUAL RESOURCES STUDY

The final study report was distributed to the RC on June 26, 2024, and was included as Attachment B of the fifth Quarterly Study Progress Report.

Variance from Approved Study Plan

The study was completed in accordance with the approved study plan with the addition of the proposed Fisher Knob Access Road into the viewshed model.

7.0 RECREATIONAL RESOURCES STUDY

The status of the Recreational Resources Study is described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: The draft RUN Study Report, including the Foothills Trail carrying Capacity analysis report, was distributed to the

Recreational & Visual Resources RC in May and June, 2024. The final RUN Study Report will be provided in the USR.

- **Foothills Trail Condition Assessment**: Duke Energy received comments on the draft report from the FTC, South Carolina Department of Natural Resources (SCDNR), and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. Additional information was collected by Long Cane Trails to address some of the RC comments. A memo summarizing the additional information was prepared and distributed to the RC for review on June 26, 2024. The FTC provided comments on the memo, which will be addressed in the USR. The final Foothills Trail Condition Assessment report, including the additional information memo, will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. Development of the draft report is underway and distribution to Recreational & Visual Resources RC members is planned for October.

Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

8.0 CULTURAL RESOURCES STUDY

The final report was attached as Attachment B of the fourth Quarterly Progress Report[2]. In Q3, Duke Energy identified the need to slightly expand the proposed FERC Project Boundary and the Area of Potential Effect (APE) to align with the proposed widened corridor for the transmission line, based on its current design. Duke Energy notified the SC SHPO of this minor modification to the APE by letter dated September 11, 2024. Additional cultural resources field work has been conducted along the proposed approximately 9.3-mile-long 525-kV transmission corridor for Bad Creek II. Results will be incorporated into an updated final report in the USR.

[2] Consistent with FERC policy, the Cultural Resources report was submitted as Controlled Unclassified Information (CUI)/Privileged information.

Variance from Approved Study Plan

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed Fisher Knob Access Road and the transmission corridor.

9.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Although disproportionately high or adverse effects to Environmental Justice (EJ) communities surrounding the Project were not identified through desktop analyses, FERC has indicated in verbal comments during the Initial Study Report (ISR) meeting that they would recommend outreach to engage the identified environmental justice communities in the relicensing process. Duke Energy is currently in the process of planning public outreach efforts for late 2024, with a focus on the two geographic areas identified during the desktop analysis. Outreach efforts will be summarized within the USR.

Variance from Approved Study Plan

The study was conducted in accordance with the study plan as modified by FERC.

10.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy developed a bat study plan in consultation with the SCDNR and U.S. Fish and Wildlife Service (USFWS) to carry out additional surveys for bats at the Project due to potential clearing associated with the proposed Fisher Knob Access Road, spoil areas, transmission line, and other areas of proposed Bad Creek II Power Complex infrastructure. The final bat study plan was distributed to the Wildlife and Botanical RC on May 31, 2024. Copies of the study plan were also distributed to the U.S. Department of Agriculture (J. Magniez) and FERC staff (S. Salazar), per individual requests.

Surveys were carried out between June 1 and June 20 in proposed impact areas including potential spoil sites and the proposed Fisher Knob Access Road, as well as areas potentially impacted by the proposed transmission line construction and maintenance. The potential impact areas contain suitable summer habitat, as outlined by 2024 USFWS guidelines, that require bat surveys according to linear and non-linear project protocols since tree clearing needs to take place during the restricted cutting timeframes. Bat surveys followed the 2024 Range-wide

Indiana Bat and Northern Long-eared Bat Survey Guidelines.[3] The final Bat Study Plan was provided with the fifth Study Progress Report. The Bat Survey Report is currently under development and will be included in the USR.

In response to a written request from the SCDNR in comments submitted to the Commission on the ISR, Duke Energy developed a study plan for the federally threatened small whorled pogonia. This study was designed to determine the presence or absence of this protected species prior to land disturbance activities associated with the access road and overall construction of the Bad Creek II Power Complex and to aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species. This survey and other fieldwork components were completed in June 2024. Additionally, field biologists recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey. The small whorled pogonia draft study plan was distributed to the SCDNR and USFWS for review and comment on May 24, 2024; neither agency had comment on the draft study plan, therefore, the final study plan was distributed to the Wildlife and Botanical RC on June 5, 2024. The final Small Whorled Pogonia Study Plan was provided with the fifth Progress Report as Attachment E. The Small Whorled Pogonia Survey Report was distributed to the Wildlife and Botanical RC on August 28, 2024, and the report was revised to incorporate feedback from the SCDNR and Upstate Forever. This final report was distributed to the Wildlife and Botanical RC on September 19, 2024 and is included as Attachment B.

11.0 PERMITTING ACTIVITIES

In the fifth Quarterly Study Progress Report, Duke Energy provided information about initial work in support of Clean Water Act Section 404 / 401 permitting, including pre-application meetings with the U.S. Army Corps of Engineers (USACE) (as well as SCDES, USFWS, SCDNR, and Catawba Indian Nation) on March 28, 2024, and a follow-up meeting with additional USACE staff on April 11, 2024. In Q3, Duke Energy's consultant, HDR Engineering, Inc. (HDR), carried out surveys of the Project Area for Waters of the U.S. (WOTUS) under Clean Water Act Section 404/401, including delineation of jurisdictional WOUS and stream classifications, in accordance with current regulations and guidance. Duke Energy and HDR filed a combined Preliminary/Approved Jurisdictional Request with the USACE on September 28,

[3] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

2024, seeking written verification for the delineated waters within the Project Area and are continuing coordination with USACE on this process.

Attachment A: Bad Creek CFD Model Updated Pumping Rates Addendum

Attachment B: Small Whorled Pogonia Survey Report

From: Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
Sent: Wednesday, October 2, 2024 3:07 PM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: RE: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

Thank you, Alan.
In that case, please do not include the North Carolina SHPO in this matter as we do not have role in the Section 106 consultation process. And, are working hard to deal with Hurricane Helene's damage in NC.
Appreciate your quick reply and understanding.

Renee Gledhill-Earley
Environmental Review Coordinator
NC State Historic Preservation Office
919-814-6579

Please note my new email address is renee.gledhill-earley@dncr.nc.gov

---

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, October 2, 2024 2:18 PM
To: Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
Subject: Re: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

CAUTION: External email. Do not click links or open attachments unless verified. Report suspicious emails with the Report Message button located on your Outlook menu bar on the Home tab.

Hi Renee,

Confirming, none of the Bad Creek project lies within the State of NC.

We completely understand, relate, and sympathize with you folks regarding the challenges left in Hurricane Helene's path.

Hoping you folks are safe and healthy.
Alan

From: Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
Sent: Wednesday, October 2, 2024 1:55:58 PM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: RE: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Alan:
Given that we are in triage mode with projects due to Hurricane Helene, can you confirm that none of P-2740 Bad Creek Relicensing – is located within the State of North Carolina. Your answer will help us direct the project if there is any of it in NC.
Thank you.

Renee Gledhill-Earley
Environmental Review Coordinator
NC State Historic Preservation Office
919-814-6579

Please note my new email address is renee.gledhill-earley@dncr.nc.gov

---

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, October 2, 2024 12:05 PM
To: gcyantis2 <gcyantis2@yahoo.com>; Wood, Chris J. <chris.wood@ncwildlife.org>; suewilliams130@gmail.com; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; Dale Wilde <dwilde@keoweefolks.org>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Liz Thomas <liz.thomas@klgates.com>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Clemsonla <Clemsonla@gmail.com>; Tarver, Fred <fred.tarver@deq.nc.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Strong, Brian <brian.strong@ncparks.gov>; MacStone <MacStone@naturalandtrust.org>; Chris Starker <cstarker@upstateforever.org>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; PShirley <PShirley@oconeeco.com>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Rohde, Fritz <fritz.rohde@noaa.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Peter Raabe <praabe@americanrivers.org>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; growens@gmail.com; Olds, Melanie J <melanie_olds@fws.gov>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; lputnammitchell <lputnammitchell@gmail.com>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Elizabeth Miller <MillerE@dnr.sc.gov>; derrick.miller@usda.gov; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Laughter, Jaime <jaime.laughter@transylvaniacounty.org>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Keene, Terry - AQD <jtk7140@me.com>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Erika Hollis <ehollis@upstateforever.org>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; glenn@hilliardgrp.com; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; hightocw@dhec.sc.gov; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Charles (Rowdy) B Harris <charris@scprt.com>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; Wenonah Haire <wenonah.haire@catawba.com>; jhains@g.clemson.edu; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; Sara Green

<sara@scwf.org>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>; Andrew Gleason <andrewandwilla@hotmail.com>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Adin T Fell <afell@scprt.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Andy Douglas <adoug41@att.net>; Davis, Amin <amin.davis@deq.nc.gov>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Cotton, Mark <mark@cottonrealestate.com>; Corney, Steve <steve@corney.org>; Corney, Michael <mike_corney@yahoo.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Wes Cooler <wes.cooler@mac.com>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Case, Mike <mgcase@icloud.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; abrock@oconeesc.com; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Boos, Laura - USACE <Laura.M.Boos@usace.army.mil>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Beason, Erica - SCDNR <BeasonE@dnr.sc.gov>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

You don't often get email from alan.stuart@duke-energy.com. Learn why this is important

CAUTION: External email. Do not click links or open attachments unless verified. Report suspicious emails with the Report Message button located on your Outlook menu bar on the Home tab.

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the Relicensing Study Progress Report No. 6 filing, which includes activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. The Study Progress Report No. 6 was electronically filed with FERC by Duke Energy on October 2, 2024 and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/documents/).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Please stay safe,
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

Email correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties by an authorized state official.

From: Massey, John (Gant) <jmassey@blm.gov>
Sent: Thursday, October 3, 2024 12:22:23 PM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: Kennedy, Brian C <bckennedy@blm.gov>; Harris, William G <wgharris@blm.gov>; Paffrath, Hunter R <hpaffrath@blm.gov>
Subject: Re: [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Alan, thanks for reaching out to the Bureau of Land Management (BLM). Both the Southeastern States District Office Realty and Minerals staff have checked whether there are any BLM surface properties or federal mineral rights that might be affected by the Bad Creek Pumped Storage Project. No conflicts have been identified, so we have no further comments.

Best wishes for the success of this project.

Sincerely,

Gant

John Gant Massey, Ph.D.
Assistant District Manager-Resources
Bureau of Land Management, Eastern States State Office
Southeastern States District Office
273 Market Street, Flowood, Mississippi 39232
Interior Region 1, 2 and 4: N. Atlantic - Appalachian; S. Atlantic - Gulf; MS Basin
phone: 601-715-5572
jmassey@blm.gov
https://www.blm.gov/office/southeastern-states

Miles forward every day. g

From: SSDO_Comments, BLM_ES <BLM_ES_SSDO_Comments@blm.gov>
Sent: Wednesday, October 2, 2024 1:40 PM
To: Kennedy, Brian C <bckennedy@blm.gov>; Massey, John (Gant) <jmassey@blm.gov>
Subject: FW: [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

Hunter Paffrath
Bureau of Land Management
Southeastern States Public Affairs
C: (769) 366-4821

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, October 2, 2024 11:05 AM
To: gcyantis2 <gcyantis2@yahoo.com>; Wood, Chris J. <chris.wood@ncwildlife.org>; suewilliams130@gmail.com; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; Dale Wilde <dwilde@keoweefolks.org>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; awatt.ukb-nsn_contact <awatt@ukb-nsn.gov>; SSDO_Comments, BLM_ES <BLM_ES_SSDO_Comments@blm.gov>; syerka.nc-cherokee_contact <syerka@nc-cherokee.com>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Liz Thomas <liz.thomas@klgates.com>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Clemsonla <Clemsonla@gmail.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; MacStone <MacStone@naturalandtrust.org>; Chris Starker <cstarker@upstateforever.org>; ashlstep@nc-cherokee.com; PShirley <PShirley@oconeeco.com>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Rohde, Fritz <fritz.rohde@noaa.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; rigginl@dnr.sc.gov; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rawlings, Leonard D <Leonard.Rawlings@bia.gov>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; praabe@americanrivers.org; Peterson, Harold S <Harold.Peterson@bia.gov>; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; growens@gmail.com; Olds, Melanie J <melanie_olds@fws.gov>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; lputnammitchell <lputnammitchell@gmail.com>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Elizabeth Miller <MillerE@dnr.sc.gov>; derrick.miller@usda.gov; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Keene, Terry - AQD <jtk7140@me.com>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Erika Hollis <ehollis@upstateforever.org>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; glenn@hilliardgrp.com; David Hill <dhill@mcn-nsn.gov>; hightocw@dhec.sc.gov; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Charles (Rowdy) B Harris <charris@scprt.com>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; wenonah.haire.catwba_contact <wenonah.haire@catawba.com>; jhains@g.clemson.edu; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; Sara Green <sara@scwf.org>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Andrew Gleason <andrewandwilla@hotmail.com>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Adin T Fell <afell@scprt.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Duncan, Jeffrey R <Jeff_Duncan@nps.gov>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Andy Douglas <adoug41@att.net>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Dach, Bob - USBIA NR <robert.dach@bia.gov>;

Cotton, Mark <mark@cottonrealestate.com>; Corney, Steve <steve@corney.org>; Corney, Michael <mike_corney@yahoo.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Wes Cooler <wes.cooler@mac.com>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Colburn, Kevin <kevin@americanwhitewater.org>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Case, Mike <mgcase@icloud.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; abrock@oconeesc.com; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Boos, Laura - USACE <Laura.M.Boos@usace.army.mil>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Beason, Erica - SCDNR <BeasonE@dnr.sc.gov>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the Relicensing Study Progress Report No. 6 filing, which includes activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. The Study Progress Report No. 6 was electronically filed with FERC by Duke Energy on October 2, 2024 and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/documents/).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Please stay safe,
Alan

Alan Stuart

Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

From:	Stuart, Alan Witten
To:	Adams, Jennifer - Oconee County; Alexander, D - seneca.sc; Alexander, Thomas - SC Senate; Amedee, Morgan D.; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Ericah Beason; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; Boos, Laura - USACE; Boss, Jeff - Greenville Water; Caggiano, Annie - Oconee Economic Alliance; Case, Mike; Cato, Van - US Senate; Chief of NEPA Program - USEPA; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Farrell, Christine - NC State Parks; Adin T Fell; tim; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gordon, Jeffrey - SC Office of Reg Staff; Green, Sara - SC Wildlife Federation; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Mayor, Clemson - cityofclemson; Hall, Tim - City of Walhalla, SC; Charles (Rowdy) B Harris; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Jocassee Outdoor Center; Johnson, Elizabeth - SCDAH; JohnsonHughes, Christy; Keene, Terry - AQD; Kirouac, Justin - Oconee Cty Administrator; Kulpa, Sarah; Salazar, Maggie; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McKoy, Brice - USACE; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; Mitchell, Phil - Fishers Knob Home Owners Group; Olds, Melanie J; growens@gmail.com; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Ridgeway, Chip - USACE; Lorianne Riggin; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Scipio, Isaiah - Mayor, City of Pickens, SC; PShirley; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; Stone, Mac - Naturaland Trust; Strong, Brian - NC State Parks; Tarver, Fred - NCDEQ; Clemsonla; Thomas Esq, Elizabeth - K&L Gates LLP; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation; Townsend, Russell - Eastern Band of Cherokee Indians; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130@gmail.com; Santos, Sarah Anna
Cc:	Sarah Salazar; Kulpa, Sarah; McCarney-Castle, Kerry; Huff, Jen; Salazar, Maggie; Ziegler, Ty; Fletcher, Scott T; Abney, Michael A; Pardue, Ethan; Churchill, Christy
Subject:	Save the Date - FERC 2740 Bad Creek Relicensing Updated Study Report Meeting on January 16, 2025
Date:	Monday, December 2, 2024 2:06:23 PM

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Bad Creek Relicensing Stakeholders:

Duke Energy will convene a meeting of all relicensing stakeholders to review the Updated Study Report (USR) results to be filed with FERC on **January 3, 2025**. The meeting will occur on Thursday, January 16, 2025, 9 am–4 pm, at the Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100). The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2025 with filing of the Draft License Application (DLA). Lunch will be served at the meeting.

Duke Energy will send a separate meeting invitation so you can schedule on your Outlook calendar. We strongly encourage in-person participation but will offer a virtual Teams meeting link for those who cannot attend in person. If **you do plan to attend in person**, please respond to me so I can ensure there is an accurate headcount for lunch.

A meeting agenda will be provided to participants prior the January 16 meeting date.

Thanks, and we look forward to seeing you at the meeting.

Regards,
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
525 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

January 3, 2025

Electronically Filed

Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Updated Study Report and Updated Study Report Meeting

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (Project) (FERC Project No. 2740), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Project utilizes the Bad Creek Reservoir as the upper reservoir and Lake Jocassee, which is licensed as part of the Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503), as the lower reservoir.

The existing (original) license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 50-year term, with an effective date of August 1, 1977, and expires July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Duke Energy is proposing additional energy storage and generation capacity at the Project, which would be developed by constructing a new 1,400-MW Bad Creek II Power Complex (Bad Creek II) adjacent to the existing powerhouse.

On December 5, 2022, Duke Energy filed the Revised Study Plan (RSP) describing the studies the Licensee proposed to conduct in support of relicensing the Project, in accordance with 18 CFR §5.11. The Commission approved the RSP with modifications on January 4, 2023, in its Study Plan Determination (SPD). As approved by the Commission in its SPD, Duke Energy has implemented the following six studies during the 2023-2024 field seasons:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

Duke Energy filed the Initial Study Report (ISR) on January 4, 2023, and per 18 CFR §5.15(c), Duke Energy held an ISR meeting with participants and FERC staff on Wednesday, January 17, 2024. Additionally, in accordance with 18 CFR §5.15, Duke Energy has filed quarterly study progress reports documenting study implementation and is hereby filing the Updated Study Report (USR) with the Commission.

The USR describes methods and results of the studies conducted in support of preparing an application for a new license for the existing Project and construction of Bad Creek II. Duke Energy is filing the USR with the Commission electronically and is distributing notification to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing a notification of filing via U.S. mail. Parties interested in the relicensing process may obtain a copy of the USR electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2] If any party would like to request a CD containing a copy of the USR, please contact the undersigned at the address listed below. Note that Controlled Unclassified Information // Privileged (CUI//PRIV) pertaining to locations of protected archeological sites is being filed under separate cover.

In comments filed on the ISR or at the ISR meeting, FERC staff requested that certain study data (including GIS files) be provided electronically, and Duke Energy committed to including the requested data and GIS files with the USR filing. The requested data is being provided in electronic format as part of this USR filing.

USR Meeting

The Commission's regulations at 18 CFR §5.15(f) require Duke Energy to hold a meeting with relicensing participants and FERC staff within 15 days of filing the USR. Accordingly, Duke Energy will hold an USR Meeting from 9:00 AM to 5:00 PM (approximately) on Thursday, January 16, 2025, at its Wenwood Operations Center in Greenville, SC. An agenda for the USR Meeting is provided in Attachment 2. Please note the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Duke Energy encourages in-person participation by stakeholders and Commission staff. Please contact Alan Stuart (alan.stuart@duke-energy.com) by January 9, 2025 to register for the meeting or to request a Microsoft Teams option to participate.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://www.badcreekpumpedstorage.com/

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
Fishery Ecologist and Water Quality Specialist
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
Fishery Biologist
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Bernhart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Laura Boos
U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919
Laura.M.Boos@usace.army.mil

Brice McKoy
U.S. Army Corps of Engineers
Peter.B.McKoy@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chip Ridgeway
U.S. Army Corps of Engineers
Irvin.C.Ridgeway@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of Joe Wilson
U.S. House of Representatives (CD2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CD3)
116 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CD5)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Lindsey Graham
U.S. Senate
211 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Fred Tarver
North Carolina Department of Environmental Quality, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 29699-1611
fred.tarver@ncdenr.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

North Carolina Office of the Governor
20301 Mail Service Center
Raleigh, NC 27699-0301

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Vann Stancil
Research Coordinator
North Carolina Wildlife Resource Commission, Habitat Conservation Division
645 Fish Hatchery Rd
Marion, NC 28752
vann.stancil@ncwildlife.org

The Honorable Alan Wilson
Office of the Attorney General of South Carolina
P.O. Box 11549
Columbia, SC 29211

The Honorable Henry McMaster
Office of the Governor of South Carolina
1100 Gervais Street
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
Energy Planning and Emerging Technology Department
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
Energy Planning and Emerging Technology Department
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Morgan Amedee
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
Morgan.Amedee@des.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
hightoCW@des.sc.gov

Jennifer Hughes
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
hughesjr@des.sc.gov

Erica Beason
State Malacologist
South Carolina Department of Natural Resources
BeasonE@dnr.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Bill Whitmire
South Carolina House of Representatives (CD1)
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Adam Duncan
South Carolina House of Representatives (CD2)
208 E. South 3rd Street
Seneca, SC 29678

Phillip Bowers
South Carolina House of Representatives (CD3)
P.O. Box 9
Six Mile, SC 29682

David Hiott
South Carolina House of Representatives (CD4)
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Neal Collins
South Carolina House of Representatives (CD5)
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

Blake Sanders
South Carolina House of Representatives (CD9)
1 Hindman St.
Pelzer, SC 29669

Thomas Alexander
South Carolina State Senate (District 1)
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate (District 2)
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Elizabeth Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office, SC Department of Archives & History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Andrew Bateman
Acting Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Phillip Shirley
Parks, Recreation & Tourism Director
Oconee County
415 S. Pine St
Wahalla, SC 29691
PShirley@oconeesc.com

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

Robert Halfacre
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Isaiah Scipio
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
iscipio@pickenscity.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Justin Kirouac
County Administrator
Oconee County
jkirouac@oconee.ga.us

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynn Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Roger Cain
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
rcain@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gerry Yantis
Advocates for Quality Development (AQD)
gcyantis2@yahoo.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
President
Friends of Lake Keowee Society
1201 N Fant Street
Anderson, SC 29672
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Mike Hoffstatter
Regional Director
National Wild Turkey Federation
770 Augusta Rd
Edgefield, SC 29824
mhoffstatter@nwtf.net

Wes Cooler
Trustee
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Executive Director
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Michael Bedenburgh
Palmetto Trust for Historic Preservation
8301 Parklane Rd
Columbia, SC 29223
oldhouse@palmettotrust.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Meeting Agenda

Bad Creek Pumped Storage Project Relicensing
Updated Study Report Meeting

January 16, 2025
9:00 am – 5:00 pm

Wenwood Operations Center
425 Fairforest Way, Greenville, SC 29607

Introduction

- Welcome and Meeting Purpose
- Safety Moment
- Introductions and FERC ILP Schedule Review
- General Project and Relicensing Study Overview

Water Resources

- Task 1: Existing Water Quality Data Report*
- Task 2: Water Quality Monitoring in Whitewater River Arm
- Task 3: Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)*
    - Updated Pumping Results
- Task 4: Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)
- Task 5: Water Quality Management Plan

Break – 15 min

Recreational Resources

- Task 1: Foothills Trail Recreation Use & Needs
- Task 2: Foothills Trail Conditions Assessment
- Task 3: Whitewater River Cove Existing Recreational Use*
- Task 4: Whitewater River Cove Recreational Public Safety Evaluation

Aquatic Resources

- Task 1: Entrainment*
    - (Addendum 1) Updated Pumping Results
    - (Addendum 2) Literature Review
- Task 2: Desktop Studies on Pelagic & Littoral Habitat
- Task 3: Mussel Surveys & Stream Habitat Quality Surveys*

Lunch – 30 min

Environmental Justice*

- Public Outreach Update

Cultural Resources*

- 2024 Surveys

Visual Resources • Tasks 5-9
Additional Bad Creek II Studies and Updates • Small-whorled pogonia survey • Bat surveys
Questions and Additional Discussion
Closing

** Indicates topic was covered during the Initial Study Report meeting; however, study task objectives and main results will be summarized.*

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Wednesday, January 8, 2025 9:21 AM
To: Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Ericah Beason <BeasonE@dnr.sc.gov>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; Boos, Laura - USACE <Laura.M.Boos@usace.army.mil>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Cain, Roger - United Keetoowah Band of Cherokee Indians <rcain@ukb-nsn.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Chief of NEPA Program - USEPA <kajumba.ntale@epa.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Adin T Fell <afell@scprt.com>; tim <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>;

Sara <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; Charles (Rowdy) B Harris <charris@scprt.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kirouac, Justin - Oconee Cty Administrator <jkirouac@oconee.ga.us>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; pmccormack <pmccormack@scprt.com>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Scipio, Isaiah - Mayor, City of Pickens, SC <iscipio@pickenscity.com>; PShirley <PShirley@oconeeco.com>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Stancil, Vann F <vann.stancil@ncwildlife.org>; Chris Starker <cstarker@upstateforever.org>; Stone, Mac - Naturaland Trust <MacStone@naturalandtrust.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Clemsonla <Clemsonla@gmail.com>; Thomas Esq, Elizabeth - K&L Gates LLP <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>
Subject: P-2740 Bad Creek Relicensing – Updated Study Report Filing

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, and expires July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Duke Energy is proposing additional energy storage and generation capacity at the Project, which would be developed by

constructing a new 1,400-MW Bad Creek II Power Complex (Bad Creek II) adjacent to the existing powerhouse.

We are notifying stakeholders of the availability of the next major ILP submittal, the Updated Study Report (USR), which was electronically filed with FERC by Duke Energy on January 3, 2025. The USR describes methods and results of the studies conducted in support of preparing an application for a new license for the existing Project and construction of Bad Creek II. Please note that, due to file size restrictions, the USR transmittal letter is attached to this email. Duke Energy encourages stakeholders to view the entire filing on the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/).

Duke Energy will hold a USR Meeting from 9:00 AM to 5:00 PM (approximately) on Thursday, January 16, 2025, at its Wenwood Operations Center in Greenville, SC. An agenda for the USR Meeting is attached to this email. Duke Energy encourages in-person participation by stakeholders. Please contact me at Alan Stuart (alan.stuart@duke-energy.com) by January 9, 2025, to register for the meeting or to request a Microsoft Teams option to participate.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Regards,
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
526 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

January 9, 2025

Electronically Filed

Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Updated Study Report – Supporting GIS Files

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, and expires July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Federal Energy Regulatory Commission (FERC) Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Pursuant to the ILP, Duke Energy filed the Updated Study Report on January 3, 2025. Duke Energy is hereby providing GIS files for the proposed Project boundary, spoil areas, and surface waters requested by FERC in their comments on the Project's Initial Study Report (filed January 4, 2024), and in support of the Updated Study Report.

Duke Energy looks forward to continuing to work with FERC staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If you have any questions or require additional information, please contact me at Alan.Stuart@duke-energy.com or 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

Duke Energy Corporation
Regulated and Renewable Energy
525 South Tryon Street / Mail Code DEP-35B
Charlotte, NC 28202

January 29, 2025

Electronically Filed

Debbie-Anne A. Reese, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
Updated Study Report Meeting Summary

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (Project) (FERC Project No. 2740), located in Oconee County, South Carolina, approximately eight miles north of Salem. The Project utilizes the Bad Creek Reservoir as the upper reservoir and Lake Jocassee, which is licensed as part of the Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503), as the lower reservoir.

The existing (original) license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 50-year term, with an effective date of August 1, 1977, and expires July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Duke Energy is proposing additional energy storage and generation capacity at the Project, which would be developed by constructing a new 1,400-MW Bad Creek II Power Complex (Bad Creek II) adjacent to the existing powerhouse.

Pursuant to 18 CFR §5.15(f), Duke Energy filed the Updated Study Report (USR) on January 3, 2025. Duke Energy held the USR Meeting with relicensing stakeholders and FERC staff on Thursday, January 16, 2025 from 9am to 4pm at the Duke Energy Wenwood Operations Center in Greenville, SC. The meeting included a virtual (Microsoft Teams) option for remote participants.

Duke Energy hereby files the USR Meeting summary for Commission and relicensing stakeholder review as Attachment 1. The USR Meeting presentation is included as Attachment 2. Duke Energy is filing the USR Meeting summary with the Commission electronically and distributing notification to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing a notification of filing via U.S. mail. Parties interested

in the relicensing process may obtain a copy of the USR Meeting summary electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2]

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://www.badcreekpumpedstorage.com/

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Federal Agency

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426
Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
888 First St, N.E.
Room 101-56
Washington, D.C. 20426

Jeffrey Duncan
Fishery Ecologist and Water Quality Specialist
National Park Service
535 Chestnut St
Ste 207
Chattanooga, TN 37402-4930
jeff_duncan@nps.gov

National Park Service
100 Alabama St S.W.
Ste 1924
Atlanta, GA 30303

Fritz Rohde
Fishery Biologist
NOAA – National Marine Fisheries Service
Habitat Conservation Division
101 Pivers Island Rd
Beaufort, NC 28518-9722
Fritz.rohde@noaa.gov

David Bernhart
NOAA – National Marine Fisheries Service
Southeast Region
263 13th Ave S.
St. Petersburg, FL 33701-5505
david.bernhart@noaa.gov

Southeastern Power Administration
1166 Athens Tech Rd
Elberton, GA 30635-6711

Harold Peterson
National Hydropower Program Coordinator
U.S Bureau of Indian Affairs
609 Demoines Dr
Hermitage, TN 37076
harold.peterson@bia.gov

Leonard Rawlings
U.S Bureau of Indian Affairs, Eastern Regional Office
545 Marriott Dr
Ste 700
Nashville, TN 37214
Leonard.Rawlings@bia.gov

U.S Bureau of Indian Affairs, Office of the Solicitor
1849 C St N.W.
MS6557
Washington, D.C. 20240

Laura Boos
U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919
Laura.M.Boos@usace.army.mil

Brice McKoy
U.S. Army Corps of Engineers
Peter.B.McKoy@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
60 Forsyth St, S.W.
Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Chip Ridgeway
U.S. Army Corps of Engineers
Irvin.C.Ridgeway@usace.army.mil

U.S. Army Corps of Engineers, Office of the Chief of Engineers
20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
william.g.bailey@usace.army.mil

Marvin Griffin
U.S. Army Corps of Engineers, Savannah District
100 W. Olgethorpe Ave
Savannah, GA 31401-3640
marvin.l.griffin@usace.army.mil

U.S. Army Corps of Engineers, Water Management
60 Darlington Ave
Wilmington, NC 28403-1343

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
MS 2430
Washington, D.C. 20240

U.S. Environmental Protection Agency, Region IV
61 Forsyth St S.W.
Atlanta, GA 30303-8931

Chief of the NEPA Program Office
U.S. Environmental Protection Agency, Region IV
kajumba.ntale@epa.gov

Christy Johnson-Hughes
Project Leader
U.S. Fish and Wildlife Service
christy_johnsonhughes@fws.gov

Melanie Olds
SC Ecological Services Field Office, FERC Coordinator
U.S. Fish and Wildlife Service
176 Croghan Spur Rd
Ste 200
Charleston, SC 29407-7558
melanie_olds@fws.gov

U.S. Fish and Wildlife Service
187S Century Blvd N.E.
Ste 400
Atlanta, GA 30345

U.S. Fish and Wildlife Service
1849 C St N.W.
Room 3238
Washington, D.C. 20240

Jen Barnhart
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
jenniferjbarnhart@fs.fed.us

Derrick Miller
Special Uses Program Manager
U.S. Forest Service – Sumter National Forest
112 Andrew Pickens Cir
Mountain Rest, SC 29664
Derrick.Miller@usda.gov

U.S. Forest Service, Nantahala National Forest
160A Zillicoa St
Asheville, NC 28802

U.S. Forest Service, Southern Region
5645 Riggins Mill Rd
Dry Branch, GA 31020

Office of Joe Wilson
U.S. House of Representatives (CD2)
2229 Rayburn House Office Building
Washington, D.C. 20515

Office of Jeff Duncan
U.S. House of Representatives (CD3)
116 Cannon House Office Building
Washington, D.C. 20515

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Office of William Timmons
U.S. House of Representatives (CD4)
1237 Longworth House Office Building
Washington, D.C. 20515

Office of Ralph Norman
U.S. House of Representatives (CD5)
1004 Longworth House Office Building
Washington, D.C. 20515

Office of James E. Clyburn
U.S. House of Representatives (CD6)
2135 Rayburn House Office Building
Washington, D.C. 20515

Office of Russell Fry
U.S. House of Representatives (CD7)
1626 Longworth House Office Building
Washington, D.C. 20515

Office of Lindsey Graham
U.S. Senate
211 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Budd
U.S. Senate
217 Russell Senate Office Building
Washington, D.C. 20510

Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
Washington, D.C. 20510

Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
Washington, D.C. 20510

Van Cato
U.S. Senate, Upstate Regional Office
130 South Main St
Ste 700
Greenville, SC 29601
Van_Cato@lgraham.senate.gov

State Agency

North Carolina Department of Agriculture and Consumer Services
Division of Soil and Water Conservation
1614 Mail Service Center
Raleigh, NC 27699-1614

Andrew Moore
North Carolina Department of Environmental Quality, Division of Water Resources
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211
Andrew.W.Moore@deq.nc.gov

North Carolina Department of Environmental Quality, Division of Land Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
Raleigh, NC 29699-1617

North Carolina Department of Environmental Quality, Office of the Secretary
1601 Mail Service Center
Raleigh, NC 27699-1601

Elizabeth Weese
North Carolina Department of Justice
114 West Edenton St
Raleigh, NC 27602
jweese@ncdoj.gov

Amin Davis
North Carolina Division of Parks and Recreation
1615 Mail Service Center
Raleigh, NC 27699-1615
amin.davis@ncdenr.gov

Mike Clampitt
North Carolina House of Representatives, District 119
300 N. Salisbury Street
Room 633
Raleigh, NC 27603
Mike.Clampitt@ncleg.gov

North Carolina Office of the Governor
20301 Mail Service Center
Raleigh, NC 27699-0301

North Carolina State Environmental Review Clearinghouse
NC Department of Administration
116 West Jones St
Ste 5106
Raleigh, NC 27603

Christine Farrell
Environmental Review Coordinator
North Carolina State Parks
christine.farrell@ncparks.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Brian Strong
North Carolina State Parks
brian.strong@ncparks.gov

North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building, 5th Floor
Raleigh, NC 27603-5918

Vann Stancil
Research Coordinator
North Carolina Wildlife Resource Commission, Habitat Conservation Division
645 Fish Hatchery Rd
Marion, NC 28752
vann.stancil@ncwildlife.org

The Honorable Alan Wilson
Office of the Attorney General of South Carolina
P.O. Box 11549
Columbia, SC 29211

The Honorable Henry McMaster
Office of the Governor of South Carolina
1100 Gervais Street
Columbia, SC 29201

Public Service Commission of South Carolina Office
101 Executive Center Drive
Suite 100
Columbia, SC 29210

