APPENDIX E-1

STAKEHOLDER CONSULTATION DOCUMENTATION

FILED SEPARATELY

Appendices

APPENDIX E-2

STAKEHOLDER CONSULTATION MATRIX

Commenting Entity	Comment	DESC Response
USFWS – 1	the Service no longer feels the navigation lock, which is more centrally located on the river as opposed to being located on or near one of the banks, is appropriate or adequate to provide safe, timely, and effective fish passage.	Comment noted. DESC will work with USFWS and NMFS the Fish Passage TWC to determine appropriate timing and of future fish passage facilities.
USFWS – 2	The Service plans to file with FERC a new Section 18 Fishway Prescription for the relicensing of this Project.	Comment noted.
USFWS – 3	Additionally, the Service would like to request DESC further study effective downstream passage at Stevens Creek, including more species than previous entrainment studies for the Project. The Service will work with DESC to identify additional species to be included. The additional information will be used to inform future decisions regarding downstream passage to be included in a new Section 18 Fishway Prescription.	DESC and the Fish Passage TWC have worked to discuss further scope this request. Additional details regarding upda entrainment analyses have been included in Section 4.5.2.1
GADNR – 1	PAD 3.0 - A map of the land adjacent to the project showing Dominion Energy South Carolina, Inc.'s (DESC) land holdings with distinct representation for leased and non-leased lands would be useful in assessing study results.	This information has been provided to agencies. DESC has reviewed these land holdings in detail and did not locate an with acceptable topography for an additional recreation site.
GADNR – 2	PAD 3.7, 4.3, 4.5 - Fish Passage - Fish passage is an important issue to WRD. We will remain engaged in the established Fish Passage Technical Working Committee (FPTWC) to ensure that fish passage design is able to pass all migratory species of concern including American Shad, Atlantic and Shortnose Sturgeon, Robust Redhorse, Striped Bass, and American Eel.	Comment noted.
GADNR – 3	Fish Entrainment and Turbine-Induced Mortality - The PAD states that DESC is not proposing mitigation or enhancement measures related to fish and aquatic resources at this time. However, DESC recognizes from previous studies that fish entrainment occurs at the project resulting in the loss of approximately 15,000 fish annually with impacts to 16 or 17 species including Threadfin Shad, Bluegill, American Eel and others. Under the SCHPs current license, Article 406 requires annual payments to fund resource-based enhancements in the Savannah River basin in coordination with the Department of the Interior, South Carolina DNR. WRD will continue to engage with DESC and other stakeholders to identify fisheries resource mitigation strategies for the upcoming license term.	Comment noted.
	Aquatic Non-native Invasive Species - Impacts of invasive species (both plant and animal) have direct effects on native flora and fauna within and downstream of the project boundary. As part of the relicensing process, DESC is developing an Aquatic Habitat Whitepaper. We recommend this document include a Section on invasive aquatic vegetation, as well as an evaluation of measures, beyond signage (e.g., installation of boat cleaning stations at project ramps), to prevent potential movement of aquatic invasive plants found in SCHP's reservoir to other	Comment noted. Information on invasive species is included Section 4.6.1.3 of this Exhibit E. Environmental impacts of
GADNR - 4	waterbodies. PAD 3.7, 3.8, 4.3, 5.1 - Recreation/Access - The PAD refers to a six-year recreational plan update that includes a study ruling out the viability of providing a recreational site, including a year-round accessible boat launch, on the Georgia side of the reservoir. No further information is provided as to how the study was conducted or the results. WRD respectfully requests that a copy of the study design and results be made available to stakeholders for review and reference during the	This information is referring to FERC Form 80 filings which y up until recently, a required recreational filing under FERC-i licenses (unless otherwise waived). An updated and comprehensive recreation study has been performed throug relicensing to provide updated use details to inform recreation improvements at the Stevens Creek Project, which involved
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Commenting Entity	Comment	DESC Response
GADNR – 6	Available public boating and fishing access sites up- and downstream of the dam do not adequately provide Georgia residents with recreational access to the project. WRD recommends DESC evaluate the following enhancements:	See discussion for GADNR comments 7, 8, and 9 below.
	Downstream River Access - The one-mile reach between Stevens Creek Dam and the Augusta Diversion Dam is currently a popular destination for paddling, fishing, and outdoor recreation despite inadequate access. Numerous local businesses offer guided tours to this area. The area's popularity is likely to grow as Columbia County Convention and Visitors Bureau is actively promoting paddling in this area as part of their "Serene 18 Paddle Trail" marketing campaign. Currently, boating access to this area is only possible via a primitive canoe-launch just above the Augusta Diversion Dam, requiring users to paddle upstream and float back down to the same launch. A canoe portage at Stevens Creek Dam (a canoe/kayak launch downstream of the dam in connection with added reservoir access) would be extremely beneficial for outdoor recreation in the Stevens Creek area. The portage would allow for the upstream expansion of the Augusta Canal Water Trail already established below the Augusta Diversion Dam and connect most of the Serene 18 paddle trails currently disconnected by the Stevens Creek Dam. Since the downstream Augusta Diversion Dam facilitates portaging into either the Augusta Canal or the Savannah River, the portage at Stevens Creek Dam would connect all upstream recreation sites to the Savannah River downstream, creating the opportunity to paddle from Clarks Hill	Request noted and discussed in further detail of Section 4.8.
GADNR – 7 GADNR – 8	Dam to downstream Augusta. Reservoir Access - Currently the only fishing and boating access on the Georgia side of the project is near the upper end of the reservoir at Bettys Branch, more than five river miles upstream of the dam. A boat launch near the lower section of the reservoir was identified as a need by WRD in the previous relicensing process and is still recognized as a need.	this Exhibit E. Request noted and discussed in further detail of Section 4.8. this Exhibit E.
GADNR – 9	Tailrace Fishing Pier - Article 413 (5) of SCHP's current license required DESC to construct a tailrace fishing platform on the Georgia side of the project. DESC cites potential vandalism of Stallings Island, a National Historic Landmark, as the reason for not fulfilling its license requirement to install and maintain the tailrace fishing platform and the provision was removed from Article 413. WRD does not agree with the determination that a fishing platform itself would provide additional access to the center channel and Stallings Island. In fact, having more "eyes on the river" from bank angling may discourage looters and as stated by DESC in the PAD; access to Stallings Island is already established.	Request noted and discussed in further detail of Section 4.8. this Exhibit E.
GADNR – 10	 Mollusk Study Plan - WRD requested that the study area include large tributaries on the Georgia side of the reservoir, including, but not limited to, Kioke Creek, Little River, Uchee Creek, and the area downstream of the dam. WRD concurs with the updated study plan, which had not yet been filed with FERC or posted on the project website at the time WRD's comment letter was written Recreation Study Plan - WRD requested that the recreation survey include questions addressing WRD's concerns and that the survey be more broadly conducted/distributed. WRD concurs with the updated study plan, which had not been filed with FERC or posted on the project website at the time WRD's concerns with the updated study plan, which had not 	The Mussel Study was subsequently updated to include the GADNR-requested Geographic Scope changes.
GADNR – 11	letter was written.	Comment noted.