Jeffrey Gordon
Energy Planning and Emerging Technology Department
S. C. Office of Regulatory Staff
jgordon@ors.sc.gov

Findlay Salter
Energy Planning and Emerging Technology Department
S. C. Office of Regulatory Staff
fsalter@ors.sc.gov

Morgan Amedee
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
Morgan.Amedee@des.sc.gov

Charles Hightower
Water Quality Standards & Wetlands Section, Manager
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
hightoCW@des.sc.gov

Jennifer Hughes
South Carolina Department of Environmental Services
2600 Bull St
Columbia, SC 29201-1708
hughesjr@des.sc.gov

Erica Beason
State Malacologist
South Carolina Department of Natural Resources
BeasonE@dnr.sc.gov

Shannon Bobertz
South Carolina Department of Natural Resources
326 Little Brooke Lane
West Columbia, SC 29172
bobertzs@dnr.sc.gov

Elizabeth Miller
FERC Coordinator
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
millere@dnr.sc.gov

Lorrianne Riggin
South Carolina Department of Natural Resources
P.O. Box 167
Columbia, SC 29202-0167
rigginl@dnr.sc.gov

Aiden Fell
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29211
afell@scprt.com

Rowdy Harris
South Carolina Department of Parks, Recreation & Tourism
charris@scprt.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kelly Howell
South Carolina Department of Parks, Recreation & Tourism
Khowell@scprt.com

Paul McCormack
Director
South Carolina Department of Parks, Recreation & Tourism
1205 Pendleton St
Columbia, SC 29201
pmccormack@scprt.com

Bill Whitmire
South Carolina House of Representatives (CD1)
P.O. Box 11867
Room 436C
Columbia, SC 29211
billwhitmire@schouse.gov

Adam Duncan
South Carolina House of Representatives (CD2)
208 E. South 3rd Street
Seneca, SC 29678

Phillip Bowers
South Carolina House of Representatives (CD3)
P.O. Box 9
Six Mile, SC 29682

David Hiott
South Carolina House of Representatives (CD4)
P.O. Box 11867
Room 4188
Columbia, SC 29211
davidhiott@schouse.gov

Neal Collins
South Carolina House of Representatives (CD5)
P.O. Box 11867
Room 429
Columbia, SC 29211
nealcollins@schouse.gov

Blake Sanders
South Carolina House of Representatives (CD9)
1 Hindman St.
Pelzer, SC 29669

Thomas Alexander
South Carolina State Senate (District 1)
P.O. Box 142
Room 313
Columbia, SC 29202-0142
thomasalexander@scsenate.gov

Rex Rice
South Carolina State Senate (District 2)
P.O. Box 142
Room 101
Columbia, SC 29202-0142
rexrice@scsenate.gov

Elizabeth Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office, SC Department of Archives & History
8301 Parklane Rd
Columbia, SC 29223
EMJOHNSON@scdah.sc.gov

Andrew Bateman
Acting Executive Director
State of South Carolina, Office of Regulatory Staff
1401 Main Street
Suite 900
Columbia, SC 29201

Local Government

Phillip Shirley
Parks, Recreation & Tourism Director
Oconee County
415 S. Pine St
Wahalla, SC 29691
PShirley@oconeesc.com

Scott Willett
Anderson Regional Joint Water System
swillett@arjwater.com

Maureen Copelof
Mayor
City of Brevard, NC
95 W. Main St
Brevard, NC 28712
maureen.copelof@cityofbrevard.com

Robert Halfacre
City of Clemson, SC
1250 Tiger Blvd
Ste 1
Clemson, SC 29631
Mayor@cityofclemson.org

Isaiah Scipio
Mayor
City of Pickens, SC
219 Pendleton Street
P.O. Box 217
Pickens, SC 29671
iscipio@pickenscity.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Daniel Alexander
Mayor
City of Seneca, SC
P.O. Box 4773
Seneca, SC 29679
dalexander@seneca.sc.us

Bob Faires
City of Seneca, Seneca Light & Water
P.O. Box 4773
Seneca, SC 29676

Tim Hall
City of Walhalla, SC
P.O. Box 1099
Walhalla, SC 29691
thall@cityofwalhalla.com

Jeff Boss
CEO
Greenville Water
P.O. Box 687
Greenville, SC 29602
jboss@greenvillewater.com

Justin Kirouac
County Administrator
Oconee County
jkirouac@oconee.ga.us

Jennifer Adams
Clerk to Council
Oconee County
415 S. Pine St
Walhalla, SC 29691
councilclerkinfo@oconeesc.com

Ken Roper
County Administrator
Pickens County
222 McDaniel Ave
B-10
Pickens, SC 29671
kenr@co.pickens.sc.us

David Gilstrap
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
gilstrap4@gmail.com

Steve Jewsbury
Pickens County Water Authority
222 McDaniel Ave
8-1
Pickens, SC 29671
sjewsburyjr@bellsouth.net

Lynn Towe
Mayor
Town of Salem
5A Park Ave
Salem, SC 29676

Jamie Laughter
County Manager
Transylvania County, NC
21 East Main St
Brevard, NC 28712
jaime.laughter@transylvaniacounty.org

Tribes

Wenonah Haire Caitlyn Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd
Rock Hill, SC 29730
wenonah.haire@catawba.com

William Harris
Chief
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
22361 Bald Hill Road
Tahlequah, OK 74464
elizabeth-toombs@cherokee.org

Chief Richard Sneed
Eastern Band of Cherokee Indians
88 Council House Loop Rd
Cherokee, NC 28719
ashlstep@nc-cherokee.com

Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians, Qualla Boundary
P.O. Box 455
Cherokee, NC 28719
syerka@nc-cherokee.com

David Hill
Principal Chief
Muscogee (Creek) Nation
1007 East Eufaula St.
Okmulgee, OK 74447
dhill@mcn-nsn.gov

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Turner Hunt
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, OK 74447
thunt@muscogeenation.com

Roger Cain
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians
P.O Box 746
Tahlequah, OK 74465
rcain@ukb-nsn.gov

Non-Governmental

Terry Keene
Advocates for Quality Development (AQD)
jtk7140@me.com

Sue Williams
Advocates for Quality Development (AQD)
suewilliams130@gmail.com

Gary Owens
President
Advocates for Quality Development, Inc.
P.O . Box 802
Seneca, SC 29679
growens@gmail.com

Peter Raabe
Southeast Regional Director
American Rivers
Praabe@americanrivers.org

Kevin Colburn
National Stewardship Director
American Whitewater
2725 Highland Dr
Missoula, Montana 59802
kevin@americanwhitewater.org

Jeff Lineberger
Duke Energy
jeff.lineberger@duke-energy.com

Garry Rice
Duke Energy
4720 Piedmont Row Dr
Mail Code PNG04C
Charlotte, NC 28210
garry.rice@duke-energy.com

Alan Stuart
Duke Energy
alan.stuart@duke-energy.com

Phil Mitchell
Fishers Knob Homeowners Group
lputnammitchell@gmail.com

Don Taylor
Fishers Knob Homeowners Group
Clemsonla@gmail.com

Heyward Douglas
Executive Director
Foothills Trail Conservancy
heyward69@gmail.com

Andrew Gleason
Foothills Trail Conservancy
andrewandwilla@hotmail.com

Glenn Hilliard
Foothills Trail Conservancy
glenn@hilliardgrp.com

Bill Ranson
Foothills Trail Conservancy
bill.ranson@retiree.furman.edu

John Hains
Friends of Lake Keowee Society
jhains@g.clemson.edu

Dale Wilde
President
Friends of Lake Keowee Society
1201 N Fant Street
Anderson, SC 29672
dwilde@keoweefolks.org

Sarah Kulpa
Senior Regulatory Specialist
HDR
440 S. Church St
Ste 1200
Charlotte, NC 28202
Sarah.Kulpa@hdrinc.com

Jocassee Outdoor Center
516 Jocassee Lake Rd
Salem, NC 29676
fun@jocasseeoutdooreenter.com

Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Elizabeth Thomas Esq.
K&L Gates LLP
925 Fourth Ave
Ste 2900
Seattle, WA 98104
liz.Thomas@klGates.com

Tyler Reeves
Regional Director
National Wild Turkey Federation
treeves@nwtf.net

Wes Cooler
Trustee
Naturaland Trust
wes.cooler@mac.com

Mac Stone
Executive Director
Naturaland Trust
MacStone@naturalandtrust.org

Dale Threatt-Taylor
Chief of Staff
Nature Conservancy
1417 Stuart Engals Blvd
Mount Pleasant, SC 29464
d.threatttaylor@tnc.org

Tim Gestwicki
Executive Director
North Carolina Wildlife Federation
2155 McClintock Rd
Charlotte, NC 28205
tim@ncwf.org

Annie Caggiano
President
Oconee Economic Alliance
528 Bypass 123
Ste G
Seneca, SC 29678
acaggiano@oconeesc.com

Joanna Rothell
Preservation South Carolina
1109 Broad Street, Suite 2H
Camden, SC 29020
joanna@preservesc.org

Andy Douglas
S.C. Wildlife Federation
adoug41@att.net

Sara Green
Executive Director
South Carolina Wildlife Federation
sara@scwf.org

Bob King
Chapter President
Trout Unlimited, Chattooga River Chapter
40 Quartermaster Dr
Salem, SC 29676

Erika Hollis
Upstate Forever
507 Pettigru St
Greenville, SC 29601
ehollis@upstateforever.org

Chris Starker
Upstate Forever
507 Pettigru St
Greenville, SC 29601
cstarker@upstateforever.org

Mike Case
mgcase@icloud.com

Michael Corney
Mike_corney@yahoo.com

Steve Corney
Steve@corney.org

Mark Cotton
mark@cottonrealestate.com

Simeon Ramsden
CEO Kipling Ventures
simeon@kiplingventures.com

Kathy Rhodes
P.O. Box 325
Seneca, SC 29679

Angela Shadwick
P.O. Box 325
Seneca, SC 29679

Attachment 1

Bad Creek Pumped Storage Project - Updated Study Report Meeting Summary

Meeting Summary

Project:	Bad Creek Pumped Storage Project Relicensing (FERC Project No. 2740)
Subject:	Updated Study Report Meeting
Date:	Thursday, January 16, 2025
Location:	Duke Energy Wenwood Operations Center, 425 Fairforest Way, Greenville, South Carolina and Teams Meeting (virtual option)

In-person Attendees

Alan Stuart (Duke Energy)
Christy Churchill (Duke Energy)
Scott Fletcher (Duke Energy)
Nick Wahl (Duke Energy)
Mike Abney (Duke Energy)
Maverick Raber (Duke Energy)
Ethan Pardue (Duke Energy)
Garry Rice (Duke Energy)
Sarah Santos (Duke Energy)
Mills Dorn (Terracon)
Kelly Kirven (Kleinschmidt Assoc)
Jeremy Wimpey (Applied Trails)
Sarah Kulpa (HDR)
Ty Ziegler (HDR)
Jen Huff (HDR)
Kerry McCarney-Castle (HDR)
Kelly Thames (HDR)
Maggie Salazar (HDR)
Jennifer Gut (Kleinschmidt Assoc)
Sarah Salazar (FERC)
David Gandy (FERC)
Prabha Madduri (FERC)
Catherine Roberts (FERC)
Erika Hollis (Upstate Forever)
Sue Williams (AQD)
Wes Cooler (Naturaland Trust)
Glenn Hilliard (Foothills Trail Conservancy)
Rowdy Harris (SCPRT)
Jeffrey Phillips (Greenville Water)
Elizabeth Miller (SCDNR)
Shannon Hammond (USFS)
Derrick Miller (USFS)
Andy Douglas (SC Wildlife Federation/ Jocassee Lake Tours)

Virtual Attendees

Harold Peterson (Bureau of Indian Affairs)
Dale Wilde (FOLKS)
David Todd (City of Brevard)
Andrew Gleason (FTC)
Kelly Shaeffer (KA)
Melanie Olds (USFWS)
Wenonah Haire (Catawba Indian Nation)
Terri Russ (Terracon)
Erin Settevendemio (HDR)
John Hains (FOLKS)
Allan Creamer (FERC)
Angelle Greer (USACE)
Chip Ridgeway (USACE)

Introduction (9:00 am)

The Bad Creek Pumped Storage Project (Bad Creek or the Project) Updated Study Report (USR) was filed with the Federal Energy Regulatory Commission (FERC) on January 3, 2025 – this meeting is being held to discuss the individual studies and findings from the second year of relicensing studies and receive feedback from relicensing participants/stakeholders as well as the Federal Energy Regulatory Commission (FERC) under the Integrated Licensing Process (ILP) 18 CFR §5.15.

Alan Stuart (Duke Energy Project Manager) opened the meeting, welcomed participants in the room and online, provided an overview on meeting facility layout and emergency action responsibilities, shared the agenda, facilitated participant introductions, and provided a safety moment (fire safety).

A. Stuart noted Duke Energy is beginning the third year of the relicensing process for Bad Creek and shared the milestone schedule, indicating the Draft License Application (DLA) must be filed by March 3rd (Duke Energy will likely file in late February) and the 90-day stakeholder comment period will be triggered by that filing.

Duke Energy has recently reached settlement with Bad Creek relicensing participants and the signing ceremony for the Bad Creek Relicensing Agreement will be held next week.

Expanded Project Boundary

A. Stuart presented a slide showing the proposed expanded Project Boundary for the proposed Bad Creek II Power Complex (Bad Creek II). The addition of Bad Creek II will double the existing capacity at the Project and use the existing upper (Bad Creek) and lower (Lake Jocassee) reservoirs. The proposed underground powerhouse will be constructed with two tunnels to maintain operability during single unit outages (the current Project only has one tunnel). He also noted the new powerhouse will have variable speed units allowing for greater operational flexibility. The FERC Project Boundary is proposed for expansion by approximately 467 acres to enclose land necessary for construction and operation of the new facilities, lands that could potentially be affected by spoil placement from materials excavated for Bad Creek II, and the wider transmission corridor for the new 525-kv transmission line. (All lands within the expanded Project Boundary are owned by Duke Energy.)

Additional Spoil Areas

A. Stuart showed a figure of potential spoil areas for the approximately 4.4 million cubic yards of earth and rock that will be excavated for Bad Creek II. Duke Energy is currently evaluating which upland spoil areas to use for Bad Creek II based on natural resources studies and minimizing environmental impacts as practicable, noting not all spoil locations will be used. Duke Energy proposes to spoil rock materials from the underground powerhouse and tunnel excavations in Lake Jocassee (by expanding the original weir in the downstream direction), and materials from the upper reservoir inlet/outlet construction in dead storage/deep quarry areas within Bad Creek Reservoir, to reduce the volume of materials to be spoiled in upland locations. Spoil area evaluation is on-going in association with development of the Clean Water Act (CWA) Section 404/401 Application.

A. Stuart showed a slide listing the six FERC-approved ILP studies, noted all relicensing studies are now complete, and handed the presentation over to the resource study presenters. He noted that studies discussed during the ISR meeting will not be covered again during this meeting, however, Duke Energy is happy to take questions and/or discuss these studies further if requested.

Water Resources

Task 1 – Existing Summary of Water Quality Data and Standards

Maverick Raber presented a summary slide of objectives and key results of Task 1. The final Task 1 report was filed with the ISR and discussed during the ISR meeting.

- No comments/questions or discussion.

Task 2 – Water Quality Monitoring in the Whitewater River arm

M. Raber presented an overview of objectives, methods, and results of Task 2. Results of the first year (Study Year 1; 2023) were discussed during the ISR meeting and documented in the ISR. The final report including results of Study Years 1 and 2 (2023 and 2024) was filed with the USR. M. Raber provided an updated overview of field methods, monitoring locations, and monitoring dates, and compared water quality data (temperature and dissolved oxygen [DO]) between the two study years. [The project operated with three units in 2023 and four units in 2024.] Vertical profile data (temp and DO) shows mixing in the water column at the upstream monitoring location near the lower inlet/outlet (I/O) structure due to Project operations and tributary inflow while the monitoring location downstream of the weir shows well-defined stratification, demonstrating the weir is performing as designed and dissipating energy as water flows over the weir (i.e., vertical mixing is limited to area upstream of the weir). There were no significant differences between Study Year 1 and Study Year 2 data; data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios, consistent with historical water quality monitoring and recent computational fluid dynamics (CFD) modelling (further discussed in Task 3).

- Andy Douglas noted data (shown on Slides 26-28) indicate water level in Lake Jocassee was drawn down immediately prior to Hurricane Helene and that overall, significant lowering of the reservoir followed by a large amount of precipitation didn't seem to have much of a prolonged effect on Lake Jocassee or mixing. M. Raber agreed the Bad Creek / Lake Jocassee system is very unique and even with such a large storm, there wasn't the degree of mixing / effects one might expect in other southeastern reservoirs (i.e., in a larger watershed).

Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee due to a Second Powerhouse

Ty Ziegler presented a summary of updated modeling results for Task 3. The study was completed and filed in the ISR; however, due to the addition of variable speed units at Bad Creek II proposed after the ISR filing, additional CFD runs were made to evaluate the increase in pumping flow. Flows under generation were not significantly changed, therefore, generating operations were not modeled again.

T. Ziegler shared a rendering of the location of the proposed lower reservoir I/O structure in Lake Jocassee adjacent to the existing I/O structure and figures comparing existing vs. proposed cross-section velocities in the Whitewater River cove under pumping during full pond

and minimum pond. Lake Jocassee has never fallen to minimum pond, therefore, modeling minimum pond conditions is a hypothetical (conservative) scenario, particularly since the Keowee-Toxaway Low Inflow Protocol (which went into effect in 2014) reduces the chance of Lake Jocassee reaching minimum pond.

With Bad Creek II operation at Lake Jocassee minimum pond, surface velocities under maximum pumping could reach 10 feet per second (fps) in the recessed area of shoreline immediate downstream of the Bad Creek II lower I/O structure. However, under minimum pond conditions, Whitewater River cove just upstream of the I/O would be largely dewatered because the lakebed elevations in that area are higher than 1,080 feet above mean sea level.

The original conclusions of Task 1 are still valid and even with increased pumping capacity with variable speed units (increased flows), flow patterns are similar compared to original findings. Because surface velocities could reach 10 fps near the proposed I/O structures (only under maximum drawdown), Duke Energy would implement a safety plan to restrict boating, however, under minimum pond (which has never been reached), there likely would not be sufficient water depth for boating in upper Whitewater River cove and Duke Energy likely would not operate at full operational capacity. Lake Jocassee's lowest elevation recorded is 1,081 feet above mean sea level, which was during the severe drought conditions in 2007.

- Elizabeth Miller asked about the modeled increased velocities at the proposed I/O structure and if this information will serve to inform/modify Project operations, i.e., if higher velocities at lower lake elevations change the dispatch order of Bad Creek vs. Bad Creek II units.
    - A. Stuart said it is anticipated Bad Creek II powerhouse will be the primary powerhouse (i.e., higher in the dispatch order) due to the flexibility of the variable speed units, under all elevations, unless there are efficiency losses or other operational issues that would disproportionally affect Bad Creek II as compared to the existing powerhouse.

- E. Miller asked if Duke Energy would consider using Bad Creek instead of Bad Creek II to decrease the potential for fish entrainment at the Bad Creek II I/O structure.
    - A. Stuart responded that isn't likely due to the proposed dispatch order, however, and as contemplated in the relicensing agreement, Duke Energy is willing to further coordinate with SCDNR when Lake Jocassee pond levels drop to critical levels as specified in the relicensing agreement.

- Jeremy Wimpey and Derrick Miller asked about impacts of increased velocities on paddling and where paddlers might relocate to during lower levels at Lake Jocassee.
    - Kelly Kirven noted that potential effects of increased surface velocities to recreational boating and paddling will be discussed later during the Recreational Resources Study presentation.

- Wes Cooler stated there is likely sediment accumulation near the proposed Bad Creek II Lake Jocassee I/O structure. He asked if Duke Energy plans to expand, deepen, or

widen this area by dredging. Additionally, over the next 50 years, there will be more development in the Whitewater River watershed, which will contribute more sediment to the Whitewater River cove. Are there plans to address this?

- T. Ziegler noted that since minimum pond has never been reached, this isn't anticipated to be a problem, therefore, Duke Energy currently has no plans to widen or deepen the upstream extent of Whitewater River cove but would obviously revisit the situation if it becomes an operational problem in the future. He also noted that with implementation of the Low Inflow Protocol, Lake Jocassee is required to release less water than under historic conditions to help maintain Lake Keowee elevations and required downstream flow releases to the U.S. Army Corps (USACE) reservoirs. In addition, Lake Keowee also has more usable storage due to modifications at Oconee Nuclear Station further reducing reliance on water stored in Lake Jocassee to support Lake Keowee elevations during periods of low Project inflows.

- A. Douglas noted dead trees / branches coming down the Whitewater River waterfall could be more of an issue than sediment, as the watershed is developed.
  - M. Raber stated most of the cove is rock outcrop and the watershed is very small. It is unknown how much development will occur in the future; however, exposed soil horizons/ soil erosion is largely limited.

- A. Douglas asked if Jocassee can pull water from Keowee. T. Ziegler responded yes.

- Sarah Salazar asked about the potential for erosion along the opposite bank of the Whitewater River cove (from the Bad Creek lower I/O) in association with generation flows.
  - T. Ziegler explained full CFD model results for generation (and pumping) are documented in the ISR. The potential for erosion is one of the main reasons for development of the original CFD model. A main conclusion of the original CFD model is that due to the prevalence of bedrock in the cove, erosion was found to not be a concern, even with increased discharge with both powerhouses generating. [Note: Findings from the relicensing CFD study are included in the ISR and the initial feasibility CFD modeling study (which includes more detail about erosion and flows immediately downstream from the I/O structure) were filed in Appendix I of the Proposed Study Plan.] M. Raber also added the submerged weir helps to dissipate energy as it discharges from the facility and flows over the weir. K. McCarney-Castle added generation scenarios are covered in the ISR however, K. Kirven of Kleinschmidt will be sharing slides during the Recreation Study presentation showing proposed generation conditions for surface flows.

- John Hains (via chat): What is the maximum possible drawdown for Jocassee?

    - Mike Abney replied the maximum licensed drawdown limit is 30 ft. Under unprecedented drought, it could conceivably go lower under a variance from FERC.
- J. Hains (via chat): What is the elevation of Lake Jocassee at its lowest point? Is that the bottom of the intake structure opening or the emergency gates?
    - M. Abney responded that the Bad Creek intake is around 38 feet deep; however, there is a point where the units can't operate efficiently and would have to shut down. M. Abney added that he did not recall the elevations for Jocassee intakes offhand, but that Duke Energy would not operate the Jocassee spillway gates in a drought. (*As additional information not discussed during the USR Meeting, the openings of the Jocassee intake towers extend from El. 1,067 ft to El. 1,043 ft*).

Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS modeling)

T. Ziegler presented an overview of objectives, results, and methods for Task 4. Task 4 was carried out to identify and evaluate effects to Lake Jocassee reservoir elevations as well as effects to Lake Keowee and downstream projects resulting from operation of Bad Creek II. T. Ziegler explained the scenarios used (baseline vs. alternative), operational effects of the scenarios (including rate of change, Low Inflow Protocol stages, and releases between reservoirs), and the hydrology dataset/climate change sensitivities.

Generally, there would be minimal effects to Lake Jocassee reservoir elevation ranges resulting from Bad Creek II operations with smaller fluctuations over a 24-hour period of Lake Jocassee surface elevations. Only minimal effects were identified at Lake Keowee, the downstream USACE reservoirs, and Savanah River flows.

- J. Hains (via chat message) – At present Richard B. Russell is not allowed to pump back during the day. If that changed, how would it affect the model outcome?
    - T. Ziegler noted the CHEOPS model accounts for operating logic at Richard B. Russell so if that logic changed, there is a tool to evaluate that effect.
    - However, changes in Richard B. Russell operations likely would not affect Duke Energy facilities since Lake Hartwell is between Richard B. Russell and Keowee Hydro[1] and would buffer operational effects from Richard B. Russell.

Task 5 – Future Water Quality Monitoring Plan

T. Ziegler presented objectives for the Bad Creek II Water Quality Monitoring Plan (WQMP) and indicated that this plan will only be implemented if Bad Creek II is constructed. The plan includes two sections addressing measures for (1) Lake Jocassee and (2) upland areas (streams).

[1] The 2014 Operating Agreement between the Army Corps, SEPA, and Duke Energy considers remaining usable storage in the entire USACE system; moving water from Richard B. Russell to Hartwell would not result in a change at Richard B. Russell.

For Lake Jocassee, the main impact during construction will be sediment loading due to construction activities (i.e., submerged weir expansion and lower I/O construction) as well as overland runoff from disturbed uplands. Therefore, turbidity monitoring in Whitewater River cove during and after construction is proposed to support compliance with South Carolina Department of Environmental Services (SCDES) surface water quality standards. Other water quality parameters will also be measured (temp, DO, pH) to monitor overall conditions. Monitoring will include daily surface measurements during construction and for one year following commencement of Bad Creek II operations. The compliance point location for turbidity monitoring will be a new water quality station at the mouth of the Whitewater River cove. A boat barrier is also proposed at that location to exclude boaters from Whitewater River cove during construction due to safety concerns. The turbidity compliance threshold will be based on SCDES guidance for water quality excursions, and consultation with SCDES will be required if more than 10% of turbidity readings over a 30-day rolling period exceed the compliance threshold and the source of elevated turbidity cannot be traced to a rain event (i.e., turbidity exceedances must be tied to construction activity to initiate consultation). Historic monitoring data have shown that large rain events have caused temporary natural spikes in turbidity in the Whitewater River cove; when exceedances are attributed to rain events, the exceedance and precipitation data (from nearest weather station) will be documented and included in an annual report.

- E. Miller asked if there has ever been elevated turbidity that lasted for 30 days.
    - T. Ziegler responded no and clarified the exceedance is not for 30 consecutive days but instead would be triggered when more than 10% of the data points collected over a rolling 30-day period (i.e., three days) exceed the compliance level. Based on historic data, turbidity was elevated many times in the record due to natural events (rainfall runoff) prior to Project construction.

T. Ziegler noted Duke Energy is requesting a temporary variance for turbidity in Whitewater River cove (at the proposed compliance point) since the proposed impact is temporary in nature and will affect a very small area relative to the size of Lake Jocassee. That is, a large turbidity refugia exists that sensitive species could move into if needed, as 98% of the lake (with similar habitat to Whitewater River cove) is available as turbidity refugia. Because Lake Jocassee is considered trout waters, the current state standard for turbidity is 10 NTU; however, Duke Energy is requesting a temporary variance of 25 NTU, which is in alignment with SCDES freshwater lake standards and is considered the upper limit for some sensitive species based on literature review. The variance would only be in effect during Bad Creek II construction and would allow Duke Energy to construct the new facility while maintaining compliance with state regulations, a key goal of Duke Energy.

- A. Douglas asked if the compliance triggers / turbidity events would impact the stocking of trout and if there would be consultation with the agencies? E. Miller noted historically SCDNR doesn't stock in the Whitewater River cove. A. Douglas asked if fish are typically stocked in the winter. Rowdy Harris added that stocking at Jocassee at the Devils Fork State Park ramps is typically done in December.

- Erika Hollis asked if Duke Energy will modify construction if impacts to fish are observed. A. Stuart stated that mitigation for any impacts would be determined in consultation with the agencies under the WQMP and that Duke Energy would work to meet the regulatory limits set forth in permits. T. Ziegler noted consultation would take place if there is an exceedance of 10% of the data over a rolling 30 days and determination of the cause would be communicated to SCDES.

T. Ziegler introduced the second part of the WQMP which addresses upland streams that could be impacted by spoil areas and construction activities. Stream surveys at these locations would capture stream conditions downstream of construction BMPs and surveys will be carried out prior to and following construction.

- E. Miller asked what areas associated with spoil areas are subject to BMPs (noting the wording on the slide could indicate otherwise)
    - Ty confirmed spoil areas will have BMPs required under the construction NPDES permitting. Specific BMP measures and locations are yet to be determined.

- J. Hains (via chat) requested an explanation of H1 and H2 spoil areas in Bad Creek Reservoir.
    - S. Kulpa noted the 2018 Google Earth image shows Bad Creek reservoir drawn down which is helpful to see the bathymetry of the area; H1 and H2 are the deepest portions of the reservoir and were previously used as quarries. Adding excavated material to these areas does not decrease available usable storage for Bad Creek Project operations.

- J. Hains (via chat) asked if there would be a chemical analysis of the turbid material.
    - M. Abney noted that is not part of the WQMP.
    - J. Hains followed up by asking if there would be an effort to evaluate the cause of the turbidity and the nature of the material.
    - M. Raber indicated water is exchanged directly between Bad Creek Reservoir and the Whitewater River cove, therefore conditions in Whitewater River cove are reflective of Bad Creek Reservoir.
    - E. Miller restated her understanding that (turbidity) impacts related to fill of H1 and H2 would be reflected downstream in the Whitewater River cove through turbidity monitoring. T. Ziegler confirmed.

- E. Miller asked if spoil would be placed in H1 and H2 in the wet or during a drawdown.
    - A. Stuart and S. Kulpa responded that fill work in Bad Creek Reservoir would be done during an outage drawdown, noting it would be done primarily via truck hauling or earth moving.

- E. Miller asked if a construction sequence or schedule could be provided. J. Huff noted that this is forthcoming in the DLA but that this information is preliminary.

- Dale Wilde (via chat) asked if there are existing haul routes to the proposed spoil areas.
    - Jen Huff responded there are some existing routes and some spoil areas are more easily accessible than others. K. Thames noted final access roads to be developed will be contingent on spoil pile selection.

Break (11:15-11:30am)

Recreational Resources (11:33am)

Task 1 – Foothills Trail Recreation Use and Needs

Kelly Kirven gave an overview of the objectives, methods, and preliminary results of Task 1 of the Recreational Resources Study. The goals of the RUN Study were to assess current recreation use and identify any future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy.

Results indicated highest uses were Table Rock State Park, Sassafras Mountain, Bad Creek Hydro, and Toxaway River. Parking areas are well-used and Laurel Valley parking can be over capacity at times. Hiking and backpacking are the most popular activities and respondents in the user survey reported very good/good quality of facilities and hiking/ trail experience. The increase in future population demand (16.8% by 2035) is not expected to affect Duke Energy's ability to accommodate demand. During Bad Creek II construction, Duke Energy will close Bad Creek Hydro Access Area and Musterground Road entrance (for up to an estimated 7 years).

J. Wimpey reviewed the results of the Carrying Capacity Analysis, which indicated users' camping experiences were favorable, as they expected, and there is plenty of capacity along the trail.

Future needs for consideration include:

- Parking at Laurel Valley Access
- Increased trail maintenance
- Gradual replacement of existing infrastructure with sustainable materials
- Improved and additional trail markers and signage
- Improved and/or repaired bridges (smaller, non-engineered bridges)
- Increased removal of downed trees
- Additional and improved restroom facilities and bear cables

Task 2 – Foothills Trail Conditions Assessment

K. Kirven described the objectives, methods, and results of Task 2 of the Recreational Resources Study. The Foothills Trail (FHT) conditions assessment was performed by Long Cane Trails (LCT). LCT identified 89 areas needing maintenance or improvement within the study area. During consultation, the FTC identified an additional 30 areas for maintenance or

improvement. After reviewing data in the ISR, Recreation Resources Committee members requested additional information about four areas which was provided in a subsequent technical memo. Maintenance items identified during the conditions assessment and requested by the relicensing resource committee will be addressed prior to new license issuance.

- D. Wilde (via chat) asked if it should be noted the trail was heavily damaged by Hurricane Helene and is still closed to hikers.
    - K. Kirven noted there was damage from Hurricane Helene. LCT conducted a site visit to some areas in October after Hurricane Helene. K. Kirven shared a slide describing damage and noted that Duke Energy and FTC were working to repair and reopen the trail as soon as possible.

Task 3 – Whitewater River Cove Existing Recreational Use

K. Kirven described the objectives, methods, and results of Task 3 of the Recreational Resources Study. This study task was covered during the ISR meeting and therefore was not covered in depth.

Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

K. Kirven described the objectives and methods of Task 4 of the Recreational Resources Study. This study incorporates the findings from Task 3 of the Water Resources Study and Task 3 of the Recreational Resources study.

- E. Miller asked if there will be any signage discouraging swimming. K. Kirven noted this could be considered.

- A. Douglas asked about the signs and the location for the potential boat barrier to exclude boaters from the I/O structure during drawdown. A. Stuart responded that while exact locations have not been decided, the proposed barrier excluding access to the I/O structure will be parallel to the shoreline as opposed to the barrier that would block entry to the Whitewater River cove during construction. A. Douglas noted that information is helpful and that people will still be able to navigate a boat up the right side (looking upstream) of the cove to see the waterfalls.

- S. Salazar asked if the cove is dewatered, would that affect the weir if the crest of the weir is raised during expansion. A. Stuart responded the crest elevation will remain the same elevation; Duke Energy would expand the weir in the downstream direction only.

- E. Miller asked if there is a figure showing what it would look like if the Whitewater River cove is dewatered (i.e., minimum pond). Kelly reiterated the entire cove wouldn't be dewatered at minimum pond, and revisited the bathymetry slide in the CFD section showing the area just upstream of the I/O structure.

- J. Hains (via chat): When it mentions exclusion adjacent to the I/O, what kind of distances are we talking about? Duke Energy responded (via chat) that would leave a navigation corridor of approximately 400 feet.

Lunch Break

Aquatic Resources

M. Abney introduced the Aquatic Resources Study and provided the tasks under the study.

Task 1 - Entrainment

M. Abney summarized the two addenda developed following submittal of the final Entrainment Study in the ISR. The two addenda are included in the USR. Both were developed in response to FERC comments on the ISR. The first report addresses additional pumping flows resulting from updated hydraulic pumping capacities and the second incorporates a literature review for threadfin shad and blueback herring.

- No comments/questions or discussion.

Task 2 – Desktop Studies on Pelagic and Littoral Habitat

M. Abney presented an overview of the objectives, methods, and results of Task 2 of the Aquatic Resources Study. The objectives were to assess changes to (1) pelagic and (2) littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and Keowee-Toxaway Hydroelectric Project relicensing.

Bad Creek II operations will **not** result in impacts to spawning success or littoral zone habitat as compared to the Baseline scenario and some conditions (e.g., spawning success) may improve with the addition of Bad Creek II operations. Lake Jocassee water surface is between 1,104 feet msl and 1,109 feet msl 90% of the time under both the Baseline and Bad Creek II scenarios. This range encompasses the “high” littoral zone habitat scenario in the CHEOPS model and maintains 98.4 to 98.5% of littoral habitat, therefore, no impacts to littoral habitat resulting from proposed Project operations are expected**.**

- No comments/questions or discussion.

Task 3 – Mussel Surveys and Stream Habitat Quality Surveys

M. Abney presented an overview of the objectives of Task 3. The results were covered in the ISR, therefore, only additional consultation with the SCDNR since the time of ISR filing was summarized.

- No comments/questions or discussion.

Environmental Justice

Jenn Gut revisited objectives and results of the Environmental Justice (EJ) study, which was completed for the ISR, and the final report was filed with the ISR. In their comments on the ISR, FERC staff asked for Duke Energy to conduct public outreach to EJ communities identified during the study. A community outreach plan was developed, and two town-hall style public meetings were held in two different counties of the identified EJ communities (one in the morning, one in the evening). Organizations playing a role in supporting members of EJ communities were contacted no less than least three times prior to the meeting to disseminate information to the communities about the meetings. A pamphlet was developed and distributed to organizations and also placed on Duke Energy's public website (in English and Spanish). The distance between the two meeting locations was approximately 20 miles, therefore, both meetings were open to either EJ communities. There were no attendees from EJ communities at either meeting. There were two host-facility representatives for one meeting, who indicated to Duke Energy that little to no participation from communities is not unusual.

- No comments/questions or discussion.

Cultural Resources

Christy Churchill provided an overview of the objectives and results of the Cultural Resources Study. The Cultural Resources study methods and study results were discussed during the ISR meeting; however, more recent (2024) surveys were conducted to accommodate the expanded Area of Potential Effect (APE) (expanded to encompass construction activities and transmission corridor widening). An addendum was developed to document results of the additional Phase I survey for these new areas. No new archaeological sites were located and the addendum was filed with the USR. Concurrence for the expanded APE has been received from the South Carolina State Historic Preservation Office (SHPO) and Catawba Indian Nation, and the addendum report was distributed to the consulting parties as well.

- No comments/questions or discussion.

Visual Resources

J. Huff described the objectives, methods, and preliminary results of the Visual Resources Study; she gave a brief introduction of the nine tasks under the study. Tasks 1, 2, and 3 were covered under the ISR. Results under tasks 4-9 include results of the key views selection, existing visual quality assessment, visual analysis, visual management consistency review, mitigation assessment and conceptual design of Bad Creek II.

- S. Salazar asked about the relocation of the wastewater treatment plant and if the existing settling ponds that need to be relocated (based on tour of Bad Creek facility previous day) were considered in the Visual Resources analysis.
    - A. Stuart stated the settling ponds were not included in the analysis as the design was not performed early enough; however, the settling pond relocation areas are

determined to be in impacted areas; the new “package plant” being evaluated by Duke Energy would likely be located between the lower reservoir I/O structures.

- E. Miller asked what kind of assessment scale was used for visual quality (e.g., to make the distinction between low and moderate).
    - J. Huff responded the sub-consultant who performed this task (Land Planning Development Associates, now Kimley-Horn) used the U.S. Forest Service (USFS) visual management system. E. Miller asked about Key View 7 (Oscar Wiggington) and its classification. J. Huff responded it is ranked as very high. E. Miller noted the transmission line seems to dominate the view / draw the eye. W. Cooler added views of the transmission line corridor would depend on what time of year and if it’s been herbicide treated or cleared recently creating a contrast with the existing vegetation. J. Huff noted it also depends on time of day, noting the Oscar Wiggington overlook is not heavily visited during leaf-off seasons. J. Huff added that the dominant view is of the lake and surrounding vegetated landscape. While the transmission line is visible, it does not dominate the view.

- S. Salazar asked if the existing access to the Foothills Trail is open 24 hours and if visitors would go there at night. J. Huff noted night visits will not be allowed during construction. The Foothills Trail potential key observation view was eliminated during field work because you cannot see anything except the vegetation surrounding the trail. However, someone could possibly use the trail at night - a hiker coming off the trail late or hunters going in before dawn. S. Salazar asked if after the new switchyard is constructed, there will need to be a new place for the trail access. J. Huff responded the parking lot will be reconfigured because the road that goes to the current operations area will be reconfigured and the existing kiosk at Musterground Road would be moved. S. Salazar asked if the parking and lighting would be the same. A. Stuart responded yes, there would be no net loss of parking capacity; it would be moved but no amenities changed.

- D. Miller noted Duke Energy owns the transmission line corridor in fee simple title.

Small Whorled Pogonia

Scott Fletcher presented an overview of the objectives, methods, and findings of the small whorled pogonia (SWP) survey. There will be a SWP species protection plan in the license application and evaluated in the Biological Assessment. SWP habitat exists throughout the Project Area, however, no species occurrences were identified during the extensive survey or previous general natural resource assessments.

- S. Salazar asked if evidence of feral hog activity was observed during the survey. S. Fletcher responded there is a large population of feral hogs in the area. S. Salazar asked if the species protection plan would include excluding feral hogs. K. Kirven mentioned there is hog hunting within the Wildlife Management Area (WMA). D. Miller added the USFS is trying to reduce sounders (family groups of wild hogs) in the area;

however, the population is very difficult to manage. S. Fletcher noted that if a sensitive species were detected exclusion measures could potentially be considered for select areas, but that any type of broader measures would not be practical.

Bat Survey

S. Fletcher presented the objectives, methods, and findings of the bat survey. Of note in the discussion and not emphasized on the slides, Biotope was retained by Duke Energy to conduct the study. Biotope determined the Indiana Bat is likely not present based on acoustic calls. USFWS reviewed the acoustic data, and their findings aligned with Biotope's with the exception of Indiana bat, which the USFWS concluded should tentatively be presumed present in the Project area. Duke Energy will note USFWS' findings and will further discuss species in the Applicant-Prepared Biological Assessment and License Application, as well as the species protection plan.

- S. Salazar asked USFWS (Melanie Olds) for confirmation regarding the final bat guidance, noting that FERC received notification on October 23, 2024, that USFWS released final guidance tools for projects that may impact northern long-eared bat (NLEB)[2]; however, is unsure how this guidance differs from the April 2024 guidelines and if the October guidance is the appropriate guidance to use. M. Olds stated the seasonal data from the October report for hibernation range are appropriate for the Project. S. Salazar asked what the main changes are between the April 2024 guidance and the final October 2024 guidance. M. Olds noted there were no major changes in content; the October final guidance was revised slightly to clarify certain topics (based on review comments) but no substantive changes were introduced (e.g., acreages between NLEB and tricolored bat were put into one table to make clear; summer occupancy window was also clarified as well as year-round active range). Year-round active range doesn't apply to Bad Creek because the facility is in the hibernating range, which was confirmed with USFWS.

- M. Olds confirmed Bad Creek is not within range of any known hibernaculum. S. Fletcher added Duke Energy also checked the tunnel access portal and rock shelter documented during the bat survey period and found no evidence of bat use. Powerhouse access portal conditions are not compatible with bat habitat preferences.

- A. Stuart asked if there was any evidence of white nose syndrome in Biotope's findings. S. Fletcher stated none of the specimens captured via mist net surveys exhibited any signs of white nose syndrome.

[2] https://www.fws.gov/sites/default/files/documents/2024-10/nleb_tcb_consultation_guidance_version-1.0_final_0.pdf

- S. Salazar added that tricolored bats roost in leaf clusters as opposed to tree trunks. S. Fletcher agreed, noting that Duke Energy is currently evaluating how tree maintenance is performed on Duke Energy property.

Additional Discussion

S. Salazar stated the USFWS listed the monarch butterfly as proposed as endangered in December 2024, therefore, Duke Energy will need to consider this change in the draft and final license applications. S. Fletcher responded that Duke Energy is the largest participant of the monarch Candidate Conservation Agreement with Assurances for Monarch Butterfly (CCAA) in the country and the Bad Creek Relicensing Agreement includes monitoring (2 sites) along the existing transmission line between Bad Creek and Jocassee to be incorporated into the monarch CCAA. This will be addressed in the DLA/FLA.

S. Salazar mentioned Comprehensive Plans and asked public agencies in attendance who have Comprehensive Plans on file with FERC to visit the FERC website and ensure their Comprehensive Plans are current. The SCDNR's State Wildlife Action Plan (SWAP) was used as an example (date on plan is 2015), and E. Miller noted the SWAP on file is the most current but will be updated in 2025. S. Salazar reiterated it is the responsibility of individual agencies to file any updates to plans.

A. Stuart presented next steps in the ILP schedule and settlement agreement. Duke Energy and involved participants/stakeholders have worked collaboratively during relicensing. Duke Energy plans to provide a complete license application package to FERC in hopes that FERC will be able to issue a timely license, especially in consideration of the timeframe in which Bad Creek II is needed. S. Salazar encouraged Duke Energy to review SD2 during DLA preparation to ensure resource interests as identified by FERC are addressed in the DLA.

S. Salazar stated FERC staff are available and happy to answer any questions from the stakeholders and invited receiving participants to contact FERC staff directly with any questions or concerns about the relicensing process.

A. Stuart adjourned the meeting and thanked participants in attendance and online for their participation.

Attachment 2

Bad Creek Pumped Storage Project - Updated Study Report Meeting Presentation

Bad Creek Pumped Storage Project No. 2740

Updated Study Report Meeting

DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE®

JANUARY 16, 2025

1

Meeting Agenda

- Welcome and Meeting Purpose
- Safety Moment & Introductions
- FERC ILP Schedule Review
- General Project Overview and Updates
- Water Resources Study
  - Break
- Recreational Resources Study
- Aquatic Resources Study
  - Lunch
- Environmental Justice Study
- Cultural Resources Study
- Visual Resources Study
- Additional Studies
  - Small Whorled Pogonia Survey
  - Bat Survey
- Closing

2

Safety Moment – Fire Prevention at Home

- Get as many smoke detectors as you need. You should have a smoke detector in each bedroom and on each story of your home.
- Test your smoke detector **monthly** and change the battery in each of your smoke detectors biannually.
- Replace all smoke detectors according to the manufacturer's recommendations.
- **Practice fire drills with children** and plan escape routes.
- If the smoke detector goes off, **immediately evacuate** and call the fire department from a cell phone or a neighbor's phone.

https://www.oceaneering.com/sustainability/health-safety-and-quality-hse/safety-moments/

3

Resource Committees

Lead Technical Manager
- Mike Abney

Project Manager
- Alan Stuart

Aquatic Resources
- Mike Abney
- Nick Wahl

Water Resources
- Maverick Raber

Wildlife & Botanical Resources
- Scott Fletcher

Cultural Resources
- Christy Churchill

Recreation & Aesthetics
- Alan Stuart
- Ethan Pardue

Operations
- Lynne Dunn
- Alan Stuart

4

FERC ILP Schedule

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) Initiand Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 22, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 17, 2024

5

FERC ILP Schedule (cont.)

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 16, 2025
File USR Meeting Summary (18 CFR §5.15(f))	Duke Energy	Within 15 days of USR Meeting	Jan 31, 2025
Deadline to file comments on the USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Deadline to File Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Response to USR Meeting Summary Comments	Duke Energy	Within 30 days of USR Meeting Summary Comments filing	April 2, 2025
Comments on DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

6

Bad Creek II Complex –

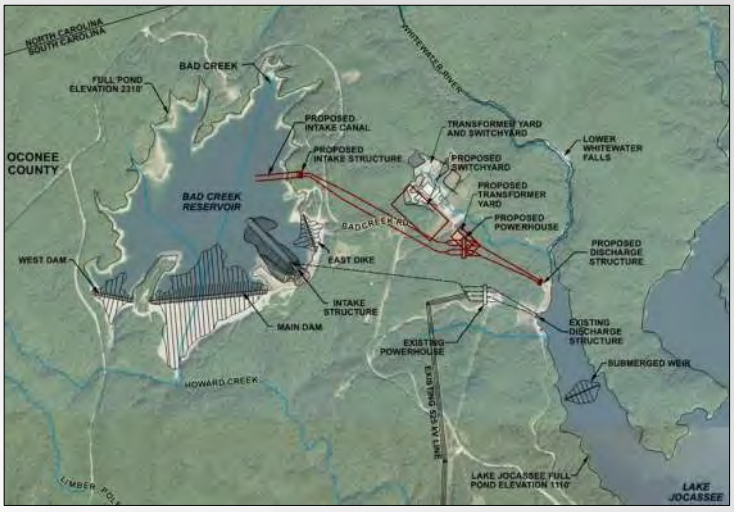
General Overview and Project Updates

7

General Project Overview

Existing Bad Creek Powerhouse
- Four units used for peak load generation
- 1,400 MW capacity; 23 hours of storage
- Generates using water from Bad Creek Reservoir
- Pumps back water from Lake Jocassee using excess night/weekend energy

Proposed Bad Creek Powerhouse Addition
- Would essentially double existing Bad Creek capacity
- Utilize existing Bad Creek Reservoir
- Two new underground tunnels and powerhouse (4 Units)
- Additional 1,400 MW capacity; Total site 3,460 MW (max generation) with 11 hours of storage



Privileged & Confidential/Attorney-Client Communication; Attorney Work Product

8

Proposed Expanded Project Boundary for Bad Creek II

Existing FERC Project Boundary

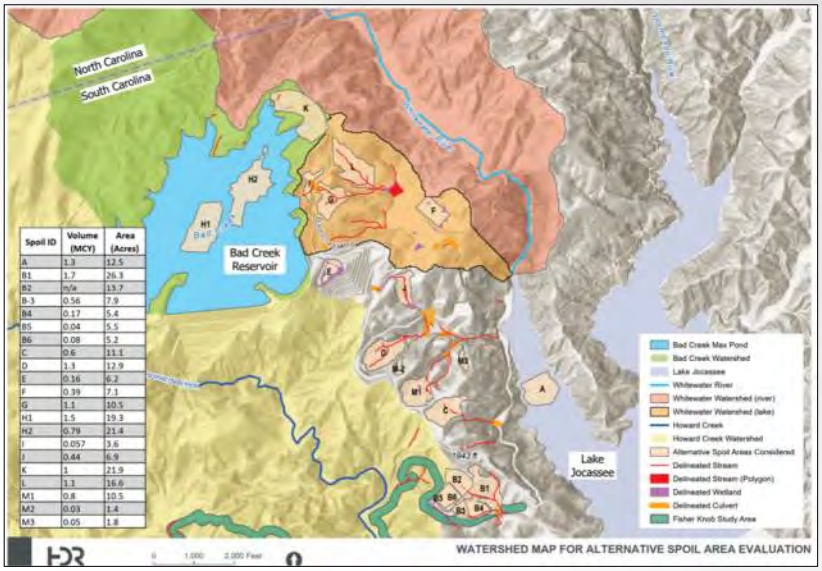
Project boundary expanded to include areas potentially impacted from spoil placement and other project works as well as transmission line widening.

Original: 1,280 acres
Expanded: 1,747 acres

Proposed Expanded Project Boundary

9

Proposed Expanded Project Boundary for Bad Creek II



Spoil ID	Volume (MCY)	Area (Acres)
A	1.3	12.5
B1	1.7	26.3
B2	n/a	13.7
B-3	0.56	7.9
B4	0.17	5.4
B5	0.04	5.5
B6	0.08	5.2
C	0.6	11.1
D	1.3	12.9
E	0.16	6.2
F	0.39	7.1
G	1.1	10.5
H1	1.5	19.3
H2	0.79	21.4
I	0.057	3.6
J	0.44	6.9
K	1	21.9
L	1.1	16.6
M1	0.8	10.5
M2	0.03	1.4
M3	0.05	1.8

- According to preliminary studies, approximately **4.4 million cubic yards of excavated material** for Bad Creek II construction will need to be deposited at upland spoil locations and/or along the submerged weir in Lake Jocassee.
  - Preferred potential areas for spoil placement are currently under evaluation.
- **Fisher Knob Access Road** is no longer being pursued as part of the relicensing strategy.

10

FERC-Approved Relicensing Studies

Study	Status
1. Water Resources	Complete
2. Recreational Resources	Complete
3. Aquatic Resources	Complete
4. Environmental Justice	Complete
5. Cultural Resources	Complete
6. Visual Resources	Complete

Note: Studies that were presented during the ISR meeting will not be covered again; however, main study objectives and results are provided.

11

Water Resources Study

12

Water Resources Study Task Refresher

Study Task	Status
Task 1 – Summary of Existing Water Quality Data And Standards	**Complete***
Task 2 – Water Quality Monitoring in Whitewater River Arm	**Complete**
Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)	**Complete***
Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)	**Complete**
Task 5 – Water Quality Monitoring Plan Development	**Complete**

** Task methods and findings were presented during ISR meeting*

13

Task 1 - Summary of Existing Water Quality Data & Standards

- **Objective:** Compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations.
- **Status:** **Complete**

14

Task 1 - Summary of Existing Water Quality Data & Standards

Task 1 Results:

1. Upstream of the submerged weir, the water column undergoes vertical mixing and there is no indication of stratification.

2. Downstream of the submerged weir, stratification is observed during all seasons and is consistent between pre and post operation conditions. Mixing is confined to the portion of the Whitewater River cove upstream of the submerged weir.

3. All water quality parameters assessed in Lake Jocassee are fully supportive of designated use classifications.

4. Results from previous studies in Howard Creek indicate water quality under operational conditions is well within the range of natural/seasonal variation observed under pre-operational conditions. Water quality conditions assessed are fully supportive of designated uses. ***Bad Creek II will not affect Howard Creek.***

Conclusion: It is not expected that adding a second powerhouse will affect water quality in Lake Jocassee (or Howard Creek).

15

15

Task 2 – Water Quality Monitoring in Whitewater River Arm

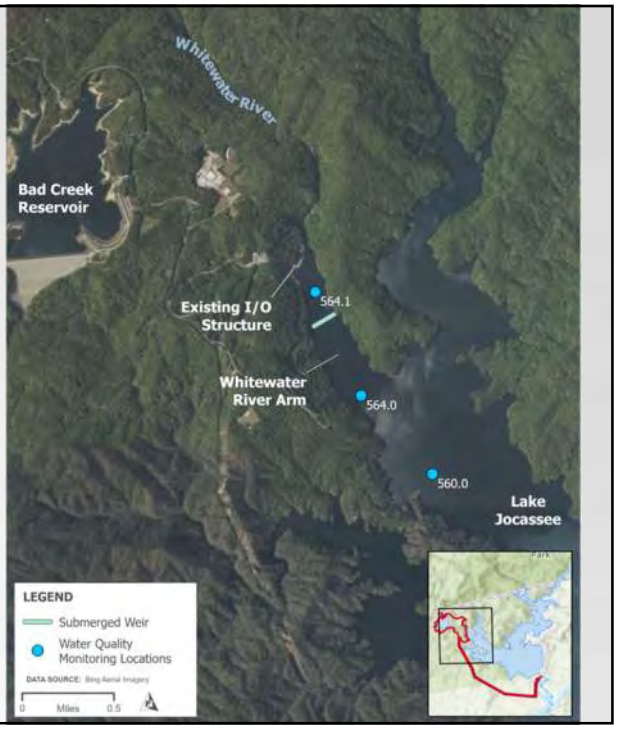
- **Objective:** Collect water quality data from 3 historical locations in the Whitewater River Cove to gather current day water quality information. Intended to provide sufficient information to support an analysis of potential Project effects on water resources in Lake Jocasee.
- **Status:** **Complete**

Bad Creek Pumped Storage Project ISR Meeting | 16

16

Task 2 – Methods

- Duke Energy collected continuous water temperature data and periodic temperature and DO profiles (bi-weekly) from locations near 3 historic monitoring stations to determine current-day water quality information during summer of 2023 and 2024.
- Data collected in 2023 represented conditions under 3-unit operations; data in 2024 was collected under 4-unit operations.
  - Unit upgrades were completed in March 2024 and increased total maximum hydraulic capacity at the Project by approximately 2,500 cfs.

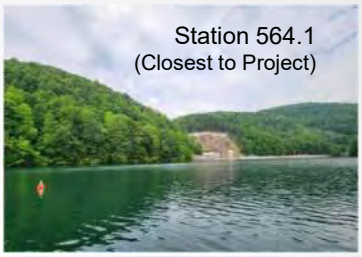


17

Task 2 – Methods

18

Task 2 – Methods



Field Dates for Water Quality Measurement and Data Collection

Study Period	Date	Details
2023	May 22	Deploy instrumentation
	May 31	Data download and vertical profile
	June 14	Data download and vertical profile
	June 27	Data download and vertical profile
	July 13, 14*	Data download and vertical profile
	July 24	Data download and vertical profile
	August 11*	Data download and vertical profile
	August 21	Data download and vertical profile
	September 7	Data download and vertical profile
	September 23*	Data download and vertical profile
	October 11	Data download; Remove instrumentation
2024	May 21	Deploy instrumentation
	June 11	Data download and vertical profile
	June 17	Data download and vertical profile
	July 1	Data download and vertical profile
	July 16	Data download and vertical profile
	July 30	Data download and vertical profile
	August 14	Data download and vertical profile
	August 26	Data download and vertical profile
	September 9	Data download and vertical profile
	September 25	Data download and vertical profile
	October 7	Data download and vertical profile; Remove instrumentation

Depth of VuLink Dataloggers

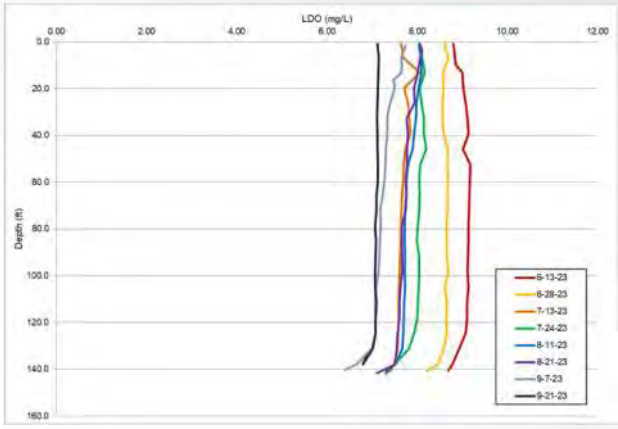
Approximate Water Depth (ft)	Approximate Elevation (ft msl)	Notes
3	1,107	Near surface
30	1,080	Normal maximum Lake Jocassee drawdown elevation
50	1,060	Approximate crest of the submerged weir
70	1,040	Approximately 20 ft below the crest of the submerged weir
100	1,010	Approximate location of thermocline

*Depths and elevations are dependent on Lake Jocassee elevations.

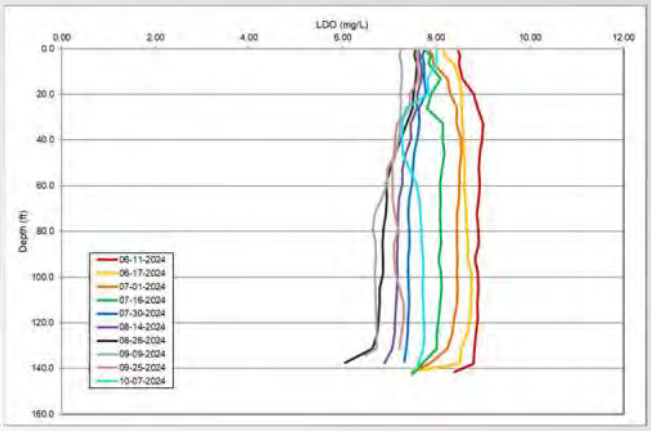
19

DO Profile Data, Station 564.1 (Upstream of Weir)

2023 (3 Units)



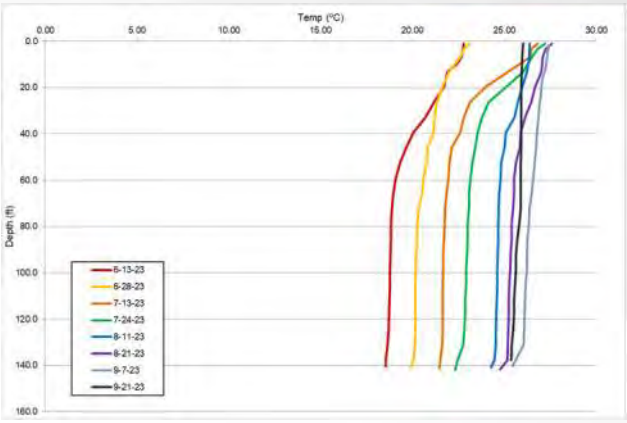
2024 (4 Units)



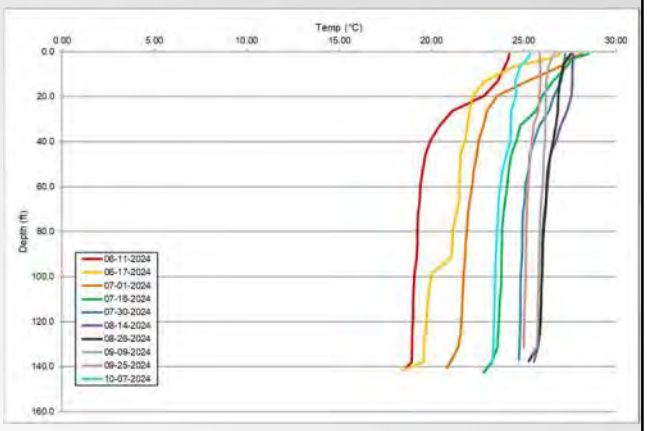
20

Temp Profile Data, Station 564.1 (Upstream of Weir)

2023 (3 Units)



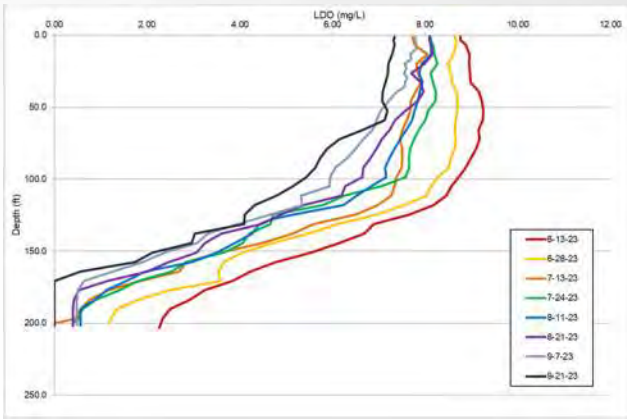
2024 (4 Units)



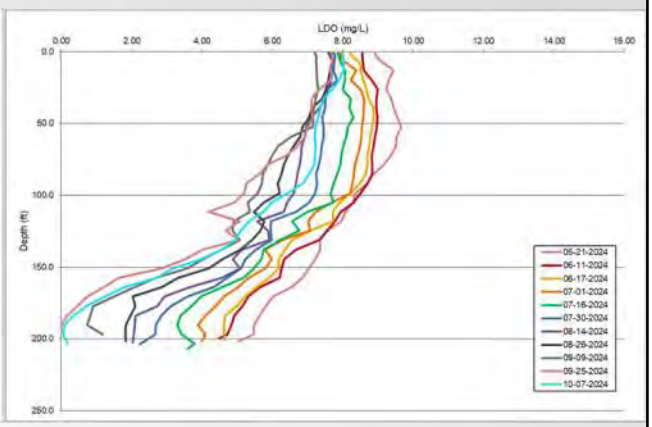
21

DO Profile Data, Station 564.0 (Immediately downstream of weir)

2023 (3 Units)



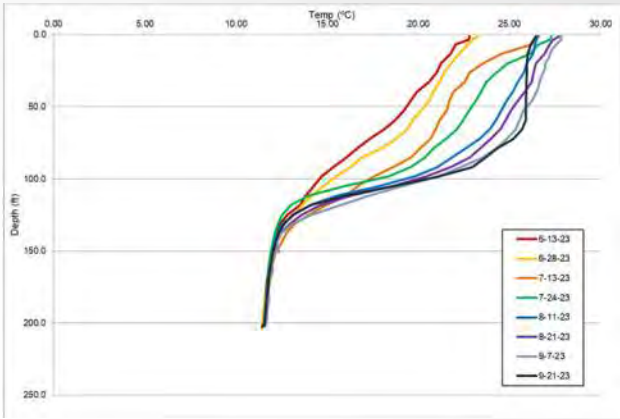
2024 (4 Units)



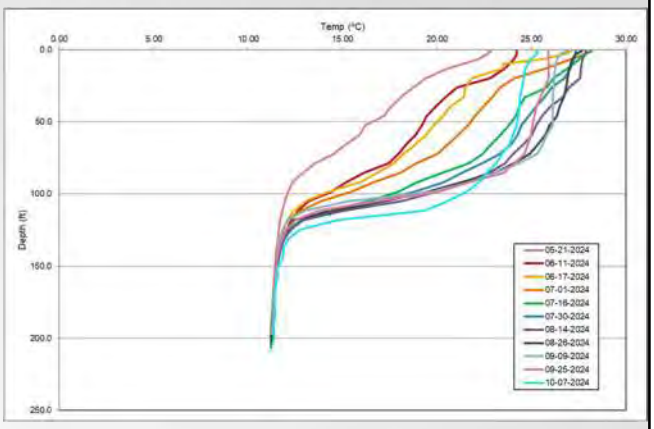
22

Temp Profile Data, Station 564.0 (Immediately downstream of weir)

2023 (3 Units)



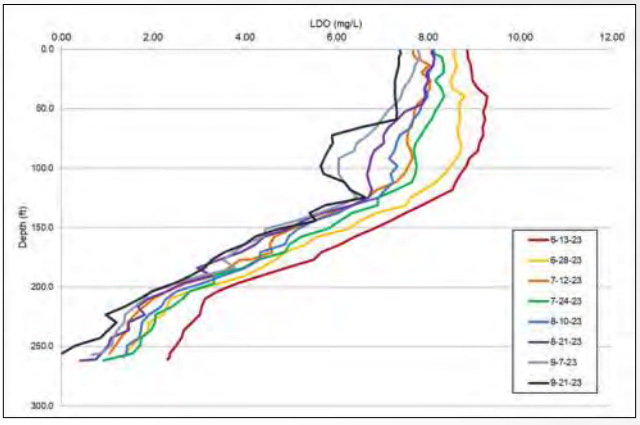
2024 (4 Units)



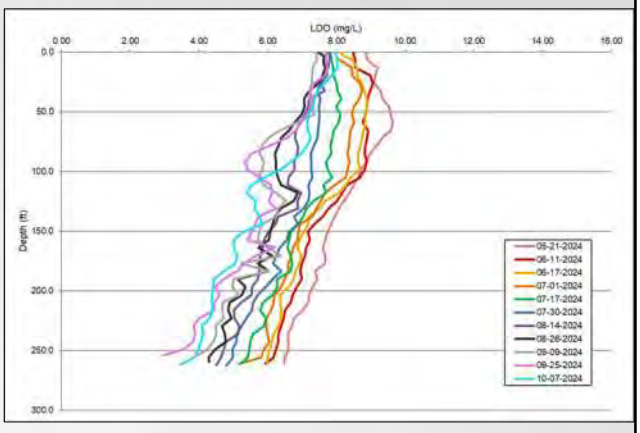
23

DO Profile Data, Station 560.0 (Downstream)

2023 (3 Units)



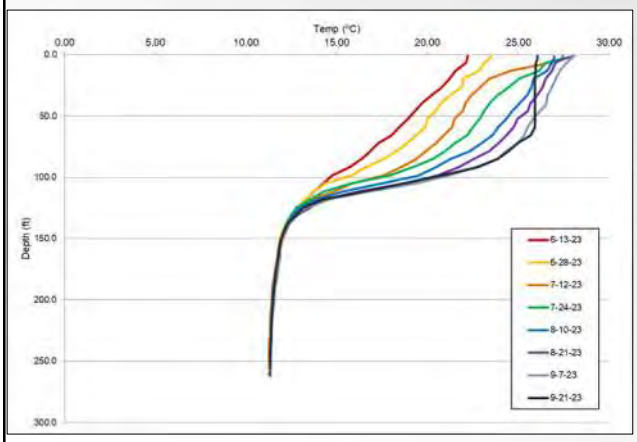
2024 (4 Units)



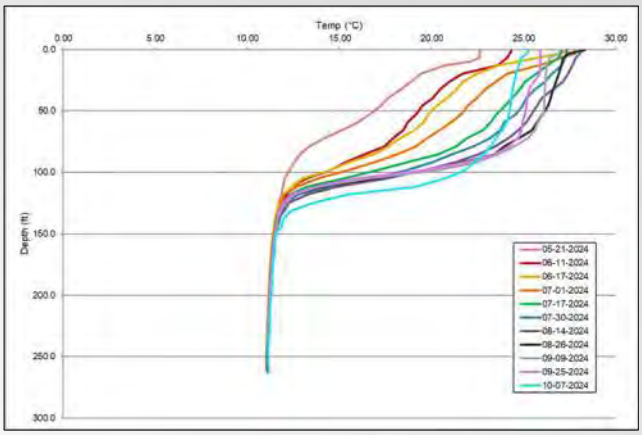
24

Temp Profile Data, Station 560.0 (Downstream)

2023 (3 Units)



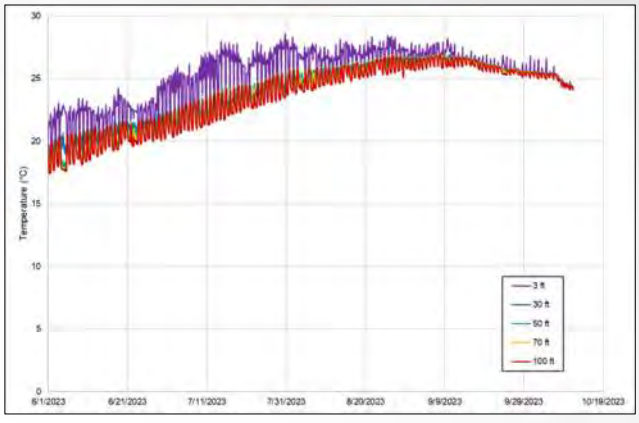
2024 (4 Units)



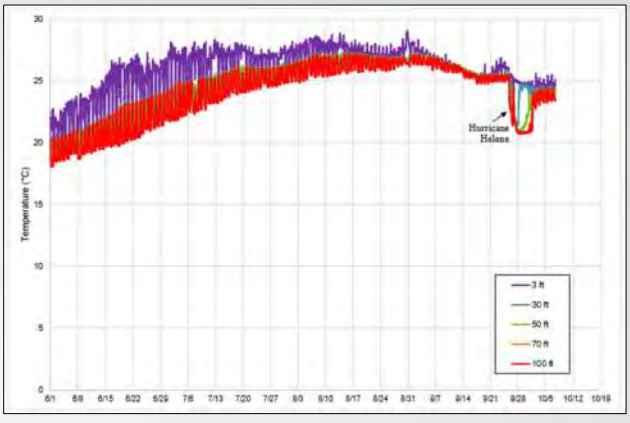
25

Continuous Temperature Data – Station 564.1
(Upstream of Weir)

2023 (3 Units)



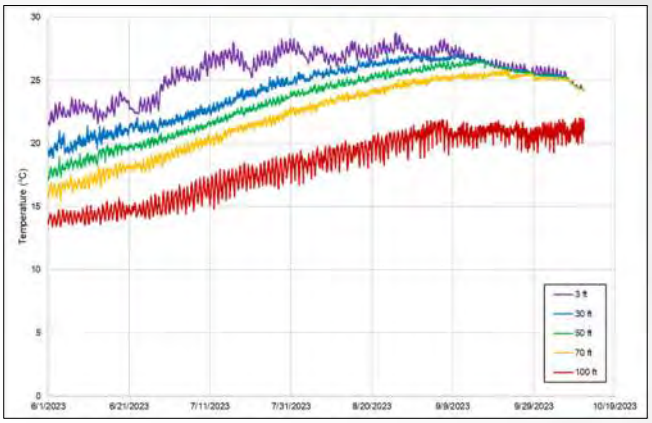
2024 (4 Units)



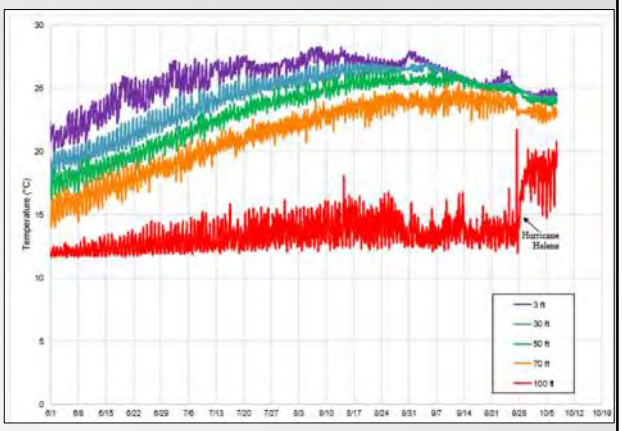
26

Continuous Temperature Data – Station 564.0
(Immediately downstream of weir)

2023 (3 Units)



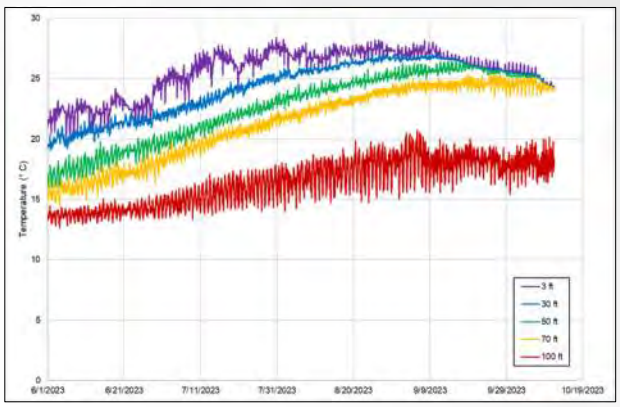
2024 (4 Units)



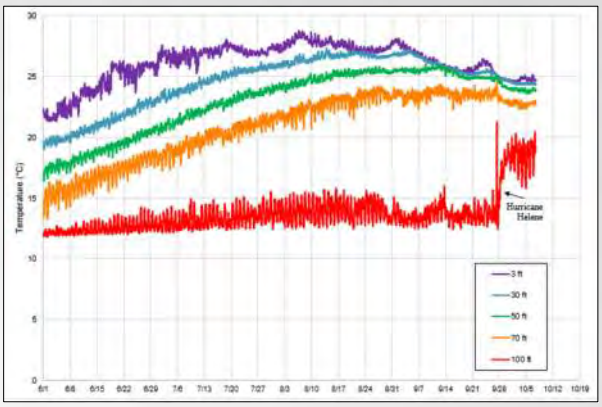
27

Continuous Temperature Data – Station 560.0
(Downstream)

2023 (3 Units)



2024 (4 Units)



28

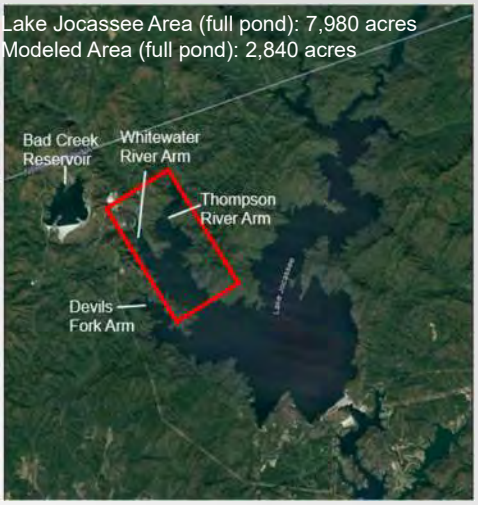
Task 2 – Conclusions

- Results from water quality monitoring in the Whitewater River cove indicate water upstream of the submerged weir is well-mixed due to Project operations under all operations.
- Data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios.
- Preservation of stratification downstream of the weir is also supported by historical water quality monitoring and by CFD model results under current project conditions as well as Bad Creek II conditions.