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Commenting Entity	Comment	DESC Response
GADNR – 12	Water Quality Study Plan - WRD requested that nutrients be added to water quality monitoring both upstream and downstream of the dam. WRD concurs with the updated study plan, which had not been filed with FERC or posted on the project website at the time WRD's comment letter was written. However, WRD continues to recommend that WRD requests a two-year study instead of the proposed one-year to account for temporal variation in weather patterns.	DESC is continuing to work with relicensing stakeholders to perform subsequent evaluations of water quality at the Stevens Creek Project.
GADNR – 13	Section 4.2.1 Drainage Area (pp 4-14 - 4-15 & Figure 4-7): Drainage area delineation excludes the upper Savannah River - the drainage area outlined on the map is not representative of the typical definition of drainage area, which is the total surface area upstream of a point on a river. This deviation should be corrected or clearly defined.	FERC has defined the drainage area for the purposes of this project to include the subbasin below Thurmond Dam. DESC h framed the drainage area discussion to be reflective of FERC's determination.
GADNR – 14	Section 4.3.1.2 Resident Fish Species (p 4-35): Redeye Bass is considered a separate species throughout the document - Redeye Bass in the Savannah has been genetically shown to be a species distinct from Redye Bass (type locality from Coosa River). The Savannah Redeye Bass is not recognized as Bartram's Bass, and there are no known records of Redeye Bass being introduced. Section 4.3.1.2 Resident Fish Species (p 4-35): Robust Redhorse Repeated	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.
GADNR – 15	broodstock collection indicates - Broodstock has not been collected from the Savannah River in quite some time. More accurate to say "recent spawning surveys indicate"	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.
GADNR – 16	Section 4.3.1.2 Resident Fish Species (p 4-37): "Numerous recreation areas, fishing piers, and bank fishing areas over 30 public fishing areas near project Fishing access to the Savannah River is also provided at Savannah Rapids Park in Augusta, and at three Project recreation sites." - "PFA" or "public fishing areas" means something very specific to WRD. Please define or reword to avoid potential confusion (e.g., public fishing sites, public fishing locations, etc.)	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.
GADNR – 17	Section 4.3.1.2 Resident Fish Species Table 4-4 (p 4-39): Both <i>Micropterus coosae</i> and <i>M. sp. Cf cataractae</i> are listed in table Table should be updated to reflect more recent literature finding that <i>M. coosae</i> is restricted to the Coosa Drainage in Georgia. Any records of <i>M. coosae</i> from the Savannah Drainage should be considered Bartram's Bass (<i>M. sp. cf cataractae</i>).	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.
GADNR – 18	Section 4.3.15 Freshwater Mussels: Common names are not capitalized throughout document, but those of fishes are capitalized - The scientific community capitalizes mollusk common names.	Comment noted.
GADNR – 19	Section 4.3.2 Temporal and Spatial Distribution of Fish and Aquatic Communities (p 4-43): states Robust Redhorse spawning habitat 8 miles below NSBLD - more recent citation would be the latest report on the RRCC website. Robust spawning habitat is located directly below NSBLD as well as historical spawning in Augusta Shoals.	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.
GADNR – 20	Section 4.3.2 Temporal and Spatial Distribution of Fish and Aquatic Communities (p 4-44): in Striped Bass and Herring discussions, states that fish pass during operation of NSBLD - As stated earlier in the document and on p 4-43, NSBLD is not currently operated.	Clarifying detail has been provided in Section 4.5.1.2 of this Exhibit E.