29

Task 3 - Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)

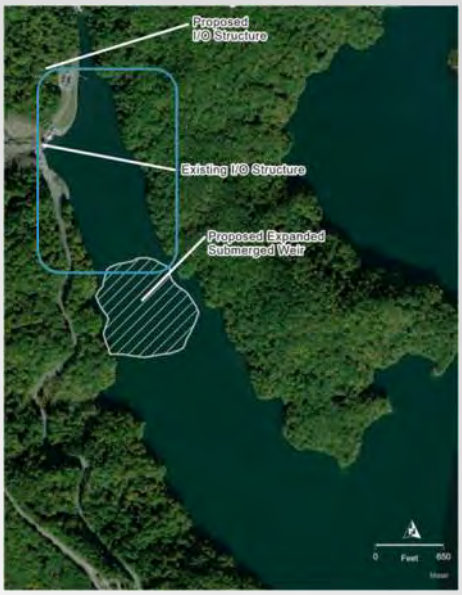
- **Objective:** Increased hydraulic capacities associated with Bad Creek II could affect flow patterns and velocities in the Whitewater River cove. Develop CFD model to evaluate flows and extent of vertical mixing in the Whitewater River arm and downstream of the submerged weir due to the addition of Bad Creek II.
  - **Status:** **Complete**
- Additional CFD modeling was carried out in 2024 to incorporate **updated hydraulic capacities** associated with Bad Creek II that were not available during original CFD modeling (design change from single speed to variable speed units).
  - An addendum to the Task 3 report was developed and updated results are presented in the following slides.



30

CFD Modeling – Updated Hydraulic Capacity

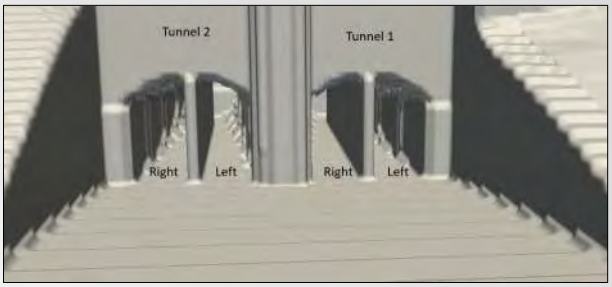
- Updated hydraulic capacity for generation resulted in similar flows as originally estimated during CFD modeling; however, updated ***pumping*** capacities resulted in a **~9 percent increase,** therefore additional CFD modeling was carried out in the Whitewater River cove for updated **pumping only.**
- The study area for this update includes the area of the Whitewater River cove from the proposed inlet/outlet (I/O) structure to the upstream end of the submerged weir (**blue rectangle**).
- A higher-resolution CFD model (previously developed for the Bad Creek II Feasibility Study) was used for this effort to assess near-field hydraulics and changes in velocity in the vicinity of the I/O structures.



31

Existing and Proposed I/O and Tunnel Configuration

- The proposed I/O structure will be approximately 600-700 ft upstream of the existing I/O structure.



- Proposed structure will be similar to existing structure; 150 ft wide and 95 ft tall.
- Two tailrace tunnels extending from the underground powerhouse will penetrate the I/O structure at invert elevation 1,012 ft msl.
- Each tailrace tunnel has a diameter of 31 ft and the right/left chambers at the outlet are approximately 38 ft tall by 17.5 ft wide.

32

Existing and Proposed I/O and Tunnel Configuration

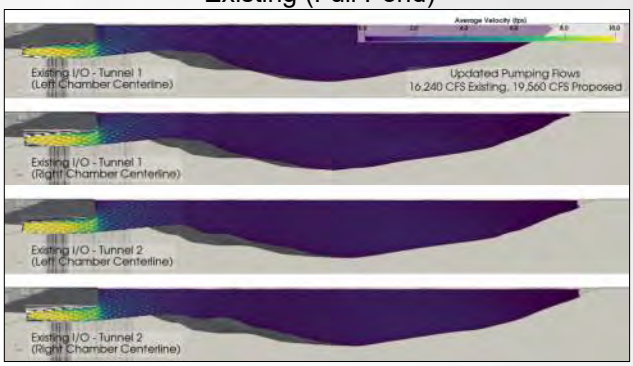
Width of Whitewater River cove:
- At existing I/O structure: 1,110 ft
- At proposed I/O structure: 675 ft

- The new I/O structure will be set back into the shoreline, creating a small alcove / intake canal in the Whitewater River Cove.

33

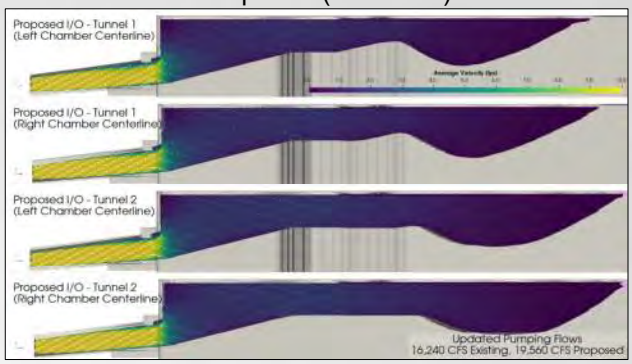
Cross-section Velocities (Pumping) – Full Pond

Existing (Full Pond)



- Depth-averaged approach velocities are 1.8 fps with a **maximum velocity of 2.0 fps**.

Proposed (Full Pond)



- Depth-averaged approach velocities are 1.7 fps with a **maximum velocity of 2.0 fps**.

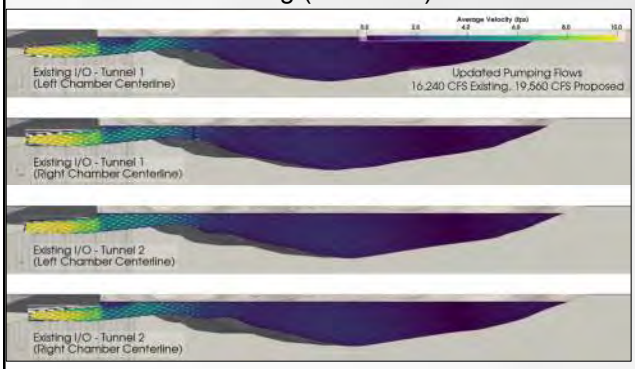
- Increased velocity impacts are limited to inside tunnels at full pond.

Noteworthy: Scale goes up to 10 fps (Yellow)

34

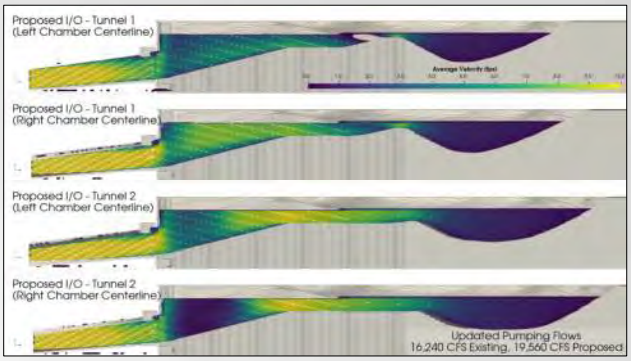
Cross-section Velocities (Pumping) – Min Pond

Existing (Min Pond)



- Depth-averaged approach velocities are 4.6 fps with a **maximum velocity of 5.2 fps**.

Proposed (Min Pond)



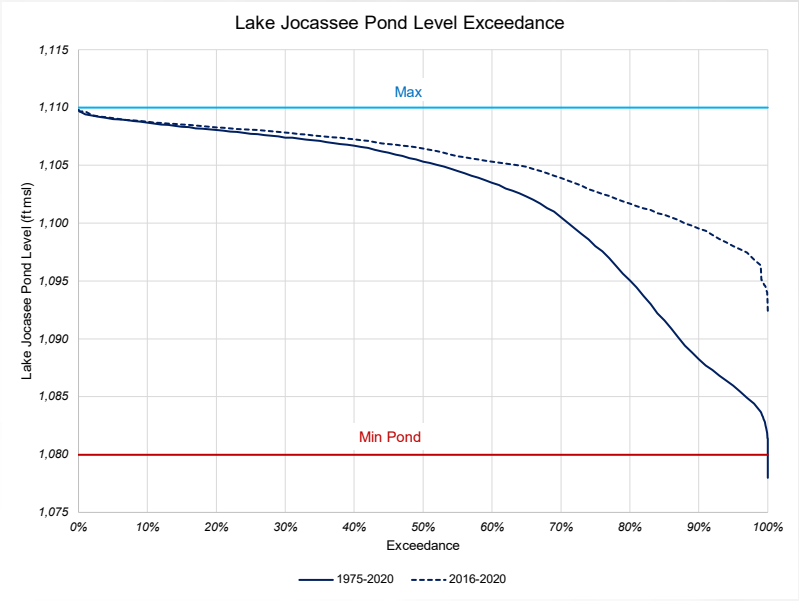
- Depth-averaged approach velocities are 4.5 fps with a **maximum velocity of 8.3 fps**.

- Increased velocity impacts extend into Whitewater River cove (at min pond).

Noteworthy: Scale goes up to 10 fps (Yellow)

35

Jocassee Water Surface Elevations (1975 – 2020)

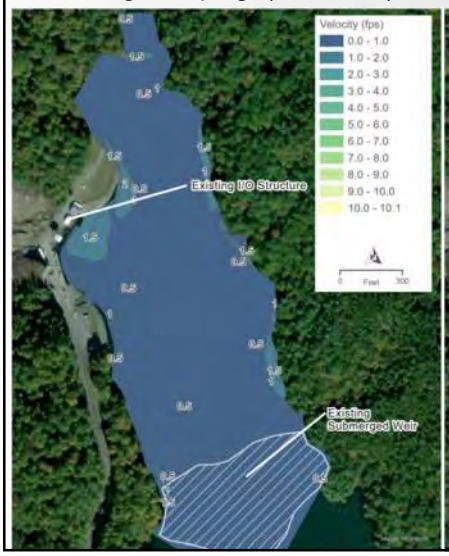


- Maximum allowable drawdown in Lake Jocassee is 30 ft (1,080 ft msl)
- Maximum historic drawdown occurred in 2007 (28.8 ft; 1,081.2 ft msl)
- Lake Jocassee pond elevations are within top 15 ft of operating pool 80% of the time
- 2014 Operating Agreement includes Low-Inflow-Protocol conditions which limit releases downstream of Lake Keowee during drought conditions.

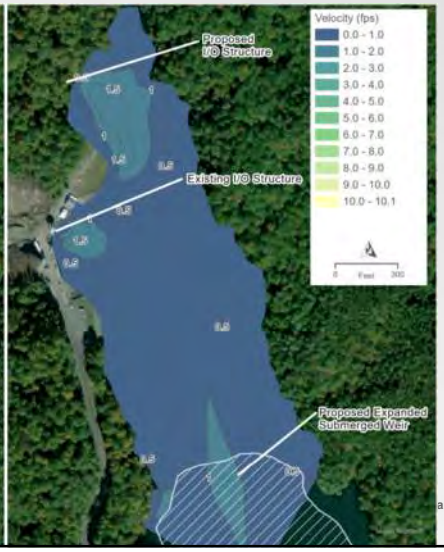
36

Surface Velocities – Full Pond

Existing Pumping (Full Pond)



Proposed Pumping (Full Pond)

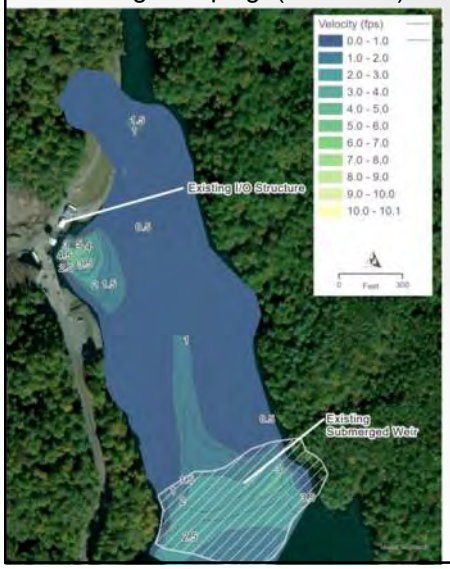


- **Left**: Under **existing pumping** at full pond, surface velocities **do not exceed 2.0 fps** and are on average below 1.0 fps.
- **Right**: Under **proposed pumping** at full pond, velocities are very similar to existing conditions with **maximum velocities of 1.5 fps** near the existing and proposed I/O structures.
- Velocities over the expanded weir are consistent with existing velocities.

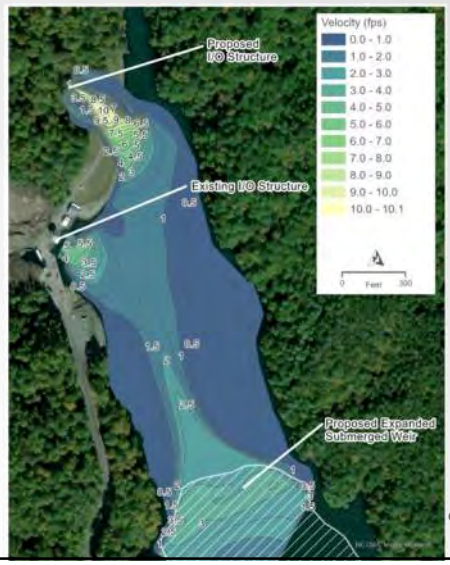
37

Surface Velocities – Minimum Pond

Existing Pumping (Min Pond)



Proposed Pumping (Min Pond)

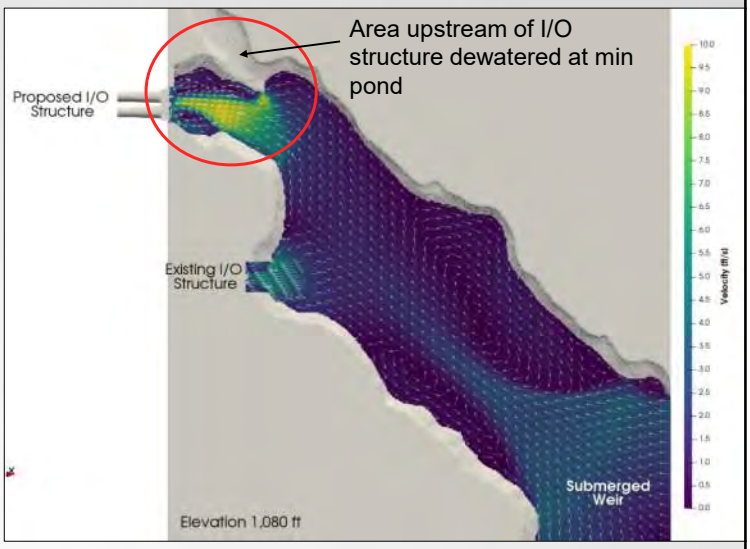


- **Left**: Under **existing pumping** at min pond, surface velocities across the weir reach 3 fps and up to 5 fps directly in front of the existing I/O structure.
- **Right**: Under **proposed pumping** at min pond, velocities reach up to 10 fps directly in front of the proposed I/O structure.
- Maximum velocity over the proposed expanded weir is ~3.5 fps, consistent with maximum velocities over the existing submerged weir.

38

Plan View – Proposed Maximum Pumping (Min Pond)

- At min pond, the area just upstream of the proposed I/O structure would be dewatered as bathymetry is >1,080 ft (note this elevation has never been reached).
- As a result, this area would not support boating activities regardless of Bad Creek II operations; which would likely not operate at maximum hydraulic capacities under these conditions.
- Duke Energy would implement a safety plan to prevent boating near the I/O structure under drawdown conditions.



39

Task 3 – CFD Modeling Conclusions

- While velocities in the Whitewater River cove increased from original results due to increased unit pumping capacities, findings from original modeling still hold true:

Original Findings

- The energy of the water discharged from Bad Creek is dissipated as it flows over the existing submerged weir.
- Bad Creek II powerhouse operations (pumping or generation) will not alter existing stratification patterns observed downstream of weir.
- Lake Jocassee at minimum pond elevation (1,080 ft msl) had the greatest effect on Whitewater River cove hydraulics (as expected).

Additional Conclusions from Updated Modeling (Proposed pumping, min pond)

- Pumping at maximum capacity under min pond conditions may result in surface velocities of **up to 10 fps** which could affect non-motorized boats (i.e., paddling would be more difficult due to increased currents).
- Areas of higher velocities (adjacent to I/O structure) will be restricted to boating.
- Boaters could travel along the eastern shoreline instead of near the Project if concerned about flows.
- The area immediately upstream of the Project would be dewatered and would preclude boating regardless of operations.
- Bad Creek would not likely operate at maximum pumping capacity under maximum drawdown scenario.

40

Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

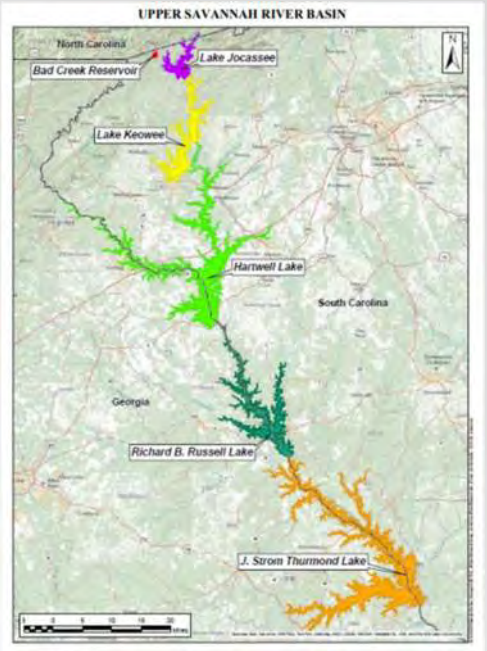
- **Objectives:**
  - Use the existing CHEOPS™ model to evaluate the difference in water **exchange rate, frequency, and magnitude** between Bad Creek Reservoir and Lake Jocassee due to the addition of a second powerhouse.
  - Identify and evaluate impacts, if any, to Lake Keowee (and downstream) as a result of operating an additional powerhouse at the Project.
- **Status:** Complete

CHEOPS™ Operations and Planning Model

41

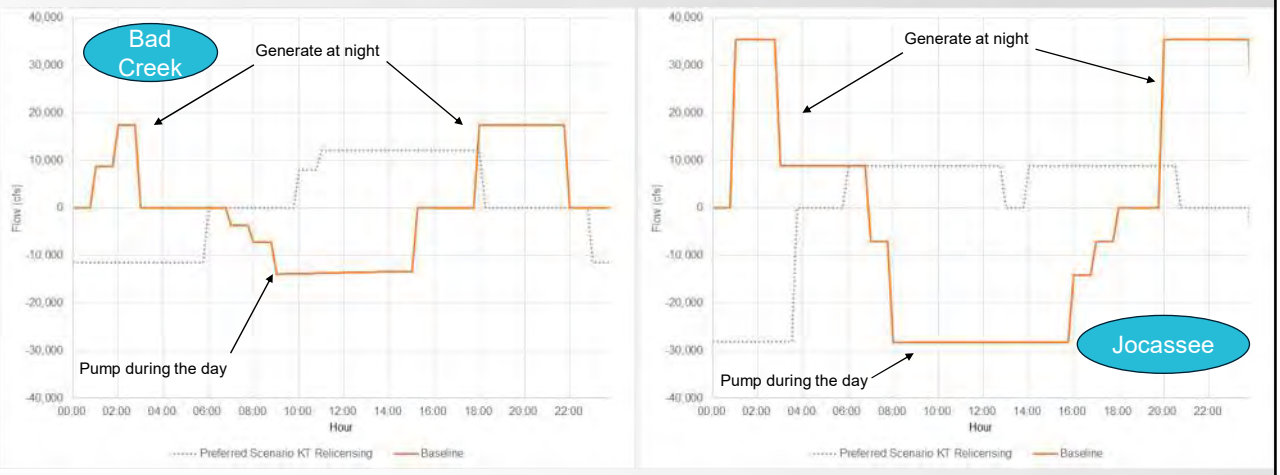
Savannah River CHEOPS™ Model

- Upper Savannah River reservoirs
  - Bad Creek
  - Jocassee
  - Keowee
  - Hartwell
  - Russell
  - Thurmond
- Model Data
  - Reservoir area & volume
  - Discharge rating curves
  - Turbine & generator data
  - Pump data
  - Load shape (pumping & generation)
  - Hydrology
  - Operating rules
    - Bad Creek License
    - Keowee-Toxaway License
      - Low Inflow Protocol
    - 2014 Operating Agreement



42

Pump/Generation Cycle Updates – Example Day



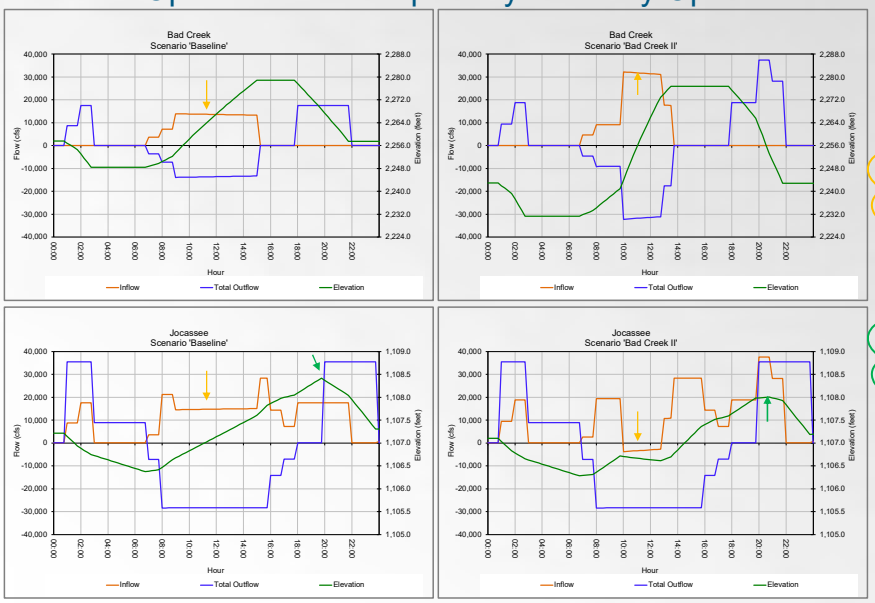
43

CHEOPS™ & Bad Creek Relicensing

- Scenarios
  - Baseline (existing facilities and FERC license requirements)
  - Alternative: Baseline + Bad Creek II
- Operational effects of scenarios
  - Lake level fluctuations at Bad Creek, Jocassee & Keowee
  - Rate of change in lake levels
  - Low Inflow Protocol (LIP) Stages
  - Keowee Releases to Lake Hartwell
- Hydrology Dataset
  - Normal: Daily unimpaired inflow (UIF) hydrology dataset (1939-2011)
  - Climate Change – Low (ccLow)
    - 3°F temperature increase (10% increase in evaporation)
  - Climate Change – High (ccHigh)
    - 6°F temperature increase (20% increase in evaporation)
    - 10% decrease in incremental reservoir inflow

44

Reservoir Operations - Example Day of Hourly Operations



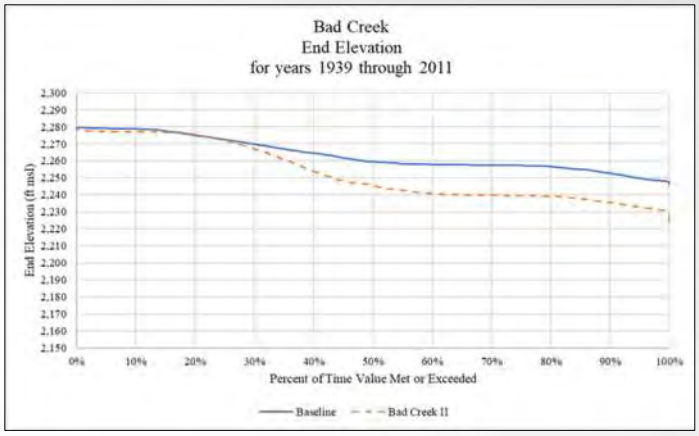
Jocassee discharge is the same for Baseline and Bad Creek II

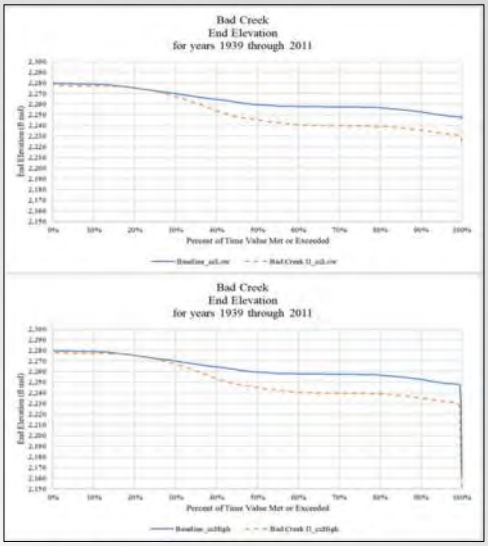
Jocassee inflow varies between scenarios with the varied Bad Creek capacity

About 0.5 feet of additional fluctuation in Jocassee under Baseline example versus Bad Creek II

45

Reservoir Elevations – Bad Creek Reservoir

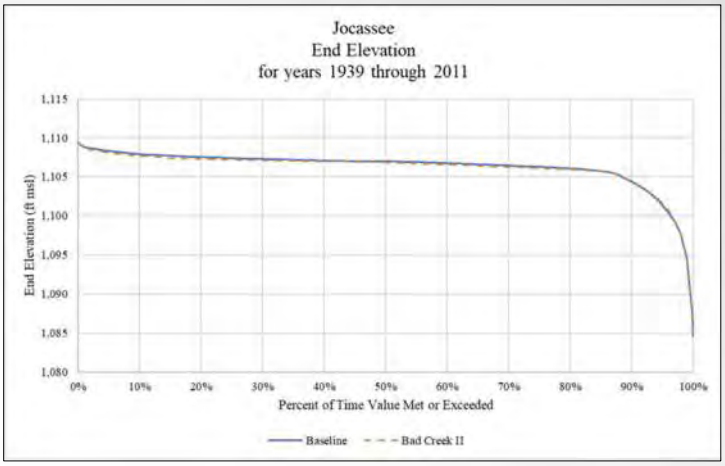


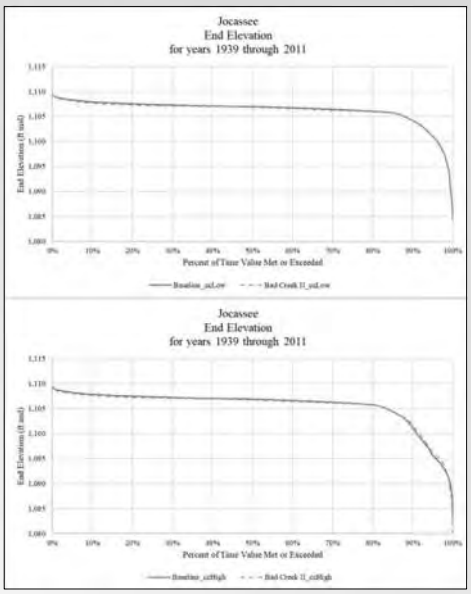


Hydrology	Baseline Elevations (ft msl)				Bad Creek II Elevations (ft msl)			
	Min	Median	Max	Band (ft)	Min	Median	Max	Band (ft)
Normal	2,246.1	2,259.5	2,280.0	33.9	2,224.7	2,245.6	2,280.0	55.3
ccLow	2,246.1	2,259.5	2,280.0	33.9	2,224.7	2,245.6	2,280.0	55.3
ccHigh	2,160.0	2,259.5	2,280.0	120.0	2,151.6	2,245.3	2,280.0	128.4

46

Reservoir Elevations – Lake Jocassee





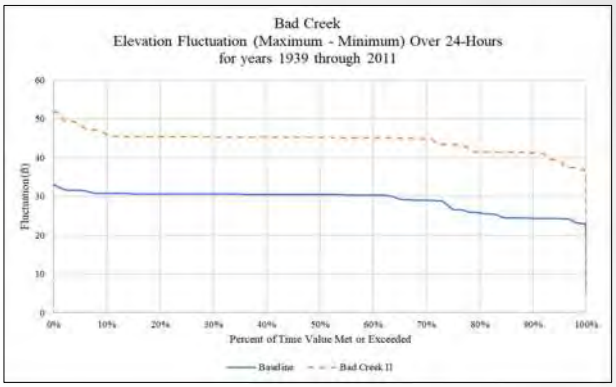
	Baseline Elevations (ft msl)				Bad Creek II Elevations (ft msl)			
	Min	Median	Max	Band (ft)	Min	Median	Max	Band (ft)
Normal	1,084.1	1,107.0	1,110.0	25.9	1,084.5	1,106.8	1,110.0	25.5
ccLow	1,083.8	1,107.0	1,110.0	26.2	1,084.2	1,106.8	1,110.0	25.8
ccHigh	1,083.0	1,106.9	1,109.5	26.5	1,080.0	1,106.7	1,109.9	29.9

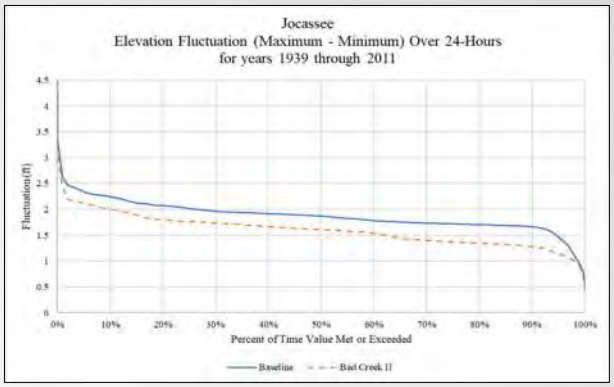
Lake Jocassee Reservoir Levels – Spawning Performance Measures (Normal Hydrology)

Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	Bad Creek II
	Lake Jocassee					(1939-2011)	(1939-2011)
	Elevation - Natural Resources						
8	Maximize spawning success for black bass and blueback herring (2.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once (Note 5)	1-Apr	31-May	5%	71%	100%
9		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5)	1-Apr	31-May	5%	34%	99%
10		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5)	1-Apr	31-May	5%	19%	89%
11		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 30 consecutive days at least once (Note 5)	1-Apr	31-May	5%	0%	59%
12		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 45 consecutive days at least once (Note 5)	1-Apr	31-May	5%	0%	0%
13	Maximize spawning success for black bass and blueback herring (3.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	100%
14		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	100%
15		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	99%
16		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 30 consecutive days at least once (Note 5)	1-Apr	31-May	5%	95%	97%
17		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 45 consecutive days at least once (Note 5)	1-Apr	31-May	5%	56%	82%
18	Maximize spawning success for sunfish and threadfin shad (2.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once (Note 5)	15-May	15-Jul	5%	45%	100%
19		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5)	15-May	15-Jul	5%	14%	92%
20		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5)	15-May	15-Jul	5%	0%	3%
21	Maximize spawning success for sunfish and threadfin shad (3.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once (Note 5)	15-May	15-Jul	5%	100%	100%
22		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once (Note 5)	15-May	15-Jul	5%	100%	100%
23		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once (Note 5)	15-May	15-Jul	5%	79%	99%

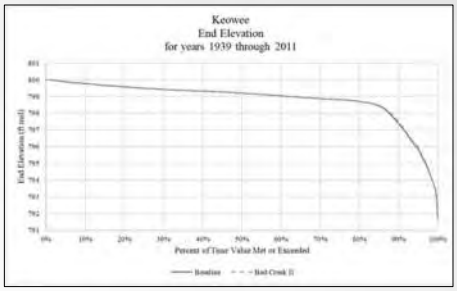
Bad Creek and Jocassee Elevation Fluctuations – Rate of Change

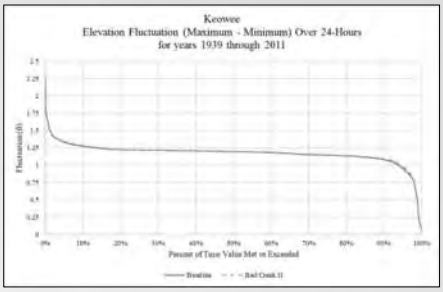
Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	Bad Creek II
	Lake Jocassee					(1939-2011)	(1939-2011)
7	Minimize effects on recreational boating	Number of days where reservoir level changes more than 1.0 ft in one hour	1-Jan	31-Dec	10	0	0

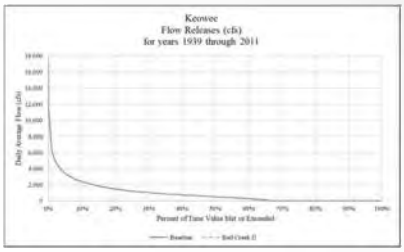


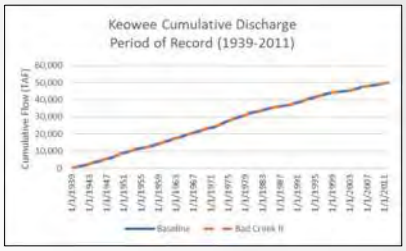


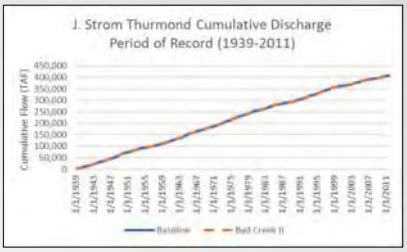
Keowee & Downstream



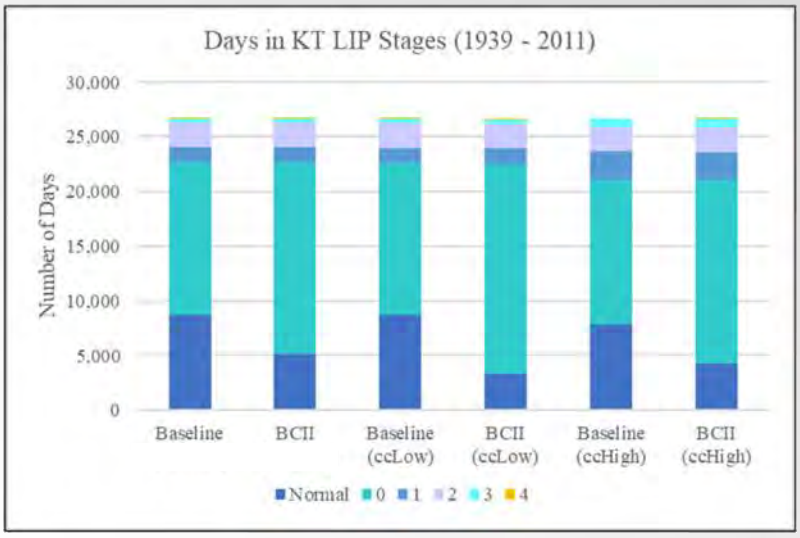








Low Inflow Protocol Stages



51

Summary Conclusions – Bad Creek II Effects

- Bad Creek Reservoir elevation: Wider operating band
- Lake Keowee and Lake Jocassee elevations: Comparable to Baseline
- Lake Jocassee reservoir level fluctuations rate of change (24-hour period): Smaller than Baseline
- Lake Keowee water intakes: No effect
- Keowee-Toxaway Low Inflow Protocol (LIP)
  - Stage 0 frequency increases
  - Differences diminish in the more advanced stages of the KT LIP
- USACE reservoirs, Savannah River flows: Minimal effect

52

Task 5 – Water Quality Monitoring Plan

Objective(s): The Water Quality Monitoring Plan (WQMP), developed in consultation with agencies and stakeholders, is focused on the proposed Bad Creek II Complex with the main goal of identifying applicable water quality parameters and/or surface water conditions to monitor associated with construction as well as appropriate monitoring methods for compliance with the South Carolina Department of Environmental Services (SCDES) regulations and protection of existing uses.

- **Status:** **Complete***

** Study report was filed with the USR as DRAFT and will be filed as final with the FLA.*

Task 5 – Water Quality Monitoring Plan Overview

- The Water Quality Monitoring Plan (WQMP) considers water quality in the Whitewater River cove and stream conditions in upland areas that will potentially be affected by Bad Creek II construction activities.
- The WQMP describes two different monitoring strategies to assess Project waters depending on location (i.e., Lake Jocassee vs. upland areas).
  - **Part I - Lake Jocassee**: Select water quality parameters in the Whitewater River cove will be measured via a multi-parameter sonde.
  - **Part II - Upland Areas**: Upland surface waters will be monitored downstream of impacted areas via stream habitat surveys.

Part I: Lake Jocassee – **Potential Impacts**

- The primary (*temporary*) impact to surface water quality in Lake Jocassee is increased turbidity caused by potential sediment loading from (1) **construction activities** and (2) **overland runoff** from temporarily disturbed land.
  - Construction actives that may (temporarily) impact turbidity in Lake Jocassee include activities associated with the lower reservoir I/O structure and cofferdam and expansion of the submerged weir).
- **No long-term degradation of water quality is expected** to result from construction and operation of the Bad Creek II Complex, however elevated turbidity from sediment loading could temporarily reduce quality of aquatic habitat.

Whitewater River Cove, Lake Jocasee

55

Part I: Lake Jocassee – **Monitoring Rationale**

- While water quality impacts would be temporary (during construction phase only) and occur in a very localized area likely limited to Whitewater River cove, monitoring water quality at a consistent location in Lake Jocassee during and after construction is proposed to maintain and document **compliance with SCDES water quality standards for turbidity**.

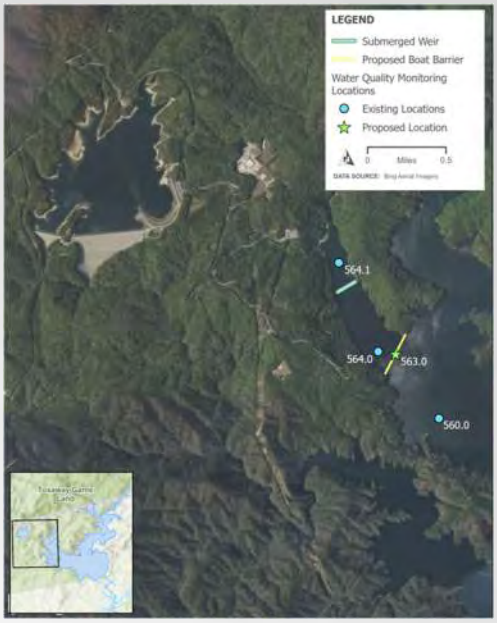
Whitewater River cove looking upstream from Fisher Knob

56

Part I: Lake Jocassee – **New Monitoring Location**

- Duke Energy proposes to monitor the following water quality parameters during the construction and post-construction phases at a new location (**Station 563.0**).
  - Turbidity
  - DO
  - Temperature
  - pH
- New station location is approximately 0.8 miles downstream of the proposed I/O structure and 0.45-miles downstream of the weir.

- Duke Energy will install a temporary boat barrier across the mouth of Whitewater River cove to prevent boating in the cove during construction. New WQ location will be situated near boat barrier.



57

Part I: Lake Jocassee – **Monitoring Methods**

- Duke Energy will measure **surface water conditions** approximately 0.3 meters below the surface at proposed Station 563.0.
  - Proposed site will be instrumented with a multi-parameter water quality sonde and high-visibility buoy at the downstream end of Whitewater River cove near the proposed temporary boat barrier.
- The **data sonde will record water quality parameters once daily** (i.e., turbidity, DO, temperature, and pH) and store readings on an internal memory drive.
- Data will be **transmitted and received electronically** (by Duke Energy personnel) via telemetry or by manual download in the field if telemetry is not available.

Data Collection Frequency

- **Pre-construction:** Pre-construction monitoring will not be performed (*the objective is to remain in compliance with state water quality standards, not to ensure recovery to an existing condition*).
- **Construction:** Water quality parameters will be **recorded once daily for the duration of Bad Creek II construction** via a multi-parameter sonde deployed at the proposed point of compliance. Data will be reviewed weekly.
- **Post-construction:** Water quality parameters will be **recorded once daily for one year (365 days) following commencement of Bad Creek II commercial operation** via a multi-parameter sonde deployed at the proposed point of compliance. Data will be reviewed bi-weekly to monthly.

58

Part I: Lake Jocassee – **Turbidity Monitoring and Compliance Criteria**

- Increased suspended loading is the proposed impact, therefore, only turbidity data will be used to inform construction activities.

An excursion is defined as any surface reading above the State water quality standard for turbidity (i.e., compliance threshold). **Criteria** for **identifying an excursion** (adapted from SCDES) and **actions to be taken** if turbidity readings exceed the compliance threshold are:

- **If** daily readings exceed the turbidity compliance threshold in more than 10% (but less than 25%) of readings over a rolling 30-day period, Duke Energy will investigate to determine if excursions are result of construction activities or rain event.
  - **If** elevated turbidity is determined to be the result of a rainfall event (i.e., runoff), data characterizing the rain event (timing and amount of precipitation) will be documented using the nearest weather station, along with corresponding recorded turbidity data.
    - **If** turbidity excursions are not clearly linked to a rainfall event, Duke Energy will consult with SCDES if daily readings exceed the turbidity compliance threshold of more than 10% (but less than 25%) of readings over a rolling 30-day period. Similarly, Duke Energy will consult with SCDES if daily readings exceed 25% of readings over a 30-day period.

59

Part I: Lake Jocassee – **Turbidity Variance**

- The turbidity water quality standard for trout waters under S.C. Reg.61-69, is not to exceed 10 NTU or 10% above natural conditions, provided existing uses are maintained. However, **Duke Energy seeks a temporary variance** from SCDES **during construction of Bad Creek II** to meet the turbidity compliance criteria standard for South Carolina freshwater lakes (i.e., 25 NTU).
  - According to S.C. Reg.61-69, a **temporary variance** is "a short-term exemption from meeting certain otherwise applicable water quality standards".

Turbidity Variance Rationale: Turbidity Refugia

- Elevated suspended sediment / turbidity can have behavioral, physical, and habitat effects on fish
  - Non-salmonid species (e.g. bluegill) are considered tolerant of turbidity levels of up to approximately 50 NTU (Gardner 1981). Lloyd (1987) indicates that for salmonids, which are more sensitive to water quality conditions, a "moderate" level of protection roughly translates to turbidity values up to **23 NTU**.
  - **Avoidance** is the primary fish behavioral response to locally turbid water
  - Regardless of the type or magnitude of the impact, it is **important that areas of refugia are available** and accessible for sensitive populations.

60

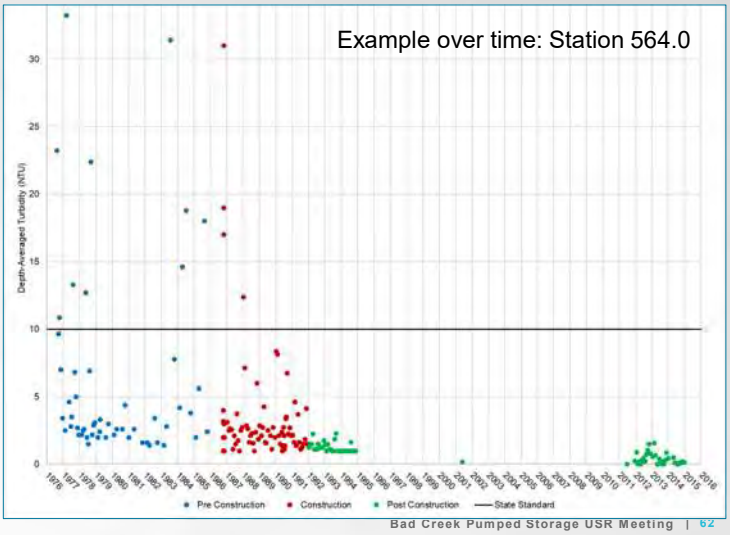
Part I: Lake Jocassee – **Turbidity Variance**

- Whitewater River cove accounts for just **1.5% of the total area of Lake Jocassee**, therefore a large turbidity refugia of similar habitat would be available to species attempting to avoid temporary impacts (98.5% of the lake).
- Because sensitive populations will be able to avoid areas of higher turbidity and increased turbidity levels will be temporary, fish that do move out of the Whitewater River cove to avoid higher turbidities are expected to return following the impact.
- Therefore, a more conservative **turbidity threshold of 25 NTU for compliance reporting**, which would still be protective of natural resources, would allow Duke Energy to construct the new facility while maintaining compliance with state regulations, which is a critical focus of Duke Energy.

61

Part I: Whitewater River Cove – **Conclusions**

- Where data are available, NTU values are higher during pre-construction periods than during construction and post construction periods (see graph below – example from Station 564.0, downstream of weir).
- Turbidity events would likely be short-lived and, based on previous data, recovery in the water column is expected to be rapid.
- Impacts are expected to be **temporary and limited** to the Whitewater River cove.
- A large turbidity refugia is available to sensitive species (98.5% of the lake).



62

Lake Jocassee WQ Reporting

- Lake Jocassee water quality data during construction will be reported per requirements of the SCDES 401 Water Quality Permit and appropriate agencies would be consulted.

63

Part II: Upland Areas – **Potential Impacts**

- Construction of the Bad Creek II Complex could temporarily impact upland surface waters due to increased sediment loading.
- Spoil material (i.e., soil and rock) (estimated 4.4 million cubic yards) are proposed to be deposited in several locations throughout the site; locations are currently under evaluation.
- Sediment runoff due to construction traffic is not included in the WQMP; these activities will be monitored as part of the NPDES Construction Permit.

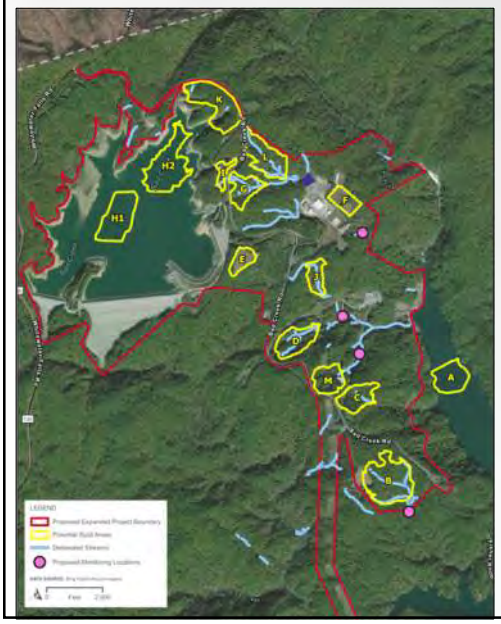
64

Part II: Upland Areas – **Monitoring Rationale**

- Water quality monitoring is not required or proposed as part of the SCDES Construction General NPDES permit; however, Duke Energy proposes to conduct stream habitat quality assessment surveys in perennial streams associated with drainage from spoil areas.
- Duke Energy will install and maintain BMPs in accordance with SCDES permit requirements to **mitigate risks to streams impacted by spoil placement** associated with Bad Creek II construction activities.

65

Part II: Upland Areas – **Survey Locations and Frequency**



- Stream assessments will be conducted at accessible downstream reaches where the **cumulative effect of construction activities** can be observed. These locations will be used to document stream conditions and function where water has flowed from the construction area, through a BMP, and into waters of the U.S. (WOTUS).

Frequency

- **Pre-construction:** Pre-construction surveys of areas that will be impacted by spoil placement and construction activities will be carried out prior to installation of BMPs.
- **Construction:** Surveys will not be carried out in areas that are protected by BMPs required by SCDES environmental permits. Duke Energy will regularly inspect and maintain BMPs to help minimize downstream potential impacts to surface waters.
- **Post-construction:** Surveys will be performed to document post-construction conditions and function. Duke Energy proposes surveys at 1-year, 3-years, and 5-years following commencement of Bad Creek II operations.
  - If necessary, an additional survey will be carried out at 7 years post-construction to ensure streams provide fully functioning and supportive habitat and replicate original (existing) stream conditions.

66

Part II: Upland Areas – Stream Assessments

- Stream assessments will consider stream conditions, aquatic resources, and habitat function and will be supported by routine monitoring of storm events and BMPs, which will be developed and implemented though the Erosion and Sediment Control (ESC) permitting process.
- Methods are in alignment with methods carried out for previous relicensing studies (Aquatic Resources, Task 3) including:
    - **USEPA Rapid Bioassessment Protocol**
    - **NCSAM**
    - **SQT**
    - **Macroinvertebrate sampling**
- Pre-construction monitoring in these areas will be compared with similar post-construction monitoring to document construction-related impacts and also determine when these areas have recovered to pre-construction conditions and to help plan for site restoration / stabilization.

67

WQMP – Standard Operating Procedures

- After the 401 permit is issued, a Standard Operating Procedures (SOP) document will be developed; this is a separate technical document presenting detailed aspects of field monitoring including sampling locations and maps, sampling methods, instrumentation specifications, and field data collection forms.
- The SOP will provide procedures for consistent and scientifically valid quantitative and qualitative monitoring in support of water and aquatic resources for Bad Creek II construction.

68

Break

69

Recreational Resources Study

70

Recreational Resources Task Refresher

Study Task	Status
Task 1 – Foothills Trail Corridor Recreation Use and Needs Study	**Complete**
Task 2 – Foothills Trail Corridor Conditions Assessment	**Complete**
Task 3 – Whitewater River Cove Existing Recreational Use Evaluation	**Complete***
Task 4 – Whitewater River Cove Recreational Public Safety Evaluation	**Complete**

** Task methods and findings were presented during ISR meeting*

71

Task 1 – Foothills Trail Corridor Recreation Use and Needs Study

- **Objective(s):** The goals of the RUN Study were to assess current recreation use and identify any future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy.
- **Status:** **Complete**

72

Task 1 – RUN Study Area

Study Area:

- the 43-mile-long segment of the Foothills Trail, 5 spur trails, and associated access areas on non-Project lands maintained by Duke Energy; the entrance road to Musterground Road; Upper Whitewater Falls Trail Access (US Forest Service)
- 4 trailheads provide vehicular access (Sassafras Mountain, Chimney Top Gap, Laurel Valley, and Bad Creek Hydro Project Trail Accesses)
- 4 trailheads provide boat-in and hike-in only trail access (Horsepasture, Toxaway River, Canebrake, and Laurel Fork Creek Trail Accesses)

73

Task 1 – RUN Study Methods

Data Collection Methods:

- Recreation site inventory
- Traffic & Trail Counters:
  - Foothills Trail
    - March 1-Nov 30, 2023
    - Long Ridge Trail – April 20-Nov 30, 2023
  - Musterground Road Traffic Counter
    - Sept 15, 2023-Jan 15, 2024
    - March 20-May 10, 2024
- Spot counts
  - Laurel Valley Trail Access to supplement the traffic counter data
- In-person surveys
  - Laurel Valley, Toxaway River, Horsepasture River, and Bad Creek Hydro
  - Collected on 30 days (mix of weekdays, weekends, holidays) between March and November 2023
- Online surveys
  - Signs with QR codes/URL were posted at all trail access areas

Table 1 Summary of Data Collection Methods by Location

Locations	Data Collection Methods				
	Recreation Site Inventory	Traffic Counts	Trail Counts	In-Person User Survey	Online User Survey
Table Rock State Park			*		
Long Ridge Trail [a]			*		
Sassafras Mountain Access	*	*	*		*
Chimneytop Gap Access	*		*		*
Laurel Valley Access [b]	*	*	*	*	*
Laurel Fork Falls Access	*		*		*
Toxaway River Access	*		*	*	*
Canebrake Access	*		*		*
Horsepasture River Access	*		*	*	*
Lower Whitewater Falls Overlook	*		*		*
Bad Creek Hydro Access	*	*	*	*	*
Coon Branch Spur Trail			*		*
Musterground Road Access		*			
Upper Whitewater Falls Access		*			

[a] The trail counter at Long Ridge Trail was added after FERC issued the SPD following discussions with stakeholders and was therefore not included in the RSP.
[b] Spot counts were collected at Laurel Valley Access to support traffic counts.

74

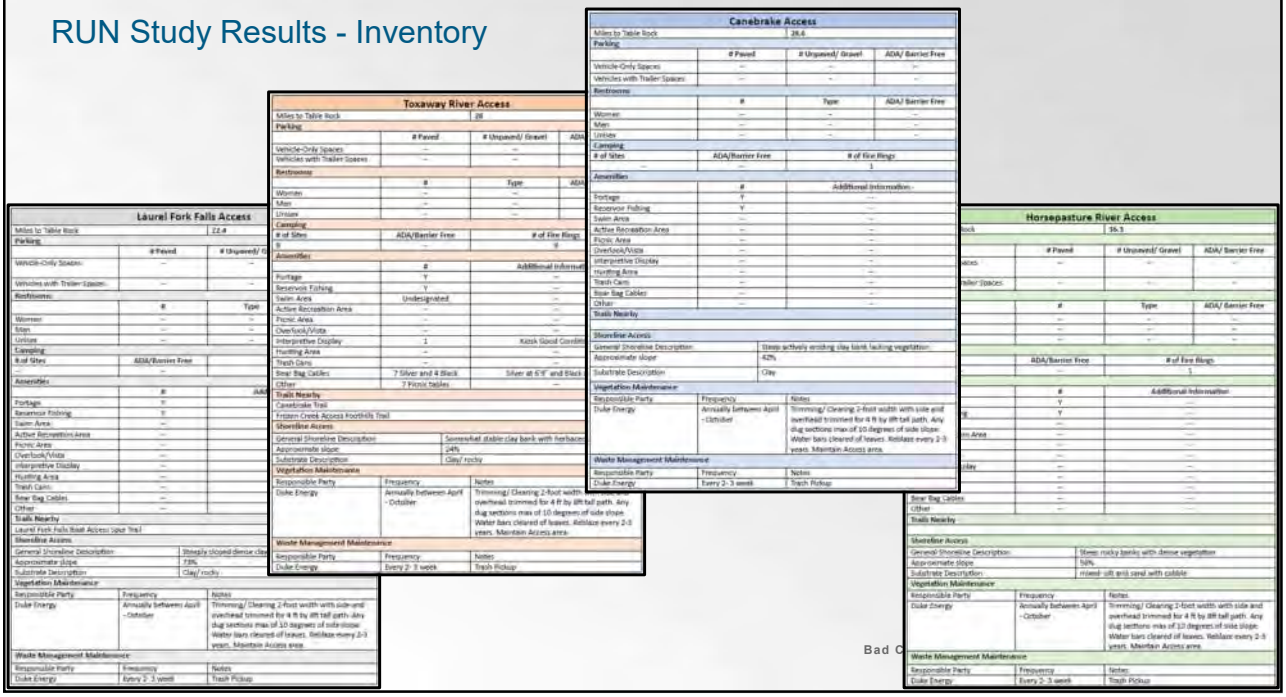
Task 1 – RUN Study Methods Summary

Data Analysis Methods:

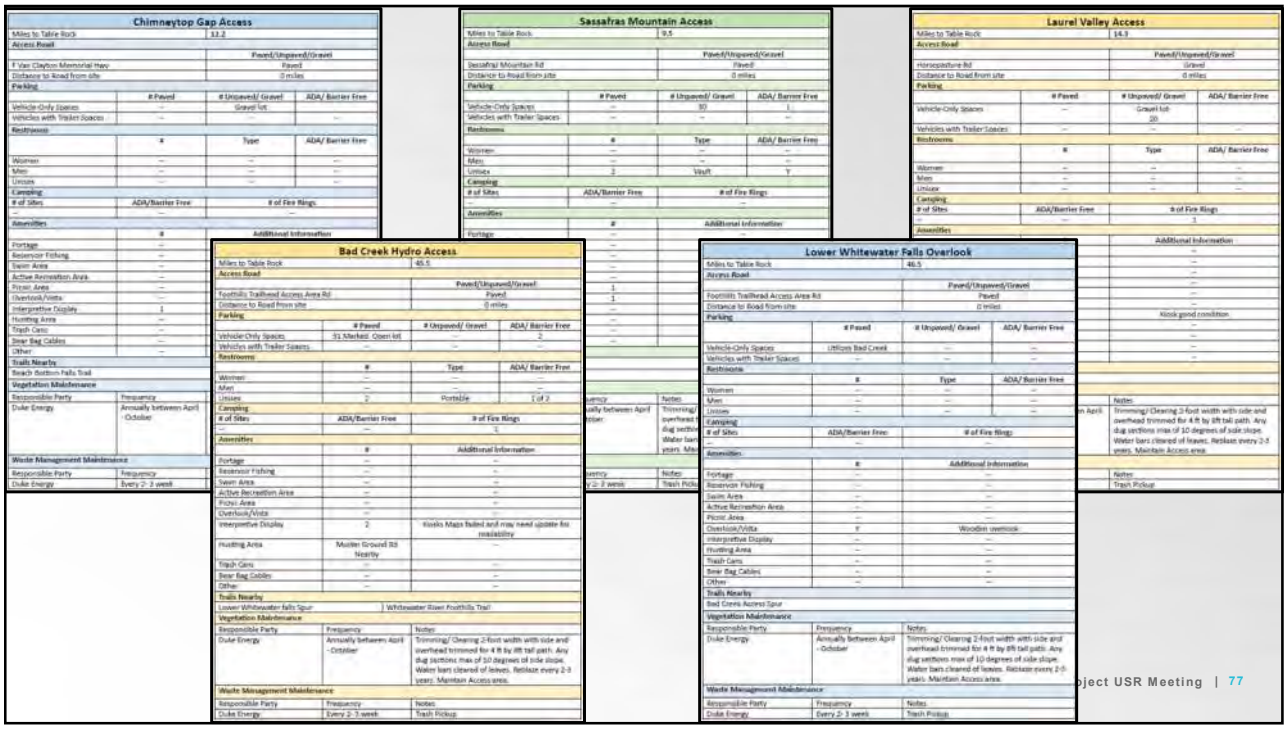
- Current Use Estimates
  - Trail counter data (Foothills Trail)
  - Traffic counter data (Musterground Road)
- User Survey Summaries
  - In-person survey data (4 access areas)
  - Online survey data (all access areas)
- Parking Demand Analysis
  - Traffic counter data (4 access areas)
  - Parking capacity estimates
  - Turnover estimates
  - Parking occupancy rate
- Trail Carrying Capacity Analysis (Applied Trails Research)
  - Current use estimates, parking capacity estimates/campsite information and user survey information
- Future Recreation Use and Needs Analysis
  - Current use estimates
  - Population projections*

75

RUN Study Results - Inventory



76



77

RUN Study Results - Current Use Estimates

Highest Overall Use

Lowest Overall Use

Highest Monthly Use

Month	Total Visitors at Trail Counter Locations by Month												
	Bad Creek Hydro	Coon Branch Spur	Lower Whitewater Falls	Horsepasture River	Canebrake	Toxaway River	Laurel Fork Falls	Laurel Valley	Chimneytop Gap	Sassafras Mountain 1[a]	Sassafras Mountain 2[a]	Long Ridge Trail[b]	Table Rock State Park
March	1,605	358	384	192	259	297	279	531	776	1,815	708	-	6,711
April	2,155	988	341	397	508	939	288	872	592	1,966	771	218	6,876
May	1,896	891	369	520	338	781	273	590	425	1,357	525	430	6,637
June	2,372	845	291	369	213	907	201	418	329	4,023	503	344	8,063
July	2,018	692	253	590	374	1,074	340	286	246	1,112	356	186	9,359
Aug	1,842	579	178	395	115	744	254	221	215	1,297	187	171	6,031
Sept	1,965	677	311	310	217	705	333	401	222	1,080	418	424	7,017
Oct	2,385	945	481	77	411	772	329	667	741	6,134	1,024	836	8,812
Nov	1,606	943	430	90	267	254	227	521	518	7,356	815	445	6,284
Total	**17,844**	**6,916**	**3,035**	**2,939**	**2,702**	**6,473**	**2,522**	**4,507**	**4,064**	**26,140**	**5,307**	**3,054**	**65,788**

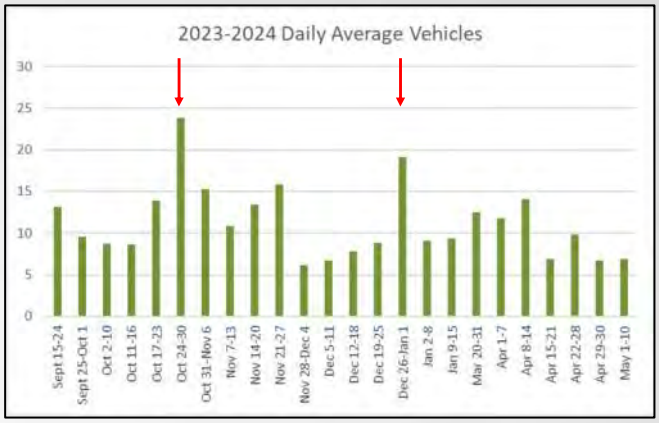
[a] The trail counter identified as "Sassafras Mountain 1" was located on the Foothills Trail approximately 200 ft. west of the observation tower; the trail counter identified as "Sassafras Mountain 2" was located southeast of the observation tower where the parking area meets the Foothills Trail.
[b] The trail counter at Long Ridge Trail was not installed until April 20, 2023.

Bad Creek Pumped Storage Project USR Meeting | 78

78

RUN Study Results - Current Use Estimates, Musterground Road

- Musterground Property managed by SCDNR as a WMA within Game Zone 1
- Various hunting seasons coincide with public access
- Use peaks last week bear (October 24-30) and deer (December 26-January 1) seasons
- Other high use times include:
  - first 10 days the road is opened (September 15-24)
  - first week of bear season (October 17-23)
  - Thanksgiving week
  - end of March through mid-April



79

RUN Study Results - User Survey Summary

- Number of surveys completed by site

Site	# of Surveys
Bad Creek Hydro	96
Horsepasture River	32
Laurel Valley	72
Toxaway River	54
Online	61
Total	**315**

- Demographics:
  - 60.6 % from South Carolina (2% or more from Greenville, Pickens, Oconee, Anderson, Spartanburg, Charleston counties)
  - 16.5 % from North Carolina (2% or more from Jackson, Mecklenburg, Buncombe, Wake counties)
  - Most common group sizes were 1-2 people
  - Most visitors were adults (18-55) followed by senior adults (55+); less than 10% of visitors were children or youth

80

RUN Study Results - User Survey Summary

Primary Reason	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	Total
Hiking	92%	50%	72%	57%	64%	72%
Backpacking	9.4%	69%	39%	67%	23%	35%
Camping	5.2%	19%	13%	50%	11%	17%
Wildlife Viewing	7.3%	6.3%	9.7%	9.3%	15%	9.5%
Picnicking	7.3%	0.0%	0.0%	30%	4.9%	8.3%
Swimming	7.3%	6.3%	4.2%	19%	4.9%	7.9%
Shoreline Relaxation	3.1%	6.3%	5.6%	17%	8.2%	7.3%
Other	6.3%	0.0%	4.2%	9.3%	9.8%	6.3%
Fishing	8.3%	3.1%	1.4%	13%	3.3%	6.0%
Wildflower Viewing	6.3%	3.1%	2.8%	3.7%	11%	5.7%
Birdwatching	4.2%	3.1%	8.3%	3.7%	1.6%	4.4%
Canoeing	1.0%	0.0%	0.0%	5.6%	0.0%	1.3%
Biking	0.0%	0.0%	2.8%	0.0%	0.0%	0.6%
Hunting	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

[1]Note that rows do not sum to 100% because respondents were allowed to list multiple activities.