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Commenting Entity	Comment	DESC Response
GADNR – 21	Section 4.3.4.2 Reservoir Fluctuation (p 4-47): "Fisheries sampling in Project waters demonstrates good reproductive success, regardless of the reservoir fluctuations (FERC 1995)." - Outdated citation. The SCDNR Fishery Enhancement Potential of Stevens Creek Reservoir, South Carolina - Georgia (2019) is a more recent reference.	Clarifying detail has been provided in Section 4.5.1.2 of th Exhibit E.
GADNR – 22	4.6 Rare, Threatened and Endangered Species - Introduction (p 4-61; Table 4-8): <i>Moxostoma robustum</i> is misspelled as "robustrum" Correct spelling throughout document(s).	The discussion included in this Exhibit E has been correct accordingly.
GADNR – 23	Section 4.6.2 Forest Service Sensitive Species (p 4-68 - 4-69; Table 4-11): Incorrect common and scientific name for Bartram's Bass; <i>Distocambarus crockeri</i> is not known from GA; <i>Moxostoma robustum</i> misspelled again make sure names are accurate throughout document based on the latest accepted scientific literature - WRD is unaware of the records of <i>D. crockeri</i> from the Georgia side. We would appreciate citations for these - Check the GADNR data portal and relevant, recent publications for appropriate distributions.	Clarifying detail has been provided in Section 4.7.1 of this E.
GADNR – 24	4.7 Recreation and Land Use - Section 4.7.3 Existing Shoreline Buffer Zones Within the Project Boundary (p 4-79): describes SCDNR buffer recommendations. Why are Georgia buffer requirements & discussion not included? Please add them or explain why they are not cited.	Section 4.10 of this DLA includes discussion of land distur and vegetation policies along streambanks and shorelines required by the Georgia Erosion and Sedimentation Contro
GADNR – 25	4.8 Aesthetic Resources - Section 4.8.3 Visual Character of Project Lands and Waters (p 4-92): area below the dam is described as both riverine and impounded in two consecutive paragraphs - Conflicting descriptions. Elaborate on the locations being described.	Clarifying detail has been provided in Section 4.10.1.6 of t Exhibit E.
GADNR – 26	Section 4.12.4 Tributary Rivers and Streams (p 4-117): lists only Stevens Creek as "major tributary" with "other smaller, feeder tributaries in the Project Area" Define "major tributary". Why were Kiokee Creek, Uchee Creek, and Little River on the Georgia side not listed as major tributaries?	Clarifying detail has been provided in Section 4.1.6 of this E.
GADNR – 27	5.1 Issues Pertaining to the Identified Resources - Section 5.1.3 Fish and Aquatic Resources (p 5-2): "Fisheries sampling in Project waters demonstrates good reproductive success, regardless of reservoir fluctuations" FERC 1995 studies are dated and WRD requests updating with more current information such as the SCDNR 2019 or others.	Updates were made regarding existing information and so within this Exhibit E where applicable and available.
GADNR – 28	Appendix A Consultation Record (PDF p578) Threatened, Endangered, and Sensitive (TES) Species, Sumter National Forest (Table; PDF p 579) - Bartram's Bass common and scientific name incorrect. Robust Redhorse scientific name misspelled.	This Exhibit E has been reviewed to correct these details.
GADNR – 29	(p3): study area did not include downstream of dam? Though project area does not expend past dam, discharge does affect water quality, water quantity, and habitat below the dam.	Project operations has been discussed in detail during this filing process and will be additionally determined during FI post-filing scoping.
GADNR – 30	Section 4.3.4 Brook Floater (p17): slimy sculpin is listed as potential host fish Slimy Sculpin does not occur in the Savannah Drainage. Either clarify that this description is range-wide or include only species pertinent to project area.	The RT&E Whitepaper has been reviewed and updated, accordingly.