81

RUN Study Results - User Survey Summary

Parking						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=270)
1 Very Poor	1.1%	0.0%	0.0%	0.0%	0.0%	0.4%
2 Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3 Fair	1.1%	4.8%	0.0%	0.0%	7.7%	2.2%
4 Good	12.9%	33.3%	28.8%	26.3%	30.8%	23.7%
5 Very Good	84.9%	61.9%	71.2%	73.7%	61.5%	73.7%

Crowding						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=309)
1 Very High	0.0%	0.0%	0.0%	1.9%	0.0%	0.3%
2 High	2.1%	0.0%	0.0%	0.0%	3.4%	1.3%
3 Moderate	7.3%	9.4%	2.9%	11.1%	13.8%	8.4%
4 Low	16.7%	21.9%	23.2%	24.1%	44.8%	25.2%
5 Very Low	74.0%	68.8%	73.9%	63.0%	37.9%	64.7%

Campsites						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=142)
1 Very Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2 Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3 Fair	0.0%	0.0%	2.9%	2.4%	10.0%	3.5%
4 Good	30.0%	22.2%	32.4%	9.8%	20.0%	21.1%
5 Very Good	70.0%	77.8%	64.7%	87.8%	70.0%	75.4%

82

RUN Study Results - User Survey Summary

Overall User Experience on Foothills Trail

Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All
1 Very Poor	0.0%	0.0%	0.0%	0.0%	1.6%	0.3%
2 Poor	2.1%	0.0%	0.0%	0.0%	1.6%	1.0%
3 Fair	1.1%	0.0%	0.0%	0.0%	1.6%	0.6%
4 Good	12.8%	12.9%	15.7%	15.7%	16.4%	12.6%
5 Very Good	84.0%	87.1%	84.3%	84.3%	78.7%	85.4%

Hiking Experience on Foothills Trail

Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	Total
1 - Very Poor	0.0%	0.0%	0.0%	2.1%	0.0%	0.3%
2 - Poor	2.1%	0.0%	0.0%	0.0%	1.6%	1.0%
3 - Fair	2.1%	0.0%	0.0%	2.1%	1.6%	1.3%
4 - Good	21.1%	18.8%	22.2%	21.3%	19.7%	20.9%
5- Very Good	74.7%	81.3%	77.8%	74.5%	77.0%	76.5%

Recommended Improvements on Foothills Trail

Recommended Improvements/Comments	Frequency
Better markers/ signs at Bad creek	27
Downed trees	25
Bridge improvements/ repairs	19
Better trail maintenance	15
Restroom improvements/ Install	13
Improved/ added bear hangs/ cables	11

RUN Study Results - Parking Demand Analysis

Month	Parking Occupancy Rate (%)			
	Bad Creek Hydro	Laurel Valley	Sassafras Mountain	Upper Whitewater Falls
March	5%	65%	36%	16%
April	7%	72%	38%	22%
May	5%	63%	34%	24%
June	5%	64%	38%	19%
July	3%	67%	46%	29%
August	3%	52%	33%	26%
September	5%	79%	46%	27%
October	7%	106%	93%	44%
November	6%	79%	45%	21%

Month	Parking Occupancy Rate (%)			
	Bad Creek Hydro	Laurel Valley	Sassafras Mountain	Upper Whitewater Falls
Weekday	3%	46%	31%	20%
Weekend	10%	133%	80%	38%
Holiday	8%	139%	73%	43%

RUN Study Results - Parking Demand Analysis

- **Bad Creek Hydro Access**
  - Parking occupancy **low** over all seasons and day types
  - Parking and crowding not identified issues
- **Laurel Valley Access**
  - Parking occupancy **moderate to high** depending on month and day type
  - Available parking does not always accommodate existing use levels
- **Sassafras Mountain Access**
  - Parking occupancy **high in October**, moderate otherwise
  - Available parking may not accommodate existing use levels in October
- **Upper Whitewater Falls Access**
  - Parking occupancy **low to moderate**; slightly higher October and holidays
  - Available parking accommodates existing use levels

85

Carrying Capacity – IVUMC Definition

Visitor capacity is a component of visitor use management and is the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established.

Desired conditions are defined as statements of aspiration that describe resource conditions, visitor experiences and opportunities, and facilities and services that an agency strives to achieve and maintain in a particular area. Desired conditions describe what conditions, outcomes, and opportunities are to be achieved and maintained in the future, not necessarily what exists today. Descriptions of desired conditions paint a picture of what the particular area will look like, feel like, sound like, and function like in the future. Additional guidance on desired conditions is forthcoming.

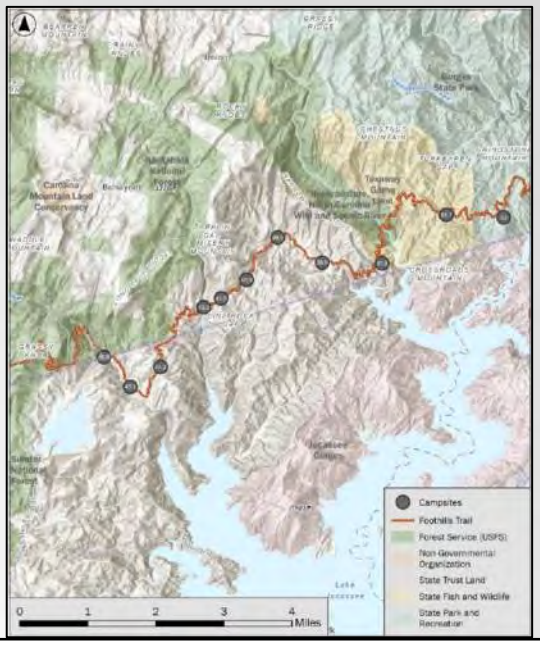
- Areas are typically managed towards desired conditions through monitoring. Quotas and rationing of use (numbers) are one of many tools that may be leveraged in the process.

86

RUN Study Results - Trail Carrying Capacity Assessment

- Parking Infrastructure
  - Vehicles by Type
- Day-use
  - Experiential (crowding/conflict)
- Overnight Use
  - Experiential (crowding/conflict)
  - Infrastructure based (campsite distribution and size)
- Trail Tread
  - Amount of use
  - Managerial resource based (stewardship and maintenance)

- Resource & Experience Based – Desired Conditions
  - Limited impacts to Vegetation, Soils, Water
    - Some litter and human waste present
  - Adequate number and distribution of sites (28 areas, 118 sites along 40+ mile trail)
    - Estimated to be at 5% capacity on average throughout the 2023 use season with a peak at 20%
  - "Well-Ammenitied" which helps to anchor and concentrate use
  - Crowding/Conflict
    - Distribution and size of sites are accommodating use without much conflict



87

RUN Study Results - Trail Carrying Capacity Assessment

Figure 17: Stone campsite furniture at Cantrell Campsite (~FT mile 8.6)

Figure 12: Bear Gap Campsite (~FT mile 33.7)

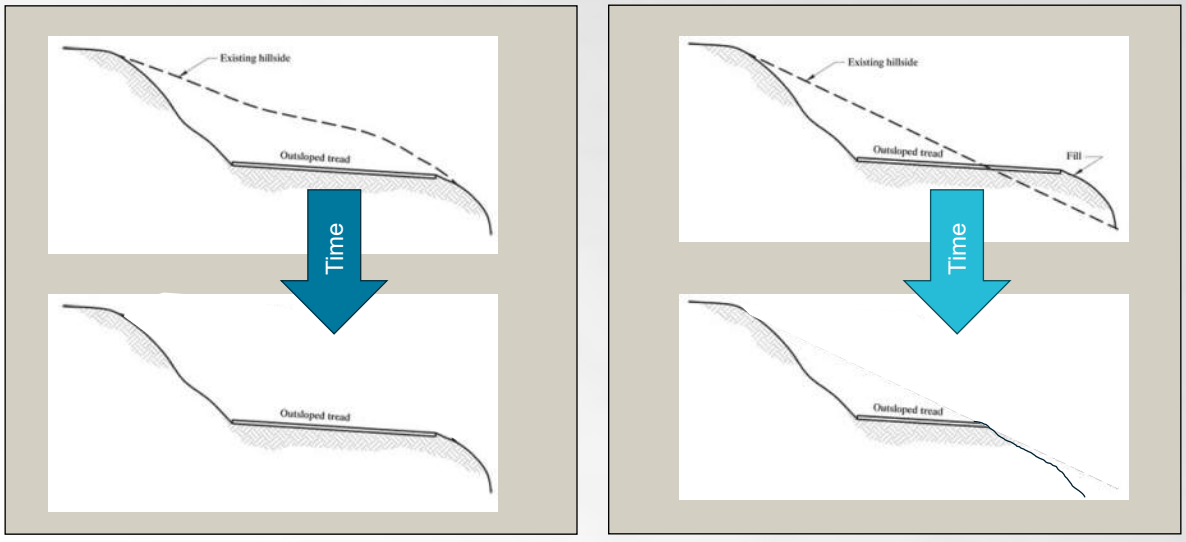
88

RUN Study Results - Trail Carrying Capacity Assessment

- 2023 trail conditions across the Duke Energy managed portion of the Foothills trail are aligned with low-use backcountry trail experiences and conditions.
- Much of the trail utilizes old "woods" road corridors
- Other portions are overly steep and have three significant challenges for long-term sustainability
  - Excessive Grades
  - Wooden Features
  - ½ Bench construction

89

Full Bench v. Half-Bench



90

RUN Study Results - Future Use and Needs Assessment

- **Future Use Estimates**
  - Based on population data from the 11 counties where most survey visitors resided and counties in which the Foothills Trails is located
  - 6 counties in **South Carolina: 13.1 percent increase** in population between 2023 and 2035
  - 5 counties in **North Carolina: 20.6 percent increase** in population between 2023 and 2035
  - Assuming recreation use follows population, future trail use may be **approximately 16.8 percent higher by 2035**

- **Future Needs for Consideration**
  - Parking at Laurel Valley Access
  - Increased trail maintenance
    - Gradual replacement of existing infrastructure with sustainable materials
  - Improved and additional trail markers and signage
  - Improved and/or repaired bridges
  - Increased removal of downed trees
  - Additional and improved restroom facilities and bear cables

Sassafras Mountain Trail Restrooms

Toxaway River Campsite

91

RUN Study Summary

- **Characterization of Current Use**
  - Highest use at Table Rock State Park, Sassafras Mountain, Bad Creek Hydro, Toxaway River
  - Parking areas well used particularly on weekends and holidays
    - Laurel Valley parking area can be over capacity
- **User Survey**
  - Hiking and backpacking most popular activities
  - Respondents reported very good/good hiking experience and overall trail experience
  - Respondents reported very good/good quality of facilities, high trail cleanliness, low crowdedness
- **Future Use Estimates**
  - May be approximately 16.8 percent higher by 2035
  - The increased demand is not expected to affect the ability of most access areas to accommodate use
- **Bad Creek II Complex**
  - Temporary impact to Musterground Road Access and Bad Creek Hydro Access during 5-7 year construction period
    - Duke Energy is planning to relocate Bad Creek Hydro Access and Musterground Road entrance during Bad Creek II Complex construction

Laurel Fork Falls

Horsepasture River Access Bridge

92

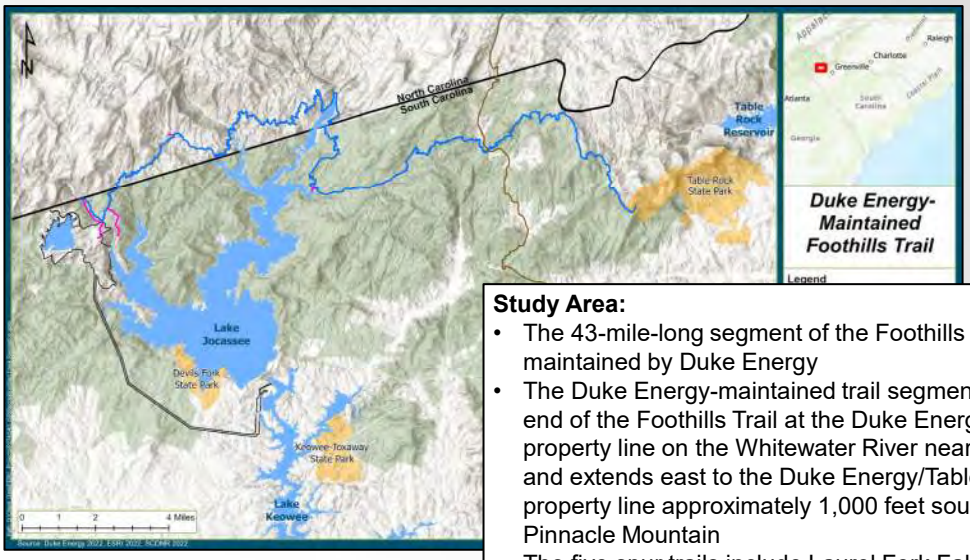
Task 2 – Foothills Trail Corridor Conditions Assessment

- **Objective(s):** To evaluate the current condition of the trail surface and corridor included in the 43-mile segment and associated spur trails of the Foothills Trail maintained by Duke Energy and identify key areas of future maintenance needs or improvements.

- **Status:** **Complete**
- **Work completed by:** **Long Cane Trails, LLC**

93

Trail Conditions Assessment - Study Area



Study Area:

- The 43-mile-long segment of the Foothills Trail and five spur trails maintained by Duke Energy
- The Duke Energy-maintained trail segment begins on the western end of the Foothills Trail at the Duke Energy/US Forest Service property line on the Whitewater River near the Bad Creek Project and extends east to the Duke Energy/Table Rock State Park property line approximately 1,000 feet southwest of the top of Pinnacle Mountain
- The five spur trails include Laurel Fork Falls, Hilliard Falls, Lower Whitewater Falls Overlook, Bad Creek, and Coon Branch

94

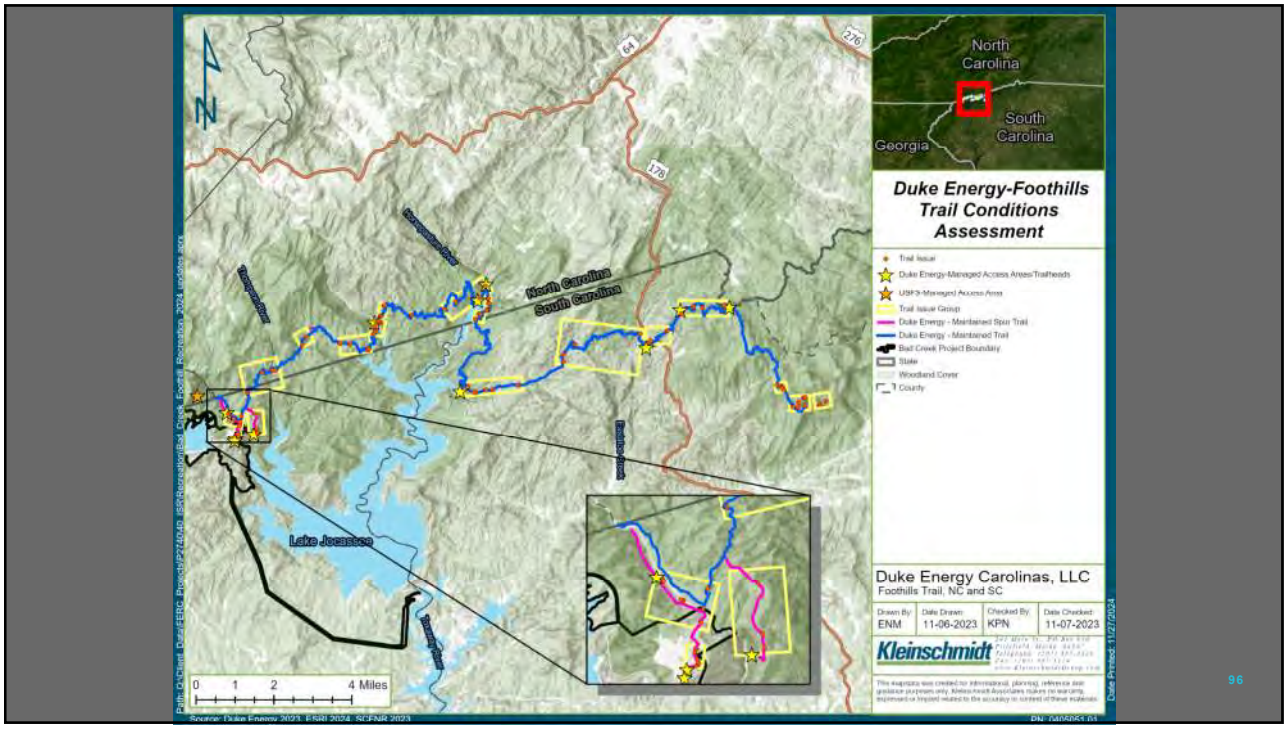
Trail Conditions Assessment - Methods

- The 43-mile segment of the Foothills Trail was divided into 6 sections using the Foothills Trail Guidebook
- Completed Trail Assessment Form
- Locate issue/structure along the trail and record GPS waypoint
- Take photos of significant issues/features for documentation
- Identify type of issue/structure using categories
- Measure issue/structure (i.e., bridges, culverts, eroded sections, washouts, wet areas, and diameters of fallen trees)
- If excessive grade is present (greater than 15 percent slope) in conjunction with erosion, utilize clinometer to measure percent slope
- Provide additional description/comments about issues/structures identified

Trail Assessment Descriptions:

Code	Description
B	Bridges, puncheon, bog bridges, turnpikes. ***Note construction material, length/width (feet) and condition of bridge.***
UC	Unimproved Crossing (stream crossing). ***Note if wading or rock steps and any maintenance required (unstable stepping stones). Note the width of the stream at the crossing point.***
C	Culvert – open or closed drain across the trail. ***Note condition of culvert, length/diameter and if sufficient size for situation.***
E	Erosion - look for exposed roots, rocks, or gullies on trail. ***Describe situation (exposed roots, gullies on tread, located on fall line (going straight down a hill regardless of grade) and length of eroded section (if greater than 25 ft, approximate distance). If excessive grade (>15% slope) in conjunction with erosion: measure steep slopes with clinometer (if numerous steep rocky slopes, no need to measure each one – note that trail has numerous steep rocky sections)***
EC	Erosion Control Devices – check dams, water bars. ***Note type and condition of structure.***
WO	Washout - section of trail has been mostly/completely washed away. ***Note length/width/depth and any hazards associated with washout. Take photo.***
WA	Wet Area/standing water (larger than 3ft diameter). ***Note length/width. Note any adjacent water feature.***
OB	Obstacle – fallen tree or other obstacle blocking treadway (include broken branches or trees leaning above/across the trail ("widow makers"). ***Note diameter of fallen tree.***
IB	Insufficient Blazing/Marking – if can't see next blaze/marker as you are moving past a blaze/marker or hard to locate next blaze marker. ***Note if blazes/markers missing or worn off.***
SI	Signage – ***Identify if Trailhead, Directional or Interpretive and if in need of repair. Note type of repair.***
AC	Additional Comment – specific locations that warrant noting such as a scenic vista, unique feature (caves, mines, rock wall) and locations of invasive species. ***Note type of feature and associated details (such as name of invasive species and amount of plants (number, area).***

95



96

96

Trail Conditions Assessment – Results and Consultation

- LCT identified **89 areas** for maintenance or improvement within the study area
- The draft report was issued to the RC for review on November 21, 2023, and submitted in ISR on January 4, 2024
- During consultation, the FTC identified an additional **30 areas** for desired maintenance or improvement
- Duke Energy met with the RC to discuss study results on February 29, 2024
  - RC agreed that additional information was needed for Trail Issues 1,11, 58 and one item submitted by FTC (FTC 21)
  - Additional field work in March and October 2024
  - Memo submitted to RC on November 21, 2024

Trail	Mile	Key Findings
Bad Creek Access Spur	0.1-0.7	• Culvert Maintenance: A culvert with a clogged drain spanning 80 feet requires clearing to allow proper water flow. • Wet Areas: Low areas on the trail with standing water need gravel addition to raise and level the path, covering 60 feet and 30 feet sections. • Erosion Control: Removal of barricades placed on the side of the trail to address water retention issues. • Steps Replacement: Several steps need replacement due to rot. • Interpretive Signage: Approximately 100 feet of trail has been rerouted, and new blazes are needed to guide hikers.
Coon Branch Spur	0.2	• Bridge Maintenance: Railing and decking replacement for a bridge, involving handrails and decking boards. • Railing Replacement: Two handrails need replacement.
Coon Branch Spur	0.4	• Bog Bridge Installation: Installation of a bog bridge measuring 4 feet x 2 feet. • Drain Cleaning: Major drain undogging is required to prevent overflow onto the trail.
Foothills Trail	31.6-72.8	• Erosion Control: Multiple sections of the Foothills Trail require erosion control measures such as grade reversals, knicks, or drainage improvements. • Steps Replacement: Various steps along the trail need replacement or repair due to damage. • Fallen Trees: Several fallen trees across the trail need removal. • Bog Bridges: Installation of new bog bridges. • Signage: Adding new trail blazes and interpretive signage. • Brush Removal: Clearing overgrown sections of the trail. • Washout Repair: Addressing trail washouts and water diversion. • New Trail Sections: Creating new trail segments to address erosion and trail conditions.
Lower Whitewater Falls Spur	0.4-1.0	• Washout and Erosion: Trail washouts, the need for stairs, and grade dips have been identified, impacting a significant portion of this spur.

97

Trail Conditions Assessment – Results Summary

- During Hurricane Helene in September 2024, the trail sustained significant damage and portions of trail remain closed
  - Duke Energy is currently working to clear trees, repair damage, and re-open the full extent of trail as soon as possible
- Duke Energy has committed to addressing all 89 maintenance and improvement areas identified by LCT and all 30 maintenance and improvement/enhancement areas identified by FTC during consultation.
  - Maintenance items will be addressed before new license issuance
  - Improvements or enhancements will be implemented following new license issuance/RMP approval

98

Task 3 – Whitewater River Cove Existing Recreational Use Evaluation

- **Objective(s):** Establish baseline recreational use within the study area, specifically the level of boating use in Whitewater River cove; and quantify recreational impacts of temporary closures of Whitewater River cove during construction of Bad Creek II Complex.
- **Status:** **Complete**

99

Task 3 – Whitewater River Cove Recreation Evaluation Summary

- Whitewater River cove is primarily visited by recreators in motorboats
- Boats tend to follow the eastern shoreline of the cove and congregate in the northern tip of the cove near the waterfall
- Visitors are assumed to be primarily sightseers (viewing the waterfall) and secondarily fishermen
- Recreation impacts from Bad Creek II Complex construction:
  - Between 19,895 and 27,852 boats displaced during 5–7-year construction period (approximately 4,000 boats per year)
  - Approximately **1-2 percent of recreation** days per year at Lake Jocassee would be affected; however, this impact (i.e., displacement) is for Whitewater River cove only.

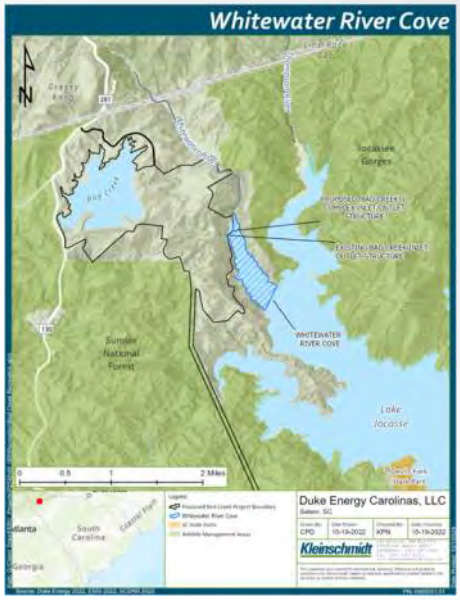
100

Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Objective(s):** Evaluate potential public safety risks that may be created or exacerbated by the Bad Creek II Complex during both the construction and operation phases. The evaluation will include but not be limited to identification of areas where access will be temporarily or permanently restricted to the public as well as a boater safety evaluation for the Whitewater River arm of Lake Jocassee.
- **Status:** **Complete**

101

Whitewater River Cove Public Recreational Safety Evaluation



- This study task is based on results from:
  1. **Recreational Resources Task 3 Study** *(Whitewater River Cove Existing Recreational Use Evaluation)*
  2. **Water Resources Task 3 Study** *(CFD Study)*
- The study area includes the Whitewater River cove of Lake Jocassee. Bad Creek II operations could affect surface velocities in the Whitewater River cove downstream of the I/O structure(s) **potentially affecting recreational use (i.e., boating) and safety.**
- Safety risks during construction of the proposed Bad Creek II Complex are not considered in this evaluation as the cove will be closed to public access during construction activities (estimated up to 7 years). Therefore, there are not potential boater safety concerns during the construction phase.

102

Whitewater River Cove Public Recreational Safety Evaluation

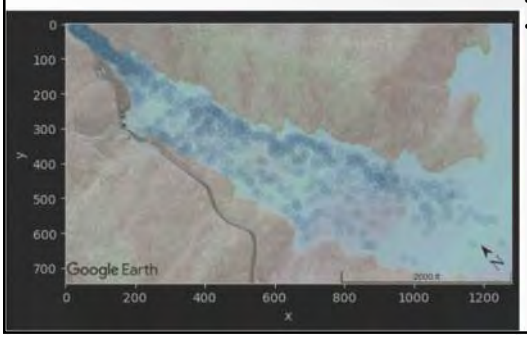
- **Recreational Task 3 Results:**
  - Boats in summer 2023 in Whitewater River cove were:
    - Motorboats (83 percent)
    - Personal watercraft (10 percent)
    - Kayaks (7 percent)
    - Canoes (less than 1 percent)
    - No paddleboards observed

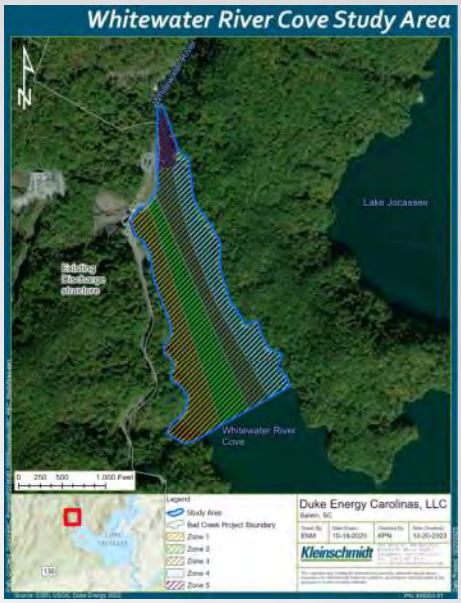
Table 4-2 Total Number of Boats and Boat Types per Flight

Flight/Survey Date	Day Type	Total # of Boats	Total # of Each Boat Type			
			Kayak	Personal Watercraft	Canoe	Motorboat
Sunday, May 28, 2023	Holiday	4	0	2	0	2
Wednesday, May 31, 2023	Weekday	4	0	0	0	4
Friday, June 2, 2023	Weekday	8	4	1	0	3
Saturday, June 3, 2023	Weekend	25	7	0	1	17
Tuesday, June 13, 2023	Weekday	13	3	0	0	10
Saturday, June 24, 2023	Weekend	34	2	1	0	31
Wednesday, June 28, 2023	Weekday	20	0	0	1	19
Saturday, July 1, 2023	Weekend	38	2	3	0	33
Tuesday, July 4, 2023	Holiday	35	1	1	0	33
Friday, July 14, 2023	Weekday	15	0	3	0	12
Saturday, July 15, 2023	Weekend	47	0	10	0	37
Thursday, July 20, 2023	Weekday	12	4	0	0	8
Saturday, July 29, 2023	Weekend	41	0	1	1	39
Monday, July 31, 2023	Weekday	21	1	0	0	20
Sunday, August 6, 2023	Weekend	14	3	6	0	5
Monday, August 7, 2023	Weekday	1	0	0	0	1
Wednesday, August 23, 2023	Weekday	8	0	1	0	7
Sunday, August 27, 2023	Weekend	22	0	1	0	21
Sunday, September 3, 2023	Holiday	48	0	13	0	35
Monday, September 4, 2023	Holiday	30	2	0	0	28
Total		**440**	**29**	**43**	**3**	**365**

Whitewater River Cove Public Recreational Safety Evaluation

- **Recreational Task 3 Results:**
  - Boats were observed in the following zones:
    - **Zone 5** (49 percent)
    - **Zone 3** (20 percent)
    - **Zone 4** (17 percent)
    - **Zone 1** (9 percent)
    - **Zone 2** (5 percent)
  - Majority of use was on weekends/holidays (day type) and July (month)
  - Duration of time in cove:
    - 90% of boaters: <1 hour
    - 9% of boaters: 1-2 hours
    - 1% of boaters: >2 hours

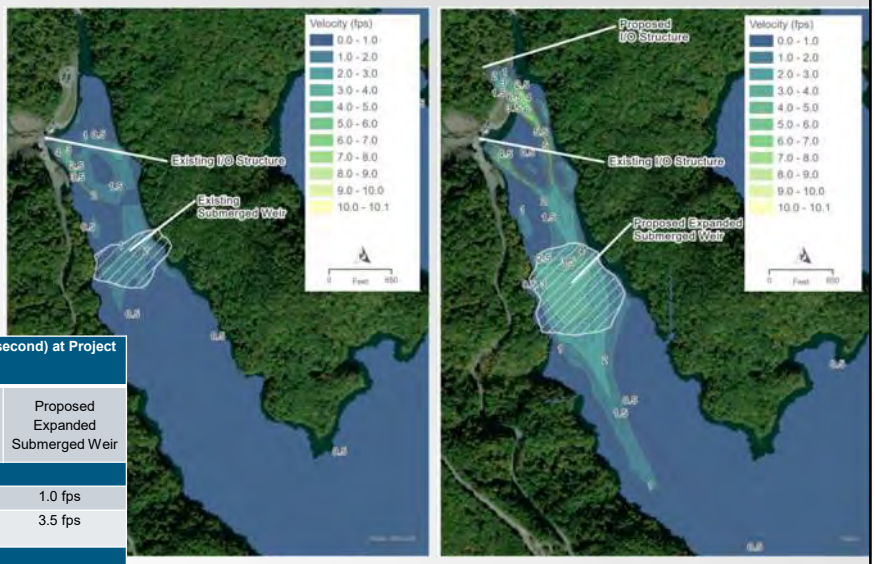




Existing vs. Proposed: Max Generation, Min Pond

Water Resources Task 3 Results:

- Operations from Bad Creek II will not measurably change surface velocities or flow patterns in the Whitewater River cove except if Lake Jocassee is at **min pond**.
- Surface velocities immediately downstream of the proposed I/O structure under max generation with both facilities operating is 6.5 fps.

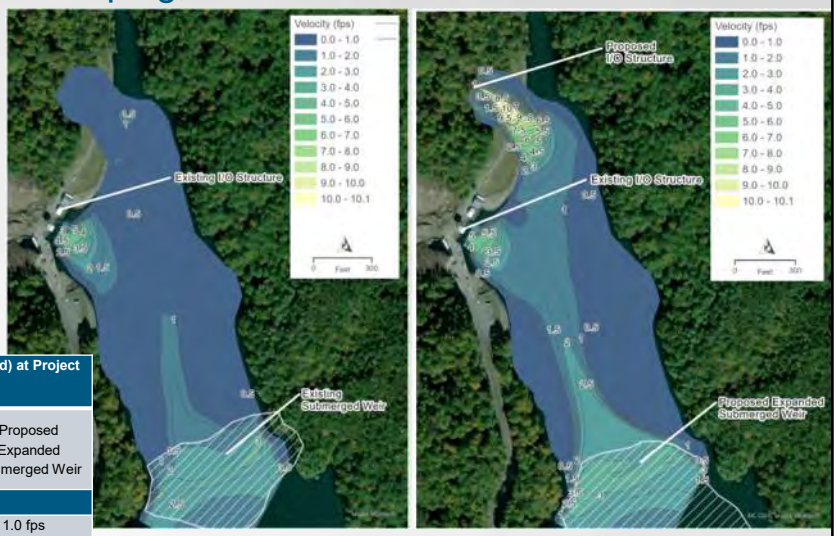


	Maximum Water Surface Velocities (feet per second) at Project Structures			
Pond Elevations	Existing I/O Configuration	Proposed I/O Configuration	Existing Submerged Weir	Proposed Expanded Submerged Weir
Pumping Operations				
Full Pond	2.0 fps	2.0 fps	1.0 fps	1.0 fps
Minimum Pond	5.0 fps	10.0 fps	3.5 fps	3.5 fps
Generating Conditions				
Full Pond	2.5 fps	2.5 fps	2.0 fps	2.0 fps
Minimum Pond	4.0 fps	6.5 fps	2.0 fps	4.0 fps

105

Existing vs. Proposed: Max Pumping, Min Pond

- As noted earlier, surface velocities immediately downstream of the proposed I/O structure under max pumping with both facilities operating is 10.0 fps.
- Duke Energy will implement safety plan to eliminate recreational boating near the structure during drawdown conditions.



	Maximum Water Surface Velocities (feet per second) at Project Structures			
Pond Elevations	Existing I/O Configuration	Proposed I/O Configuration	Existing Submerged Weir	Proposed Expanded Submerged Weir
Pumping Operations				
Full Pond	2.0 fps	2.0 fps	1.0 fps	1.0 fps
Minimum Pond	5.0 fps	10.0 fps	3.5 fps	3.5 fps
Generating Conditions				
Full Pond	2.5 fps	2.5 fps	2.0 fps	2.0 fps
Minimum Pond	4.0 fps	6.5 fps	2.0 fps	4.0 fps

106

Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Boater Safety Conclusions**
  - Most changes (i.e., increases) in maximum surface velocities due to operational and pond level scenarios would likely go unnoticed for operators of motorboats with the exception of increased (up to 10.0 fps) velocities adjacent to the proposed I/O structure during pumping operations at minimum pond.
  - Higher velocities during these conditions could affect kayaks and canoes near the proposed I/O structure (difficult paddling).

Previously stated conclusions (Water Resources Task 3):

- Areas immediately adjacent to I/O structure will likely be restricted.
- Boaters could travel along the eastern shoreline instead of near the Project if concerned about higher flows near the station.
- The area immediately upstream of the Project would be dewatered and would preclude boating regardless of operations.
- Bad Creek would not likely operate at maximum pumping capacity under maximum drawdown scenario.
- Since its creation, Lake Jocassee has never been at maximum drawdown.

107

Proposed Public Safety Measures

- While **no public safety concerns** related to typical operations exist, Duke Energy proposes to **implement the following public safety measures**:
  - Educate the public about potential hazards.
  - Restrict public access in the immediate vicinity of the I/O structure by installing floating boat barrier.
  - Post signage near structures: "*Warning: Restricted Area, No Trespassing*."
  - Post signage on each bank of the of the Whitewater River cove
  - Post signage at Devils Fork State Park kiosks with information on the Bad Creek Project and associated website and that encourages boaters to check Project operation schedules prior to boating in the Whitewater River cove.
  - Implemented public safety measures at the Project will be incorporated into the Bad Creek Public Safety Plan which will be updated and submitted to FERC for approval.

108

Lunch

109

Aquatic Resources Study

110

Aquatic Resources Study Task Refresher

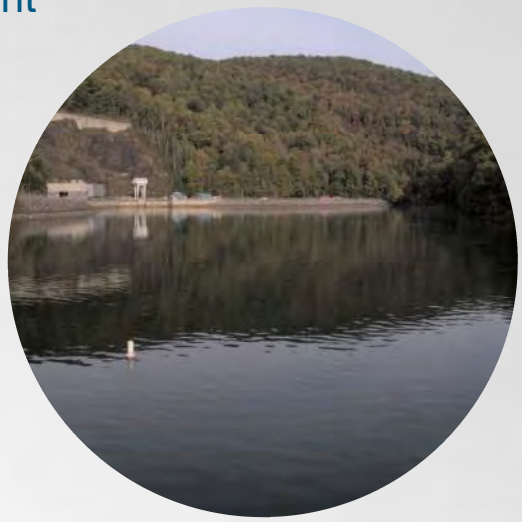
Study Task	Status
Task 1 – Consultation on Entrainment	**Complete***
Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat	**Complete**
Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna	**Complete***

** Task methods and findings presented during ISR meeting*

111

Task 1 – Consultation on Entrainment

- **Objective(s):** Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II Complex and consult with agencies and other Project stakeholders regarding results of the recent desktop Entrainment Study (Kleinschmidt 2021).
- **Status:** **Complete.**
- **Update:** Following comments from the FERC on the ISR as well as updated operations for Bad Creek II, two additional supplemental reports were developed and filed with the USR. These results are provided in the following slides.



112

Task 1 – Consultation on Entrainment – Addendum 1

- Additional modeling was carried out in 2024 to incorporate **updated hydraulic capacities** associated with Bad Creek II that were not available during original modeling (design change to variable speed units).
  - An addendum to the Entrainment report was developed (Addendum 1) and filed with the USR
- To simulate future operations while ensuring equal volumes pumped, Kleinschmidt derived a coefficient based on pumping the same volume of water as existing conditions:
  - Addition of Bad Creek II reduces operational times by 58.8% (0.412)
  - Example: If the existing (recently upgraded) Project and Bad Creek II were run at full capacity for ***6 hours***, they would pump 773,280,000 ft^3; existing Project would need to run for ***14.55*** hours to pump the **same volume of water.**
- Annual entrainment estimate remains 90,825 - 119,208 fish per year dependent on water elevation.

113

Task 1 – Consultation on Entrainment – Addendum 2

- Per the Commission's ISR comment/request, a **literature review** was carried out for the intrinsic population growth rate of Threadfin Shad and Blueback Herring.
  - An addendum to the Entrainment report was developed (Addendum 2) and filed with the USR
- Utilized lifestage specific survival rates to determine population growth rates based on Clean Water Act Section 316(b) entrainment and impingement estimates[1]
- Scenarios: low vs high fecundity, dry vs normal water
- Annual population estimates highly variable, self-sustaining over a 20-year cycle
- Lake Jocassee populations of both species have been self-sustaining for the entire term of Project license; facility is likely at or below maximum sustainable entrainment
- Bad Creek II would not substantially increase the number of entrained organisms **because the overall volume of water pumped would remain the same**

[1] *Electric Power Research Institute (EPRI). (2012). Fish Life History Parameter Values for Equivalent Adult and Production Foregone Models: Comprehensive Update. EPRI, Palo Alto, CA: 2012. Technical Report 1023103*

114

Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

- **Objective(s):** Assess changes to (1) pelagic and (2) littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and Keowee-Toxaway Hydroelectric Project (KT Project) relicensing.
- **Status:** **Complete.**

115

Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

116

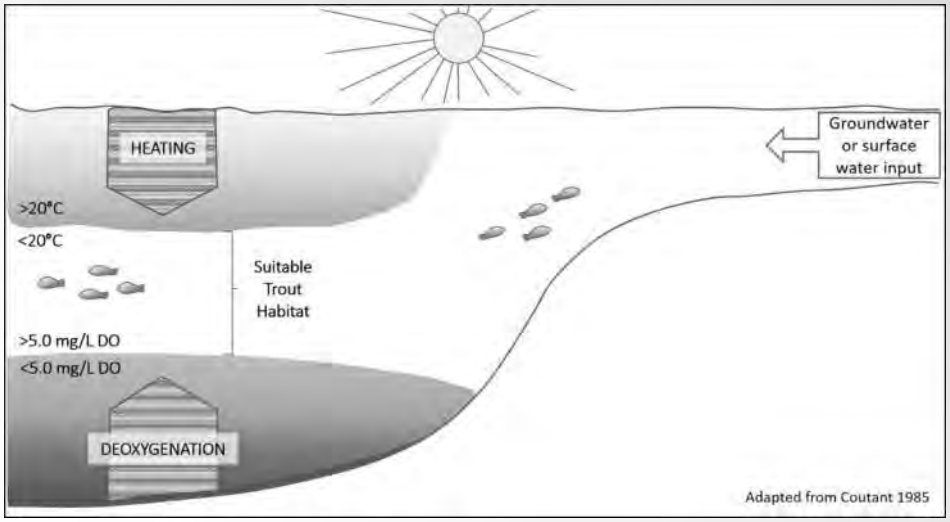
Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

117

Task 2 Results

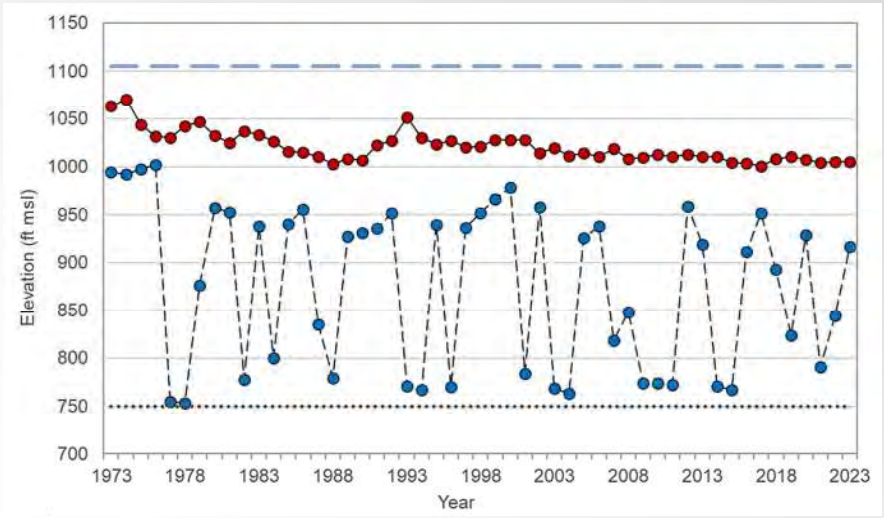
Pelagic Trout Habitat Monitoring



118

Task 2 Results

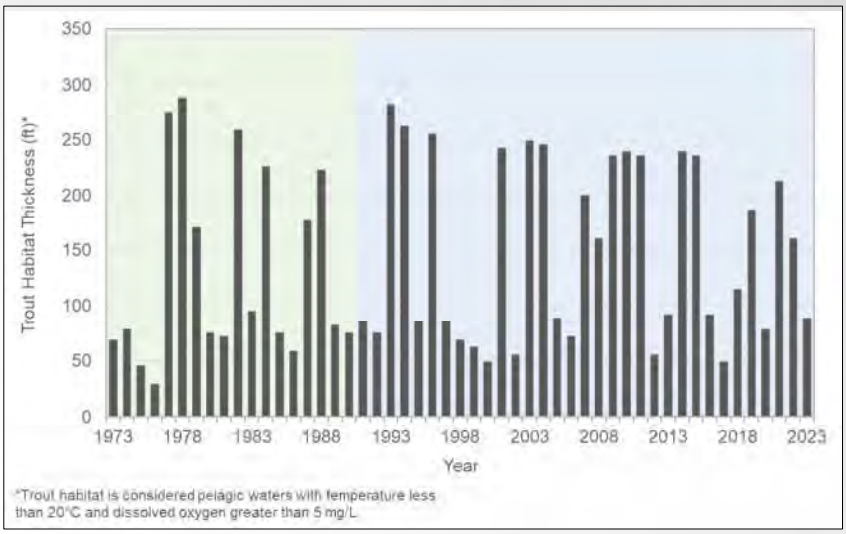
Pelagic Trout Habitat Monitoring



119

Task 2 Results

Pelagic Trout Habitat Monitoring



120

Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

121

Task 2 Results

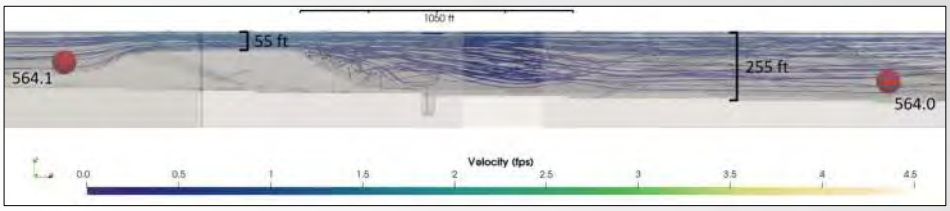
CFD Model Results Review

Generation under full pond elevation

(full pond; 1,110 ft msl)

- Slight flow acceleration over the top of the expanded weir and downstream
- Effect does not extend further than Whitewater River cove

- Water column mixing immediately downstream of the weir, but does not extend more than 1,050 ft



122

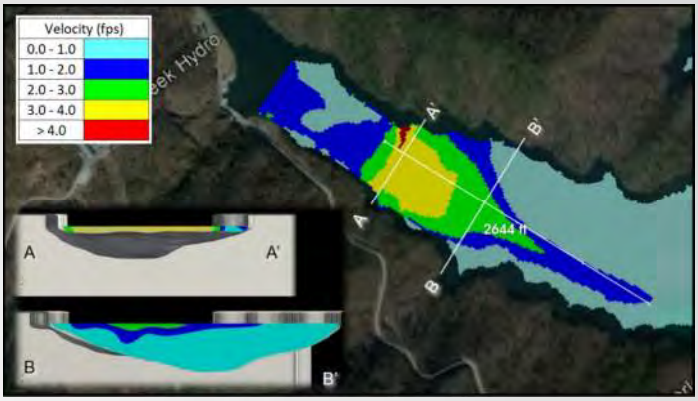
Task 2 Results

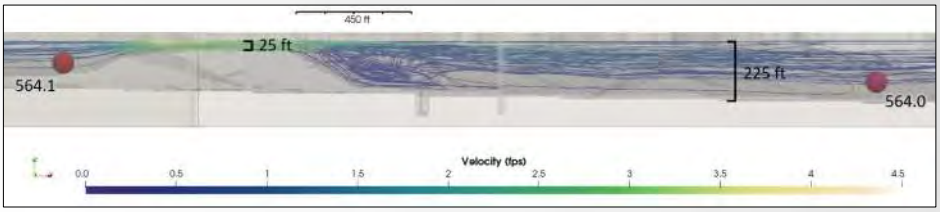
CFD Model Results Review

Generation under minimum pond elevation

(maximum drawdown; 1,080 ft msl)

- Velocity increase over the weir
- Effect does not extend further than Whitewater River cove
- Water column mixing immediately downstream of the weir, but does not extend more than 450 ft





123

Task 2 Findings

Pelagic Trout Habitat Assessment

- Pelagic trout habitat in Lake Jocassee is variable and driven by natural environmental fluctuations and to some extent, Jocassee project operations
- Similar trout habitat thickness before vs. after Bad Creek operations began in 1991
- Submerged weir currently, and predicted to provide energy dissipation effects downstream of the weir and into Lake Jocassee
- **No impacts to pelagic trout habitat resulting from proposed Project operations are expected**

124

Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

125

Task 2 Methods

CHEOPS Model Update

- HDR's proprietary CHEOPS* model was originally developed in support of the Keowee-Toxaway Project relicensing
- Evaluates the effects of operational changes and physical modifications at multi-development hydroelectric projects
- Performance measures (PMs) – a statistical summary of model output – were developed in consultation with relicensing stakeholders (particularly SCDNR)
- PMs related to frequency of water surface fluctuations and water surface elevations in the littoral zone were evaluated for this study
- Data: hydrologic data set 1939-2011
- Scenarios
  1. Baseline (operations based on Bad Creek and KT Project license requirements)
  2. Bad Creek II (Baseline + four additional units)

*__CHEOPS__: __C__omputer __H__ydro-__E__lectric __O__perations and __P__lanning __S__oftware™

126

Task 2 Methods

CHEOPS Model Update

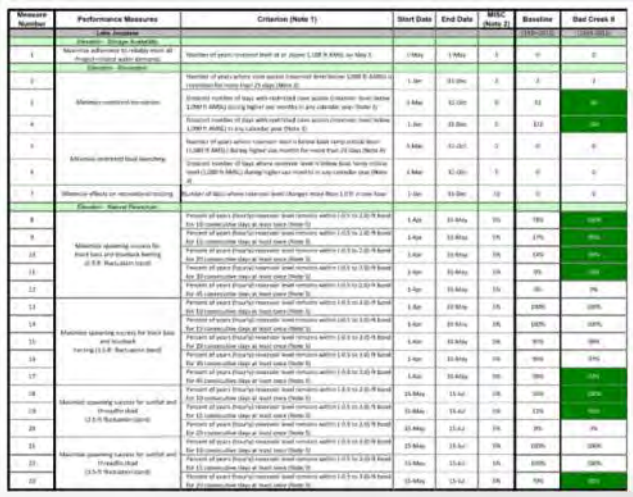
- 21 of 69 PMs evaluated in the Water Resources Task 4 study were selected for review
- Those selected were related to fish spawning, littoral zone habitat, and water surface elevations

Performance Measures	Measure Number	Criterion	Start Date	End Date	MISC[1]
Maximize spawning success for black bass and Blueback Herring (2.5-ft fluctuation band)	8	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once[2]	1-Apr	31-May	5%
	9	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once[2]	1-Apr	31-May	5%
	10	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once[2]	1-Apr	31-May	5%
	11	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 30 consecutive days at least once[2]	1-Apr	31-May	5%
	12	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 45 consecutive days at least once[2]	1-Apr	31-May	5%
Maximize spawning success for black bass and Blueback Herring (3.5-ft fluctuation band)	13	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once[2]	1-Apr	31-May	5%
	14	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once[2]	1-Apr	31-May	5%
	15	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once[2]	1-Apr	31-May	5%
	16	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 30 consecutive days at least once[2]	1-Apr	31-May	5%
	17	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 45 consecutive days at least once[2]	1-Apr	31-May	5%
Maximize spawning success for sunfish and Threadfin Shad (2.5-ft fluctuation band)	18	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once[2]	15-May	15-Jul	5%
	19	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once[2]	15-May	15-Jul	5%
	20	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once[2]	15-May	15-Jul	5%
Maximize spawning success for sunfish and Threadfin Shad (3.5-ft fluctuation band)	21	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once[2]	15-May	15-Jul	5%
	22	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once[2]	15-May	15-Jul	5%

Task 2 Results

CHEOPS Model Update

- Bad Creek II operations and lake levels would be constrained by the existing KT Project FERC license
- Most PMs evaluated showed **no significant change, or showed significant improvement** from the Baseline scenario
- Based on 24-hour elevation fluctuations, Bad Creek II operations would be offset by JPSS operations, resulting in **more stable surface elevations**
- Reservoir levels to support littoral habitat during the growing or spawning season were **not significantly different** under the Bad Creek II scenario vs. Baseline
- The model showed **zero days** where Lake Jocassee would be below 1,081 ft msl (minimum elevation)



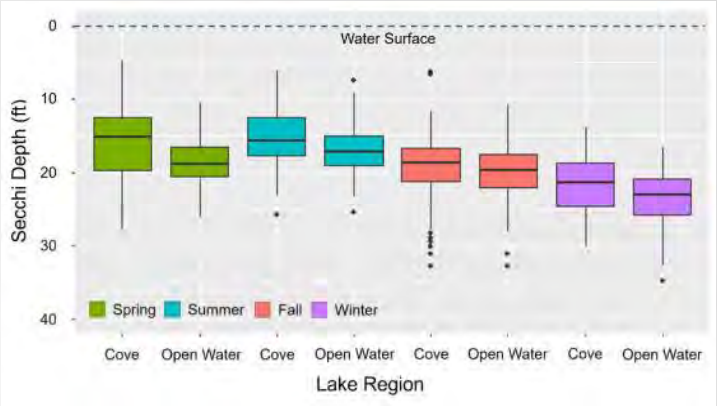
Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

Task 2 Results

Secchi Depth Data and Analysis

- Lake Jocassee is an oligotrophic reservoir
  - Secchi depth generally ≥15 ft
- Differences observed depending on proximity to tributaries, and seasonally
- Secchi depth higher in the water column (i.e., lower water clarity) in cove regions compared to open water



Region	Mean Secchi Depth
Open water	19.6 ft (SD = 4.1)
Cove	17.9 ft (SD = 5.1)

Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

131

Task 2 Methods

Estimation of the Littoral Zone

- Known relationships between **Secchi depth and light extinction to calculate the depth of the euphotic zone** (the water column that receives between 1 and 100% of incident radiation from the water surface to the lake bottom)

Region	Euphotic Zone Depth (ft)
Cove	48.4
Open Water	53.0

- Subtracted the euphotic zone depth from water surface elevation (WSE) (upper bound) to find the lake bottom elevation (lower bound) for each of five scenarios

Littoral Zone Scenario	WSE (Upper Bound)	Lake Bottom Elevation (Lower Bound)	
		Cove Region	Open Water Region
1. Maximum Elevation	1,110	1,062	1,057
2. Littoral Zone Habitat During Growing/Spawning Season (High)	1,107	1,059	1,054
3. Littoral Zone Habitat During Growing/Spawning Season (Low)	1,105	1,057	1,052
4. Normal Minimum Elevation	1,096	1,048	1,043
5. Minimum Elevation	1,080	1,032	1,027

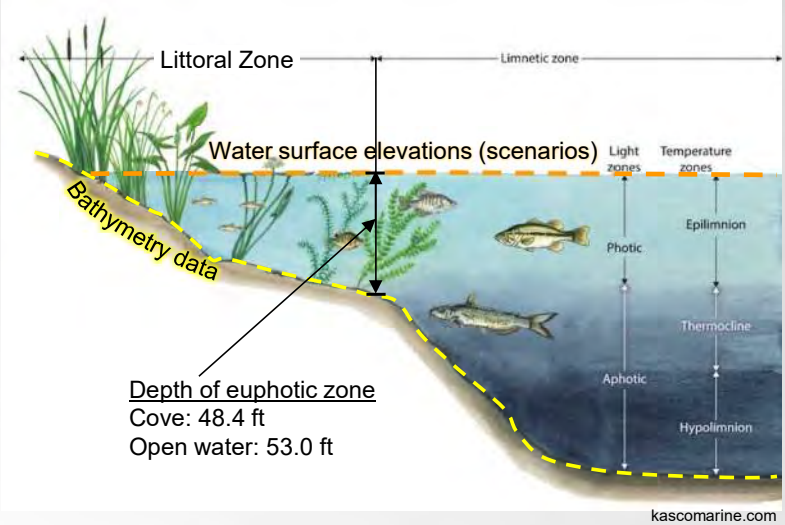
132

Task 2 Results

Estimation of the Littoral Zone

The spatial area of the littoral zone was estimated by

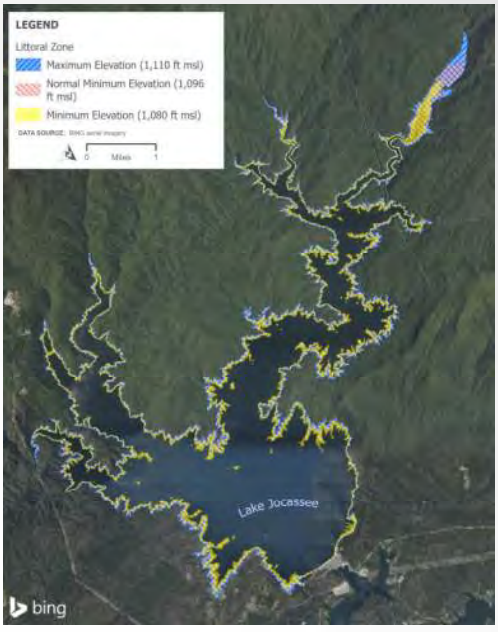
1. Calculating littoral zone depth for cove and open water regions
2. Using pre-defined water surface elevations for each scenario
3. Extracting the area of the lake between the water surface elevation and bottom of the littoral zone

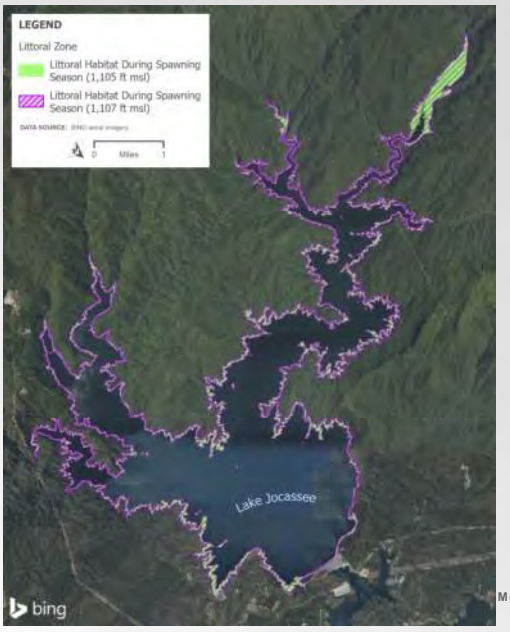


kascomarine.com

133

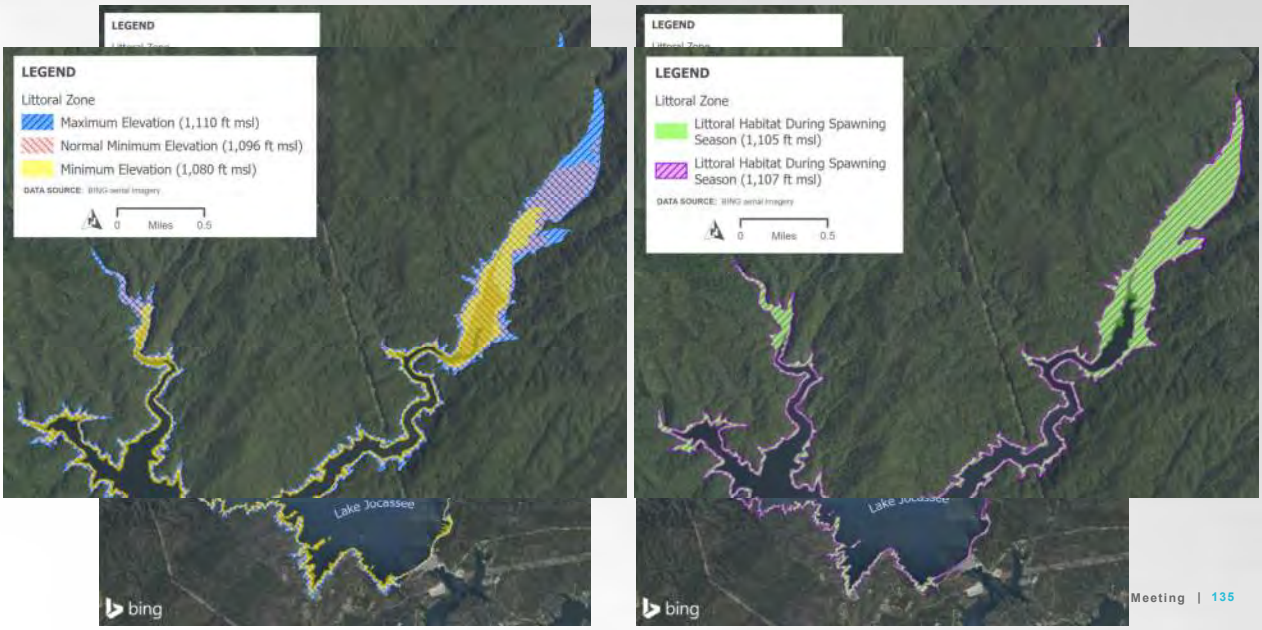
Task 2 Results Estimation of the Littoral Zone





134

Task 2 Results **Estimation of the Littoral Zone**



135

Task 2 Results
Estimation of the Littoral Zone

Littoral Zone Scenario	Littoral Zone Area (acres)			Percent difference from Maximum Elevation
	Cove	Open Water	Total	
1. Maximum Elevation (1,110 ft msl)	718.5	738.8	1,457.3	--
2. Littoral Zone Habitat During Growing/Spawning Season (High) (1,107 ft msl)	703.9	731.3	1,435.2	**-1.5**
3. Littoral Zone Habitat During Growing/Spawning Season (Low) (1,105 ft msl)	701.4	733.2	1,434.6	**-1.6**
4. Normal Minimum Elevation (1,096 ft msl)	671.7	749.7	1,421.4	**-2.5**
5. Minimum Elevation (1,080 ft msl)	541.5	746.5	1,288.0	**-11.6**

136

Task 2 Findings

Littoral Habitat Assessment

- The CHEOPS model suggests the addition of the Bad Creek II will **not** result in impacts to spawning success or littoral zone habitat as compared to the Baseline scenario
- Some conditions (e.g., spawning success) may improve with the addition of Bad Creek II Complex operations as indicated by the PMs
- The CHEOPS model, based on the hydrologic data set (1939-2011), showed **zero** days where Lake Jocassee WSE would be below 1,081 ft msl (PM 32) (the scenario representing minimal amount of littoral habitat).
- Lake Jocassee WSE is between 1,104 ft msl and 1,109 ft msl 90% of the time under both the Baseline and Bad Creek II scenarios. This range encompasses the "high" littoral zone habitat scenario in the CHEOPS model and *maintains 98.4-98.5% of littoral habitat*
- **No impacts to littoral habitat resulting from proposed Project operations are expected**

137

Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- **Objective(s):** Evaluate potential direct impacts to aquatic habitat (including wetlands) related to Bad Creek II Complex construction activities and weir expansion by quantifying and characterizing surface waters, including resource quality.
- **Status:** Complete

138

Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- Task 3 was covered in the ISR and included:
  - SCDNR site visit, meetings, consultation
  - Methods for stream habitat assessments
  - USEPA Rapid Bioassessment Protocol (RBP) scores and stream conditions
  - NCSAM stream types and functional ratings
  - Riparian vegetation assessment methods and results
  - Mussel survey methods and results
  - Fish community sampling results (Howard and Limber Pole creeks)
  - Macroinvertebrate sampling results
  - Stream Quantification Tool (SQT) results
- **Post-ISR Updates**:
  - Following **additional collaboration with the SCDNR,** RBP scores changed slightly; however, the overall stream condition categories remained the same (all results = Optimal and Suboptimal ratings)
  - Scores for the SQT used for the **Fisher Knob Access Road** were also updated, however, Fisher Knob Access Road is no longer being pursued for Bad Creek II

139

Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

Conclusions

- **Stream Habitat Assessments**
  - Streams within spoil locations and those potentially crossed by the temporary access road generally represent *stable, fully functioning conditions*
  - Characteristics across stream habitat quality rating methods which reduced overall scores included lack of baseflow (i.e., intermittent streams), natural entrenchment, streambank erosion, and/or limited quantities of large woody debris
- **Mussel Surveys**
  - No mussel habitat present in upland spoil locations
  - No mussels observed in Howard Creek, Limber Pole Creek, or Lake Jocassee

140

Environmental Justice Study

141

Environmental Justice Study

Objective(s):

- Identify presence of environmental justice communities that may be affected by the relicensing and proposed project expansion.
- Identify the presence of non-English speaking populations that may be affected by the project.
- Identify the presence of sensitive receptor locations in the geographic scope.
- Discuss the effects of the relicensing on any identified environmental justice communities and effects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
- Identify mitigation measures to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope

- **Status:** **Complete**
  - **Update**: In comments provided on the ISR, FERC staff requested that Duke Energy perform public outreach within EJ communities identified during the EJ Study. This presentation describes these public outreach activities.

142

Environmental Justice Study - Results

- One EJ community based on race identified in Transylvania County (NC) – primarily within the 5-mile buffer zone, with southwest portion in 1-mile buffer zone
- Two EJ communities based on low income identified in Oconee County (SC) and Transylvania County (NC) – both within 5-mile buffer zone

143

Summary of EJ Study Results

- The existing Bad Creek Project's continued operation is not expected to cause any effects on the parameters analyzed.
- The impacts to EJ communities from construction of the Bad Creek II Complex would be minimal due to the distance between construction activities and the nearest residential areas with EJ populations.

144

Public Outreach

- In comments provided on the ISR, FERC staff requested that Duke Energy perform public outreach within EJ communities identified during the EJ Study.

145

Environmental Justice Study – Public Outreach Plan and Implementation

The following activities were completed to encourage feedback from EJ communities surrounding the Project:

- Development of Community Outreach Plan describing an engagement plan and strategies for outreach through newspapers and community leaders to disseminate information on the public meetings.
- Development of informational materials in plain language (English and Spanish) to ensure accessibility and understandability of proposed project expansion and relicensing.
- Duke Energy held two (2) public town hall meetings: one (1) meeting in Sapphire, North Carolina; one (1) meeting in Salem, South Carolina.

146

Environmental Justice Study - Community Outreach Plan

- Organizations that play a role in supporting and securing resources for members of EJ communities were distributed outreach materials and information regarding the upcoming meetings.
- Notice of the meetings was published in newspapers of local circulation, and on Duke Energy's relicensing website.

ORGANIZATIONS CONTACTED
Oconee County Department of Social Services
St. Luke's Methodist Church Food Pantry
United Way of Oconee County
Christ Central Ministries (Oconee County)
Transylvania Social Services
Transylvania Public Health

NEWSPAPERS PUBLISHED IN
Upstate Today
Transylvania Times

147

Public Outreach Materials

148

Environmental Justice Study Public Outreach Meetings

- Duke Energy held two town hall style public meetings: one meeting in Sapphire, NC (daytime), and one in Salem, SC (evening).
- Each meeting was held at a different time of day to achieve the highest level of participation possible.
- Notice of the meetings were circulated.
- A Spanish-speaking interpreter was in attendance at both meetings.

149

Environmental Justice Study - Results of EJ Outreach Efforts

- No attendance of meetings by members of the EJ community
- A summary of outreach efforts will be compiled in the DLA

150

Cultural Resources Study

151

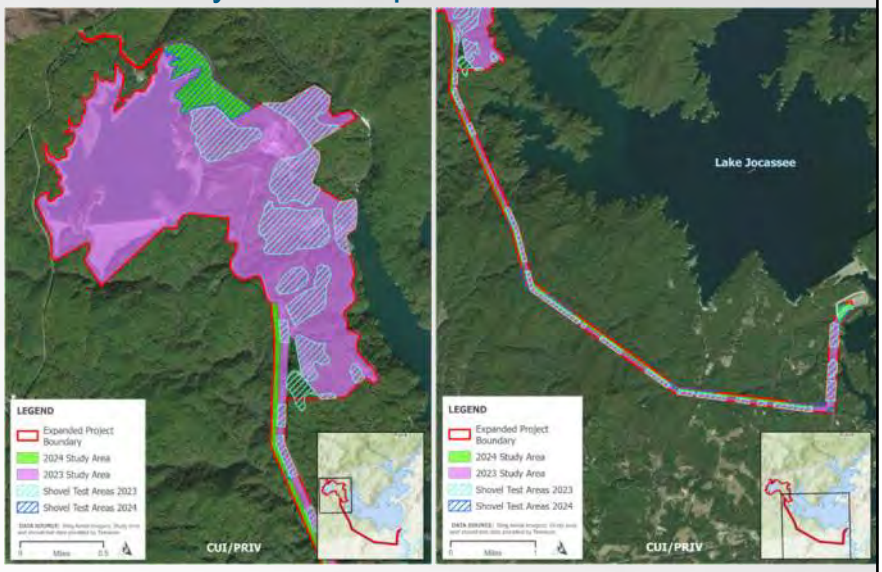
Task 1 – APE Determination

- **Objective:** In consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, and other stakeholders, Duke Energy determined the Area of Potential Effects (APE; defined as all lands within the project boundary) and performed surveys to identify historic properties within the APE.
- **Status:** **Complete**
- **Update:** In 2024, the APE was expanded to accommodate additional areas at the Project that may be impacted by Bad Creek II construction; results of these recent surveys (in 2024) are presented in a supplemental document attached to the Cultural Resources Study.

152

Task 2 – Cultural Resources Survey – 2024 Update

- A supplemental Phase I archaeological investigation of approximately 87 acres and 6.3 miles of transmission line corridor was carried out in 2024 to include areas with potential to be impacted due to corridor widening and spoil areas (see green shaded areas).
- Duke Energy notified the SC SHPO and Indian tribes of this expansion by letters transmitted September 11, 2024, and September 25, 2024, respectively.
- Concurrence from SCHPO and Catawba Indian Nation has been received.



153

Task 2 – Cultural Resources Survey – 2024 Update

- **Results of 2023 Survey:** Identified one isolated find – a Middle Archaic projectile point, tested site 38OC249, and identified five historic-age architectural resources in the APE. Site 38OC249 – Paleoindian(?) through Mississippian Period is a series of rockshelters.
  - Site is eligible for inclusion in the National Register of Historic Places. Site will be avoided by any ground disturbing activities but periodically monitored for unlawful artifact collecting.
- **Results of 2024 Survey**: The supplemental (2024) investigation in areas affected by the proposed expanded APE identified no new archaeological sites or above ground historic-age resources.

- **Conclusions**: Based on results of both studies, no historic properties will be affected by the Project.