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Commenting Entity	Comment	DESC Response
GADNR – 31	Section 4.3.6 Piedmont Prairie Burrowing Crayfish (p 18): As stated in comments for PAD section 4.6.2, WRD is unaware of the records of <i>D. crockeri</i> from the Georgia side. We would appreciate citations for these or update the information with current distribution.	The RT&E Whitepaper has been reviewed and updated, accordingly.
GADNR – 32	Section 4.3.8 Robust Redhorse (p 19): "Continued Project operations are not expected to adversely affect the species since the Project reregulates large pulses from Thurmond Dam, providing increased flow and associated habitat stability in the Augusta Shoals and further downstream." - Range description is incorrect; the Santee Basin in SC should be included provide citation for statement also applies to same statement for Bartram's Bass	The RT&E Whitepaper has been reviewed and updated, accordingly.
GADNR – 33	Section 4.3.11 Yellow Lampmussel (p 20-21): did not include range description for GA - GA not listed, but is considered a SWAP high priority species - include GA range description - species information can be readily located on the GADNR Data Portal	The RT&E Whitepaper has been reviewed and updated, accordingly.
GADNR – 34	Appendix I Mussel Study Plan (starts on PDF p 615): " <i>Elliptio complanata</i> " is misspelled in table 2-3 (PDF page 621, Mussel Study Plan pg. 4)	Comment noted.
NMFS – 1	NMFS supports the additional information needs requested by the South Carolina Department of Natural Resources and the U.S. Fish and Wildlife Service. Requested Study #1: Project Survival Study - We request a study to determine	Comment noted.
NMFS – 2	Project survival by quantifying turbine mortality and injury under multiple operating conditions to inform safe, timely, and effective downstream passage measures at the Project.	DESC and the Fish Passage TWC have worked to discus further scope this request. Additional details regarding up entrainment analyses have been included in Section 4.5.2
NMFS – 3	Requested Study #2: Upstream and Downstream Fish Passage Feasibility Study - We request a fish-passage feasibility study to determine upstream and downstream fishway alternatives at the Project to inform safe, timely, and effective passage measures for incorporation into the new license.	DESC and the Fish Passage TWC will continue to work to through the post-filing process to review existing and new available information and receive updates on the implement of downstream fish passage. Current relicensing discussion have indicated that upstream and downstream fish passage feasibility studies may be appropriately timed with downst passage implementation. Nevertheless, DESC and the Fis Passage TWC will continue to explore what may be needed the Stevens Creek Project and the timing for studies and the
SCDNR – 1	Section 2 of the PAD acknowledges the Applicant will be using the Traditional FERC Licensing Process (TLP) and discusses the process plan and schedule. The SCDNR supports the Applicant in the use of the TLP, as expressed in our April 29, 2020 letter to the Licensee.	Comment noted.
SCDNR – 2	Section 3.2 of the PAD should be corrected to state the Project is located in Edgefield and McCormick counties, SC.	This Exhibit E has been reviewed to correct these details.