154

Visual Resources Study

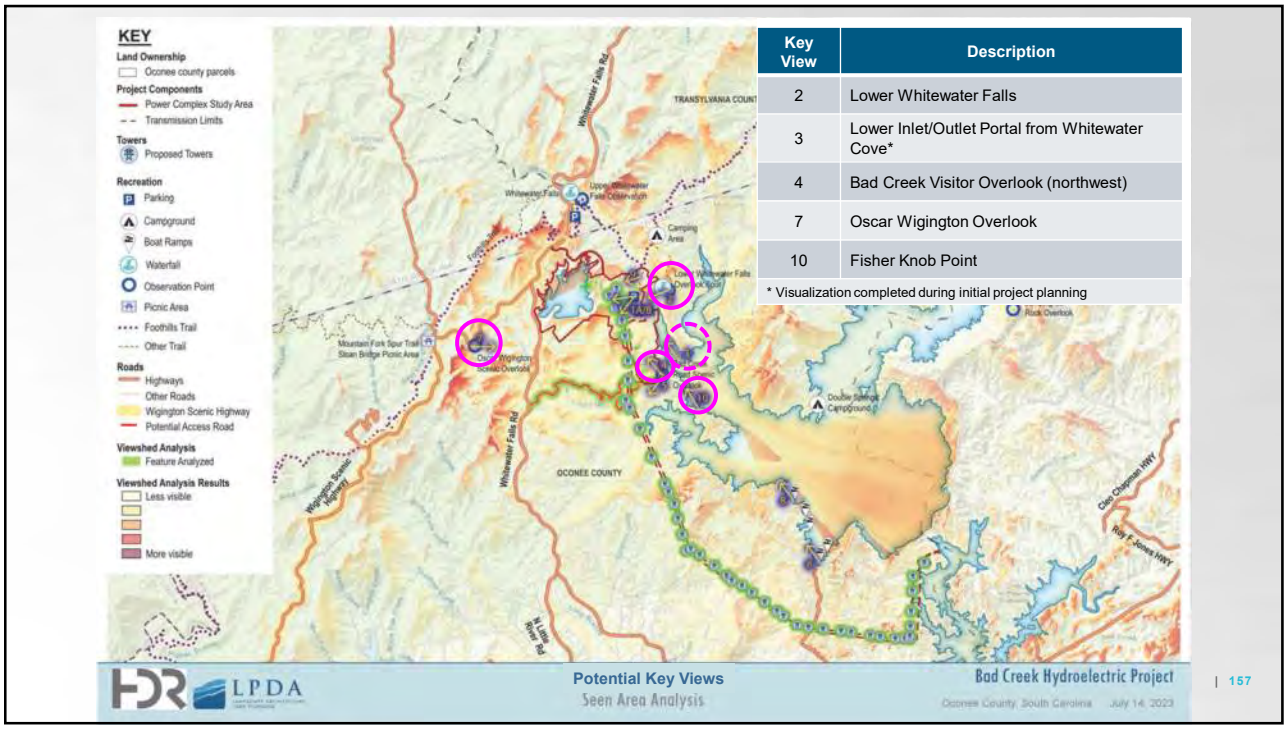
155

Visual Resources Study Task Refresher

Study Task	Status
Task 1 – Existing Landscape Description	Complete*
Task 2 – Seen Area Analysis	Complete*
Task 3 – Field Investigation	Complete*
Task 4 – Key Views Selection	Complete
Task 5 – Existing Visual Quality Assessment	Complete
Task 6 – Visual Analysis	Complete
Task 7 – Visual Management Consistency Review	Complete
Task 8 – Mitigation Assessment	Complete
Task 9 – Conceptual Design of the Bad Creek II Complex	Complete

** Reviewed during ISR meeting*

156



Key View	Description
2	Lower Whitewater Falls
3	Lower Inlet/Outlet Portal from Whitewater Cove*
4	Bad Creek Visitor Overlook (northwest)
7	Oscar Wigington Overlook
10	Fisher Knob Point

* Visualization completed during initial project planning

157

Key View 2: Lower Whitewater Falls Observation Platform

Existing

Proposed

1. Transmission lines
2. Lower inlet/outlet bank

158

Key View 3: Lower Inlet/Outlet Portal from Whitewater Cove

Existing

Proposed

159

Key View 4: Bad Creek Visitor Overlook

Existing

Proposed

1. Inlet/outlet portal
2. Inlet/outlet cove

160

Key View 7: Oscar Wigington Scenic Overlook

Existing

Proposed

161

Key View 10b: Fisher Knob Point

Existing

Proposed

1. Transmission lines
2. Lower inlet/outlet portal

162

Task 7: Visual Management Consistency Review

- United States Forest Service (USFS) Management Plans
  - Applicable to USFS lands only
  - Transmission line widening is consistent with USFS section management (timber production)
- Jim Timmerman Natural Resources Plan
  - Applicable to SCDNR land only
- Oconee County Comprehensive Plan
  - Utility projects excluded from visual resource protection requirements
  - Consistent with existing and future land use classifications
- Keowee-Toxaway Shoreline Management Plan
  - Applicable only to lands within the Keowee-Toxaway Project (FERC No. 2503)
  - Bad Creek II lower inlet/outlet structure shoreline classification: Project Operations

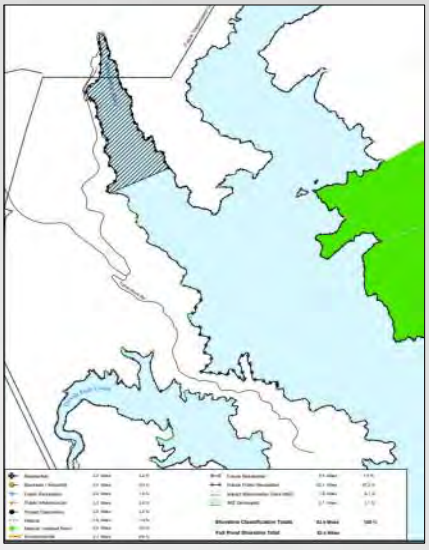


Image source: Duke Energy 2014. Jocassee Development Sheet 2 of 3.

163

Task 8 - Mitigation Assessment

Potential PME Measure	Feasibility	Estimated Cost Range	Effectiveness
Building paint colors	High	Low	Moderate
Building and roofing materials	High	Varies	Moderate
Retaining / concrete wall treatments	Moderate	High	Moderate
Revegetation of disturbed areas	High	Low	High
Fencing	Moderate	Low	Low
Landscape screening and plantings	High	Low	Moderate
Landscape berms	High-Low	High-Low	Moderate
Transmission tower material selection	Moderate	Moderate	Moderate
Transmission tower locations	Low	High	Moderate
Lighting: motion-activated lighting	High	Moderate	High
Lighting: fully shielded light fixtures	High	Low	High
Lighting: elimination of existing unnecessary lights	Moderate	Low	High
Lighting: LED lights	High	Low	Moderate
Lighting: warm color spectrum	High	Low	High

164

Task 9 - Proposed Site Layout

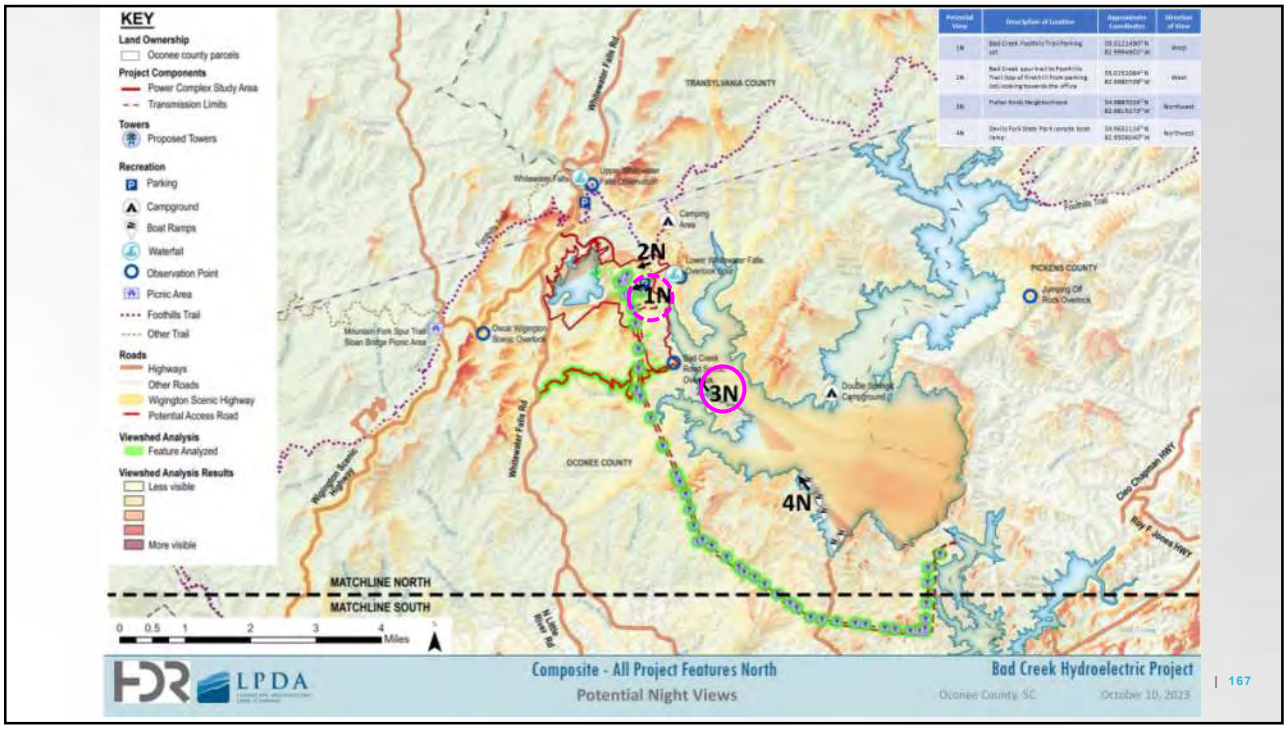
1. **Spoil areas**
2. **Upper inlet/outlet structure**
3. **Transformer yard, switchyard, access road**
4. **Interconnect line**
5. **Lower inlet/outlet**
6. **Primary transmission line**
7. **Temporary access road**

165

Task 9 – Lighting Evaluation

- Limited external lighting
  - Operations area
    - Foothills Trail parking lot
    - Warehouse, garage, administration building, parking lots
  - Lower inlet/outlet area
  - Fisher Knob residences
- Existing external lighting
  - 1980 – 1991 vintage fixtures
  - Cool spectrum
  - Unshielded (generally)

166



167

Night View 3N: Fisher Knob Point

Existing

1. Transformer yard
2. Wastewater treatment, parking
3. Lower inlet/outlet

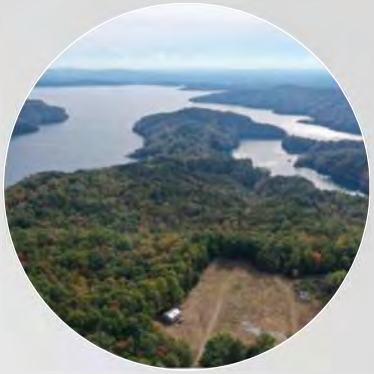
Proposed

1. Lower inlet/outlet portal

Bad Creek Pumped Storage Project USR Meeting | 168

168

Conclusions



- Project area: High scenic attractiveness
- **Existing Project**
  - Views of existing Project limited by:
    - Vegetation
    - Topography
    - Access restrictions
  - Potential mitigation
    - Lighting
    - Building colors
- **Bad Creek II** effects (construction and operation)
  - Permanent alterations to visual characteristics
  - Mitigation measures could further reduce these effects
- Visual Resources Management Plan under development

169

Break

170

Additional Surveys

171

Small Whorled Pogonia Surveys

172

Small Whorled Pogonia Surveys

- **Objective**: In response to a written request from SCDNR and to support ESA compliance for Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy surveyed several areas with potential to be impacted by Bad Creek II activities for the federally threatened small whorled pogonia (*Isotria medeoloides*) during the appropriate survey window (mid-May through early July).
- **Status:** **Complete**

Potential small whorled pogonia habitat – dry upland hardwood forest with dappled sunlight

173

Small Whorled Pogonia Surveys

- The federally threatened Small Whorled Pogonia is listed in the USFWS Information for Planning and Consultation (IPaC) database as having the p**o**tential to occur in the project vicinity.
- A study plan was developed in consultation with the USFWS and SCDNR and distributed to the Wildlife and Botanical Resource Committee in June 2024.
- Surveys included lands that will be potentially impacted by the construction of Bad Creek II including the (1) proposed spoil area locations, (2) Fisher Knob access road (*no longer being pursued*), and (3) Bad Creek Transmission Line access roads.

A Natural Resources Survey was carried out by Duke Energy in 2021 (filed with the PAD) and indicated that suitable habitat for the small whorled pogonia was present at the site, however, the study was performed outside of the survey window.

174

Small Whorled Pogonia Surveys - Methods

- Areas were surveyed along the 50-foot-wide buffer of the proposed temporary Fisher Knob access road and proposed transmission line access roads, and within the proposed limits of disturbance and spoil area alternatives.
- Surveys were conducted during the USFWS-recommended optimal survey window of mid-May – early July.
  - June 3-5 for the proposed Fisher Knob Access Road and transmission line access roads
  - May and July 2024 for potential spoil areas and the general proposed limits of disturbance for Bad Creek II construction

Photo 20. Access Road; potential habitat for SWP on margins (transmission line access roads)

- The survey methodology consisted of slowly traversing back and forth across transects; surveyors were spaced approximately 25-feet apart focusing the immediate area within a 10-to-15-foot radius depending on habitat type and visibility. Handheld Global Positioning System (GPS) units were used to navigate throughout the site to avoid survey gaps.
- Vegetation cover type and specific habitats/substrates were noted by surveyors and photographed.
- Field biologists also recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey.

175

Small Whorled Pogonia Surveys - Findings

- Small whorled pogonia was **not identified** during the 2024 surveys, and no species on the SWAP list were observed.
- Several individuals of the *Trillium* genus were identified, including potential for the southern nodding trillium (*Trillium rugelii*, a SWAP species), but could not be classified to the species level since survey for *Trillium rugelii* was conducted outside of recommended survey window.
- Photos of potential small whorled pogonia habitat and a list of identified plant species are included in the final study report.
- **Potential habitat for the small whorled pogonia was observed in all study areas.**
- A Botanical Species Protection Plan for the small whorled pogonia will be prepared for the license application.
- Small whorled pogonia will also be evaluated in the Biological Assessment for ESA compliance to support both the FERC and CWA Section 404 permitting process.

Photo 29. Potential SWP habitat; upland mixed wood with dappled sunlight (spoil location K)

Photo 27. Potential SWP habitat; dry mesic oak hickory forest (spoil locations C, D, G, I, and M)

176

Small Whorled Pogonia Surveys – Potential Habitat Photos

Photo 4. Potential SWP habitat; dry upland hardwood forest with dappled sunlight

Photo 18. Potential SWP habitat; mixed hardwood with dappled sunlight (transmission line access roads)

Photo 20. Access Road; potential habitat for SWP on margins (transmission line access roads)

Photo 1. Potential SWP habitat; rocky slope with dappled sunlight (Fisher Knob Access Road)

Photo 16. Open space along access road; potential habitat for SWP on margins (transmission line access roads)

Photo 24. Potential SWP habitat; shortleaf pine and oak woodland (spoil locations B and C)

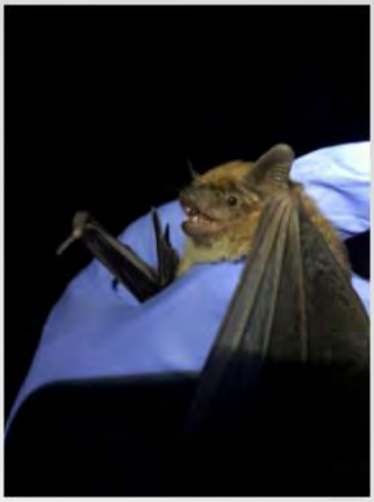
177

Bat Surveys

178

Bat Surveys

- Construction of Bad Creek II will require the removal of trees, potentially impacting suitable habitat for state and federally protected bats.
- A bat study plan was developed in consultation with USFWS and SCDNR and approved by the USFWS on May 28, 2024.
- Mist-net surveys and acoustic surveys were used to assess the presence/probable absence of the federally proposed tricolored bat (*Perimyotis subflavus*) and federally endangered northern long-eared bat (*Myotis septentrionalis;* NLEB) as well as state listed species of concern known to be present in Oconee County, including little brown bat (*Myotis lucifugus*), state endangered Rafinesque's big-eared bat (*Corynorhinus rafinesquii),* state threatened Eastern small-footed myotis (*Myotis leibii),* hoary bat (*Lasiurus cinereus*), and gray bat (*Myotis grisescens).*
- The Project area is in the hibernating range for the NLEB and tricolored bat.

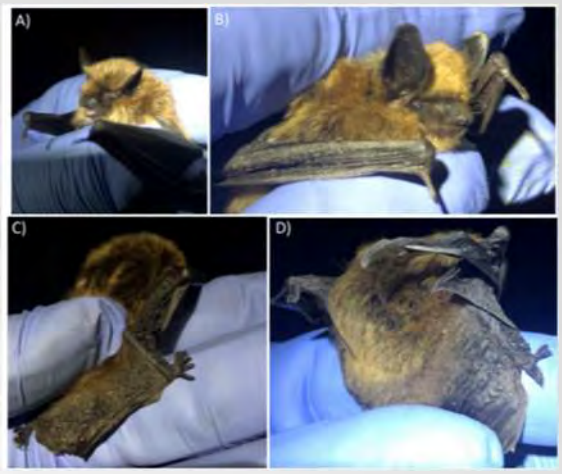


Big brown bat (Eptesicus fuscus)

179

Bat Surveys

- The project area of interest (AOI) consists of both linear and non-linear areas of potential summer habitat for target species (i.e., trees greater than 3 inches dbh) that could be impacted by the construction of an additional power complex. The level of effort was based upon the limits of disturbance, which comprises approximately **179.3 acres of suitable non-linear habitat** and **45 kilometers of suitable linear habitat**.
- Forested acreage onsite was primarily comprised of upland, mature pine-hardwood forests interspersed with early successional habitat throughout.
- Suitable summer habitat for target species including potential roost trees and snags as well as foraging and commuting habitats are located throughout the Project Area.
- Bat surveys were conducted within the AOI on the **nights of June 1st through 19th, 2024**.

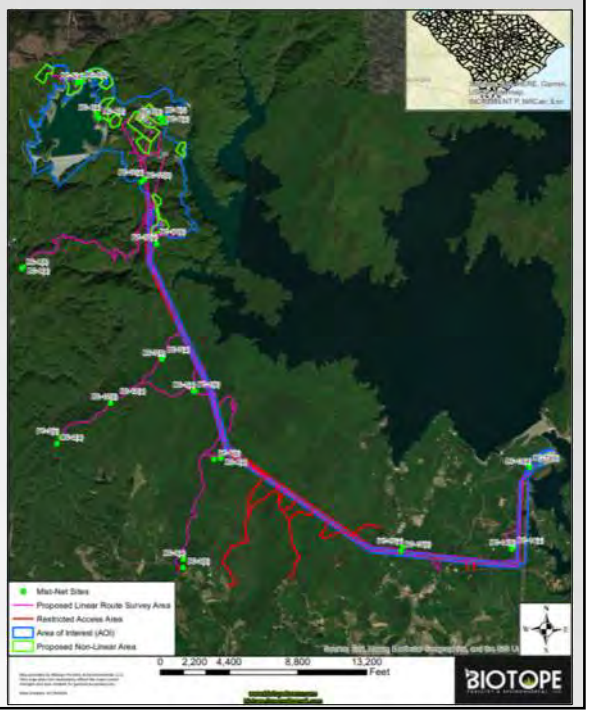


Eastern small-footed bat (Myotis leibii)

180

Bat Surveys – Mist Net Surveys

- Fifteen mist-net sites were surveyed for two calendar nights, totaling 62 net nights for the entire project.
- Mist-nets were established along primary corridors, interior forest, forest strips, forest gaps, and forest edges within the AOI to maximize bat captures.
- Net locations were selected in areas that provided preferred habitat for target species where available.
- Nets were opened approximately 10 minutes before sunset and checked every 10 minutes for at least five hours.
- The capture time, species, age, sex, reproductive condition, right forearm length, mass, Reichard's wing damage index score, net ID, and net capture height were recorded for all bats captured.
- Bat identification was performed by a qualified state and federally permitted bat biologist.



181

Bat Surveys – Mist Net Surveys

- To minimize the potential transmission of white-nose syndrome to captured bats, all netting and field activities followed the most recent decontamination protocols (October 2020) set forth by the USFWS.

182

Bat Surveys – Acoustic Surveys

- Thirty-seven acoustic sites were surveyed totaling 144 detector nights for the entire project.
- Detectors were deployed along similar features as mist-net sites where lack of side and top cover made mist-nets less desirable.
- Detectors were deployed at each site prior to sunset on night one and programmed to start recording 30 minutes prior to sunset and stop recording 30 minutes after sunrise

183

Bat Surveys – Acoustic Surveys

- Anabat Express acoustic detectors were deployed at all sites with either directional or omnidirectional microphones, dictated by the specific landscape feature being surveyed.
- Microphones were elevated at least three meters above ground level vegetation using mounting poles to remove them from excessive noise clutter and elevate them closer to the suspected flight paths.
- The proper functionality of each acoustic detector was confirmed at each field deployment by internal software displaying correct values for scheduled recording times and the absence of error or warning messages during programming
- Following the completion of field work at each acoustic detector site, data was compiled and processed using the USFWS approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, to initially classify all bat calls to species.

184

Bat Surveys – Mist Net Results

- A **total of 41 bats** were captured at the Bad Creek project across three species. Approximately 51% and 41% of the captures were big brown bats (*Eptesicus fuscus*) and eastern red bats (*Lasiurus borealis*) respectively, with the remaining 7% eastern small-footed bats (*Myotis leibii*).

Species	Sex	Age	Reproductive Condition	Number of Captures
Lasiurus borealis	Female	Adult	Non-reproductive	1
Lasiurus borealis	Male	Adult	Non-reproductive	11
Lasiurus borealis	Male	Adult	Testes descended	1
Lasiurus borealis	Unknown	Unknown	Unknown	4
Eptesicus fuscus	Female	Adult	Pregnant	5
Eptesicus fuscus	Female	Adult	Lactating	7
Eptesicus fuscus	Male	Adult	Non-reproductive	5
Eptesicus fuscus	Male	Adult	Testes descended	1
Eptesicus fuscus	Unknown	Unknown	Unknown	3
Myotis leibii	Female	Adult	Lactating	1
Myotis leibii	Male	Adult	Non-reproductive	2

185

Bat Surveys – Acoustic Results

- Acoustic surveys auto identified calls from 15 bat species, and based on species ranges and previous surveys, 10 of the 15 species were deemed likely present.

Determination of Likely Presence for All Bat Species

Species	Likely presence
Eastern red bat (*Lasiurus borealis*)	High
Big brown bat (*Eptesicus fuscus*)	High
Rafinesque's big-eared (*Corynorhinus rafinesquii*)	High
Little brown bat (*Myotis lucifugus*)	High
Gray bat (*Myotis grisescens*)	High
Tricolored bat (*Perimyotis subflavus*)	High
Evening bat (*Nycticeius humeralis*)	High
Hoary bat (*Lasiurus cinereus*)	High
Eastern small-footed bat (*Myotis leibii*)	High
Brazillian [Mexican] free-tailed bat (*Tadarida brasiliensis*)	High
Silver-haired bat (*Lasionycteris noctivagans*)	Low
Seminole bat (*Lasiurus seminolus*)	Low
Southeastern bat (*Myotis austroriparius*)	Low
Northern long-eared bat (*Myotis septentrionalis*)	Low
Indiana bat (*Myotis sodalis*)	Low

- The quality of the summer roosting and foraging habitat within the AOI appears to be generally favorable for the gray bat, tricolored bat, and little brown bat, given the diversity of suitable habitat features identified during the survey.
- The likely presence of gray, tricolored, and little brown bats highlights the ecological significance of the habitat, while the probable absence of the northern long-eared and Indiana bats suggests that, at least currently, they are not utilizing the AOI.
- Raw acoustic data files, that were autoclassified for the Northern Long-eared bat and Indiana bat, have been requested by USFWS for further evaluation.

186

Bat Surveys – Summary Results

- A total of 41 individual bats consisting of three species (eastern red bat, big brown bat, and eastern small-footed bat) were captured during mist-net surveys.
- Acoustic auto identification software suggested a diverse species use of the AOI, qualitative analysis of high frequency calls confirmed the likely presence of gray bat, little brown bat, and the tricolored bat.
- A probable absence determination was made with regards to the federally listed northern long-eared, gray, and Indiana bat, while the results indicate the proposed federally endangered tricolored bat, and the little brown bat likely use the AOI in some capacity.
- The state endangered Rafinesque's big-eared bat and state threatened Eastern small-footed bat are likely present in the AOI.

Eastern Red Bat (Lasiurus borealis)

187

Next Steps

188

FERC ILP Schedule Next Steps

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File USR Meeting Summary (18 CFR §5.15(f))	Duke Energy	Within 15 days of USR Meeting	Jan 31, 2025
Deadline to file comments on USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Deadline to File DLA (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Deadline to file comments on the USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Comments on DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

189

Questions and Action Items

190

Thank you for Participation!!!

DUKE ENERGY.
BUILDING A SMARTER ENERGY FUTURE®

191

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Thursday, January 30, 2025 9:42 AM
To: Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Ericah Beason <BeasonE@dnr.sc.gov>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; Boos, Laura - USACE <Laura.M.Boos@usace.army.mil>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Cain, Roger - United Keetoowah Band of Cherokee Indians <rcain@ukb-nsn.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Chief of NEPA Program - USEPA <kajumba.ntale@epa.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Adin T Fell <afell@scprt.com>; tim <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Sara Green <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; Charles (Rowdy) B Harris <charris@scprt.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kirouac, Justin - Oconee Cty Administrator <jkirouac@oconee.ga.us>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; pmccormack <pmccormack@scprt.com>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Reeves, Tyler - National Wild Turkey Federation <treeves@nwtf.net>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Lorianne Riggin <rigginl@dnr.sc.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Rothell, Joanna - Preservation South Carolina <joanna@preservesc.org>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Scipio, Isaiah - Mayor, City of Pickens, SC <iscipio@pickenscity.com>; PShirley <PShirley@oconeeco.com>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Stancil, Vann F <vann.stancil@ncwildlife.org>; Chris Starker <cstarker@upstateforever.org>; Stone, Mac - Naturaland Trust <MacStone@naturalandtrust.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten

<Alan.Stuart@duke-energy.com>; Clemsonla <Clemsonla@gmail.com>; Thomas Esq, Elizabeth - K&L Gates LLP <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; Williams, Sue - AQD <suewilliams130@gmail.co>
Subject: P-2740 Bad Creek Relicensing – Updated Study Report Meeting Summary Filing

CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good Morning Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, and expires July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Duke Energy is proposing additional energy storage and generation capacity at the Project, which would be developed by constructing a new 1,400-MW Bad Creek II Power Complex (Bad Creek II) adjacent to the existing powerhouse.

The Updated Study Report (USR) was electronically filed with FERC by Duke Energy on January 3, 2025. Duke Energy then held a USR Meeting on Thursday, January 16, 2025, at its Wenwood Operations Center in Greenville, SC. Duke Energy has electronically filed the USR Meeting Summary and Presentation with FERC. Duke Energy encourages stakeholders to view the entire filing on the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Questions, please let me know.

Regards,
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

FEDERAL ENERGY REGULATORY COMMISSION
MEMORANDUM

MEMORANDUM TO:	Public Files for the Bad Creek Pumped Storage Project (FERC Project No. 2740-053)
FROM:	U.S. Fish and Wildlife Service [posted by Sarah Salazar, Environmental Protection Specialist, Division of Hydropower Licensing, Office of Energy Projects]
SUBJECT:	Updated List of Threatened, Endangered, Candidate, and Proposed Species Generated by ECOS-IPaC Website on February 19, 2025
DATE :	February 19, 2025

On February 19, 2025, Commission staff accessed the U.S. Fish and Wildlife Service's ECOS-IPaC website (https://ecos.fws.gov/ipac/) to update the species list for the Bad Creek Pumped Storage Project (Bad Creek Project). The endangered gray bat and northern long-eared bat; the threatened small whorled pogonia and smooth coneflower; the proposed endangered tricolored bat; and the proposed threatened monarch butterfly may occur within the Bad Creek Project boundary, or be affected by the project. The endangered persistent trillium was removed from the species list. No candidate species are known to occur within the project boundary or be affected by the project. No designated critical habitat is located within the project boundary.

A copy of the list is attached.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 02/19/2025 16:37:18 UTC
Project Code: 2022-0030610
Project Name: Bad Creek Pumped Storage Project (P-2740-053)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

PROJECT SUMMARY

Project Code: 2022-0030610
Project Name: Bad Creek Pumped Storage Project (P-2740-053)
Project Type: Power Gen - Hydropower - FERC
Project Description: The existing Bad Creek Pumped Storage Project includes: (1) a 2,600-ft-long, 355-foot-high main dam composed of an impervious core and rockfill shell, and equipped with 5-ft-high flashboards; (2) a 900-ft-long, 170-ft-high west dam; (3) a 900-ft-long, 90 ft-high east saddle dike; (4) a 363-acre upper reservoir with a gross storage capacity of 35,513 acre-ft at a normal maximum elevation of 2,310 ft mean sea level (msl); (5) an upper reservoir intake channel consisting of a dewatering dam and bellmouth inlet; (6) a 5,026-ft-long water conveyance system consisting of: (a) a 856-ft-long, 29.5 ft-diameter vertical access shaft, (b) 1,186-ft-long, 29.5-ft-wide power tunnel, (c) a manifold tunnel, (d) four, 13.6-ft-diameter steel-lined penstocks, (e) four, 316 ft-long, 16.4-ft-diameter draft tube tunnels, and (f) two, 875-ft-long, 24.6 ft-diameter tailrace tunnels; (9) a 433-ft-long, 164-ft-tall underground powerhouse containing four, Francis reversible-pump turbine-generator units with a total installed capacity of 1,400 MW; (7) an 43.5-ft-high equipment building located about 469 ft above the underground powerhouse; (8) a 118-ft-long, 15-ft-wide reinforced concrete, lower reservoir inlet/outlet structure, including four, 30-ft-high, 18-ft-wide steel lift gates; (9) generator leads; (10) a transformer yard; (11) a switchyard consisting of: (a) four step-up transformers, (b) one 9.25-mile-long, 100 kilovolt (kV) transmission line, and (c) one 9.25-mile-long, 525-kV line; (12) a 9.25 mile-long, 254-ft-wide transmission line corridor; and (13) appurtenant facilities. The project also includes an existing 4.8-mile road that leads from the project entrance to the powerhouse area near Lake Jocassee.

The project is an automated pumped storage plant where water is regularly moved from the upper reservoir to the lower reservoir during generation, and from the lower reservoir back to the upper reservoir during pumping. All water utilized for generation originates from the 7,980-acre lower reservoir (Lake Jocassee). Lake Jocassee has a gross storage capacity of 1,206,798 acre-ft at a normal maximum elevation of 1,110 ft msl. The project is licensed to operate on a weekly pump-storage cycle with the upper reservoir, fluctuating between 2,310 ft msl (normal max. elevation) and 2,150 ft msl (normal min. elevation), resulting in a maximum drawdown of 160 ft and 31,808 acre-ft useable storage capacity. In practice, the project operates in a daily pump-storage cycle by maintaining the upper reservoir above 2,250 ft msl for approximately 97% of the time to maximize head and unit efficiency. The average annual generation of the project is about 1,884,685 MWh. The average annual energy required for pumping during the same period is about 2,398,114

MWh. The net energy consumption of the project is 513,429 MWh.

Duke Energy proposes to continue to operate and maintain the project and evaluate the feasibility of constructing and operating a second generating facility, Bad Creek II Complex, which would consist of a new: (a) upper reservoir inlet/outlet structure, (b) water conveyance system, (c) underground powerhouse, (d) powerhouse access tunnels, (e) lower reservoir inlet/outlet structure, (f) switchyard, (g) transformer yard, and (h) transmission line. The proposed powerhouse would include four new, reversible pump-turbine units with an installed generating and pumping capacity between 106 MW and 425 MW. Average annual generation would increase by up to 25,856 MWh. No modifications would be made to the existing upper and lower reservoirs. Duke Energy would propose a project boundary in the license application that will include all lands necessary for access to, or control of, the expanded project.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.98379515,-82.99727163677541,14z

Counties: Oconee County, South Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

FLOWERING PLANTS

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information

on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

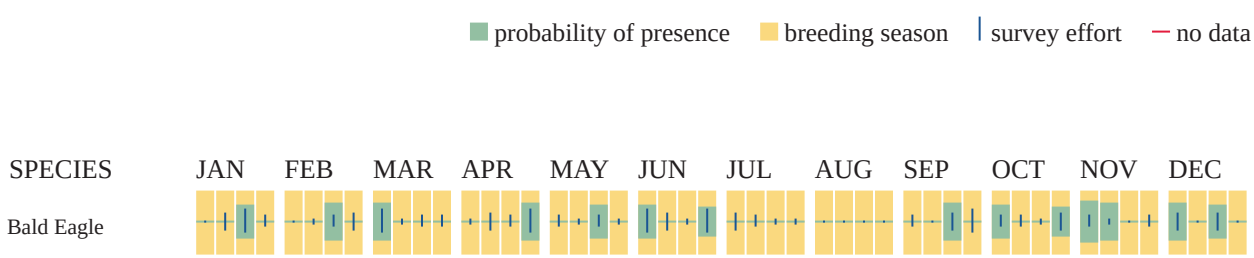
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Non-BCC
Vulnerable

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service). The incidental take of migratory birds is the injury or death of birds that results from, but is not the purpose, of an activity. The Service interprets the MBTA to prohibit incidental take.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31

NAME	BREEDING SEASON
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Cerulean Warbler *Setophaga cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 27 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9604	Breeds May 10 to Jul 10
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Kentucky Warbler *Geothlypis formosa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9443	Breeds Apr 20 to Aug 20
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

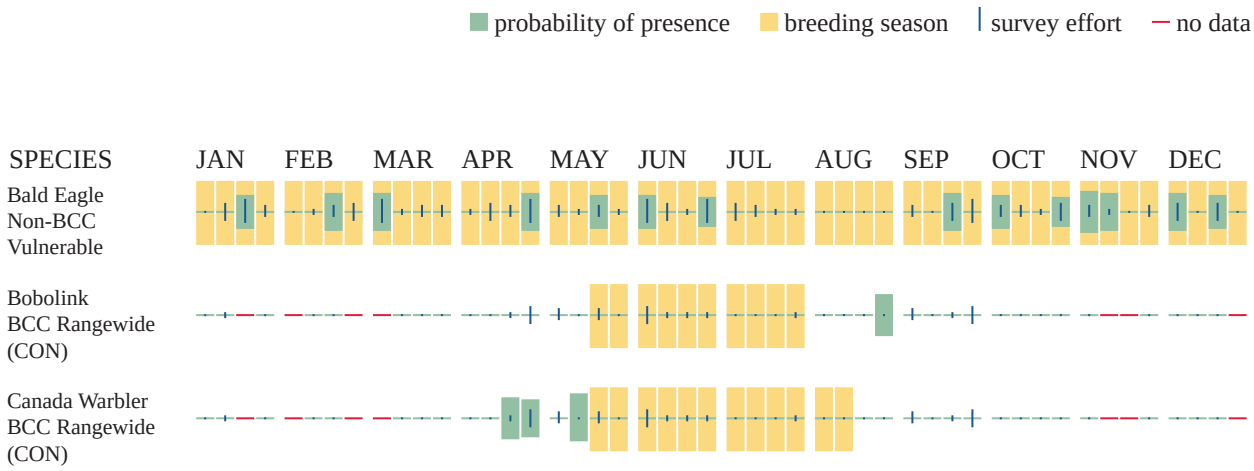
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

RIVERINE

- R5UBH
- R3UBH
- R4SBC
- R3RBH

LAKE

- L1UBHh
- L2USAh

FRESHWATER POND

- PUBHh
- PUBHx
- PUSCh
- PUBFx

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A

FRESHWATER EMERGENT WETLAND

- PEM1Ah
- PEM1A

IPAC USER CONTACT INFORMATION

Agency: Federal Energy Regulatory Commission
Name: Sarah Salazar
Address: 888 First St., NE
City: Washington
State: DC
Zip: 20426
Email sarah.salazar@ferc.gov
Phone: 2025026863