Commenting Entity	Comment	DESC Response
SCDNR – 3	The SCDNR requests additional information regarding the Project generation and operational procedures described in Section 3.3.3. Further detail would be useful to help understand how the Project re-regulates downstream flows from J. Strom Thurmond Dam (Thurmond Dam) and achieves the water management goals for the Project. The SCDNR requests the flow ratings of each turbine and how are they operated concurrently to re-regulate downstream flows from Thurmond Dam. The PAD states the estimated total hydraulic capacity is approximately 8,300 cfs as a head EL of 28 feet. The PAD consistently references the pond's 1929 NGVD elevation when describing Project operations; however, it is unclear how the head elevation in this reference is compared to the 1929 NGVD elevation given throughout the rest of the document.	Operational discussions during RCG meetings and separat meetings with resource agencies have been held at length subsequent to the receipt of PAD comments. However, DE willing to provide additional detail regarding project operation alleviate any questions regarding reservoir function, elevation downstream flows, or timing of releases relating to USACE operations if additional clarity is needed.
SCDNR – 4	Section 3.4 discusses Project operations in relation to the Thurmond Dam. The SCDNR agrees that the Stevens Creek Project provides an important service to downstream resources in its function as a re-regulating facility.	Comment noted.
SCDNR – 5	Section 4.2 describes the intent of the Project's operating plan as follow: "to develop minimum flows for Stevens Creek under various operating conditions, improve operational efficiency, minimize reservoir fluctuations (particularly during March through June spawning periods), provide more uniform downstream flows, and to address planned storage under different Thurmond Dam operating scenarios." The SCDNR is interested in further understanding the implementation of the operating plan and how these multiple intentions are being addressed and balanced particularly when potentially conflicting objectives such as minimizing reservoir fluctuations and providing uniform downstream flows cannot be met at the same time under limited inflow conditions at the Project.	Operational discussions during RCG meetings and separat meetings with resource agencies have been held at length subsequent to the receipt of PAD comments. However, DEs willing to provide additional detail regarding project operation alleviate any questions regarding reservoir function, elevation downstream flows, or timing of releases relating to USACE operations if additional clarity is needed.
SCDNR – 6	Table 4-2 should be corrected to state, "Monthly Minimum, Mean, Median, and Maximum River Flows at USGS Gage #02197000".	This Exhibit E has been reviewed to correct these details.
SCDNR – 7	Section 4.2.8 discusses potential adverse effects and issues at the Project and proposed studies that will involve additional water quality data collection. The SCDNR notes that in the freshwater mussel survey standard operating procedures provided by SCDNR's malacologist recommends collecting turbidity data near each of the sampling locations.	The Mussel Study was subsequently updated following the of PAD comments.
SCDNR – 8	Table 4-7 in Section 4.5.2 should be corrected as follows: Common Name, Scientific Name, State Priority for Conservation prothontary warbler, <i>Protonaria citrea</i> , Moderate Spotted turtle, <i>Clemmys guttata</i> , High common snapping turtle, <i>Chelydra serpentina</i> , Moderate	This Exhibit E has been reviewed to correct these details.
SCDNR – 9	The first paragraph of Section 4.6 should be corrected to state that Atlantic and Shortnose Sturgeon are both federally endangered species	This Exhibit E has been reviewed to correct these details

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Commenting Entity	Comment	DESC Response
SCDNR	Table 4-9 in Section 4.6 and Table 3-2 in Appendix H should be corrected as follows: Common Name, South Carolina Protected Species Atlantic Pigtoe, Highest Atlantic Sturgeon, Highest Brother Spike, Highest Ironcolor Shiner, Moderate Roanoke Slabshell, High Savannah Lilliput, Highest Shortnose Sturgeon, Highest Spotted Turtle, High Georgia Plume, High Wingpod Purslane, Moderate	This Exhibit E has been reviewed to correct these details.
SCDNR	Section 4.7.11 discusses stakeholder concerns regarding recreational opportunities at the Project. The SCDNR notes that several stakeholders, including GADNR and SCDNR, have expressed interest in the Licensee providing a publicly accessible canoe portage around the Project dam. A site visit is being planned for early 2021 for agency engineers to evaluate site feasibility on either side of the dam.	DESC has evaluated the potential for a canoe portage arou project dam in consultation with resource agencies, stakeh and tribes. A summary of these discussions, inclusive of cu proposals, is included in Section 4.8.2 of this Exhibit E.
SCDNR	The SCDNR understands that some stakeholders have interests in maintaining a higher pool elevation in order to enhance boating opportunities in the Project reservoir; however, SCDNR finds that current Project operations, which can affect pool elevations also serve to re-regulate and reduce fluctuation of downstream flows from Thurmond Dam to the Savannah River. SCDNR recommends that any consideration of operational changes should place a higher priority on the interests of delivering flows to protect and enhance downstream aquatic resources in the river over or above recreational boating on the reservoir.	Comment noted.
SCDNR	Bartram's Bass Study Request - Study Objectives: Assess population status and distribution of endemic Bartram's Redeye Bass and invasive Alabama Bass in the vicinity of the Stevens Creek Hydroelectric Project (Project).	DESC has since discussed this study with SCDNR, and this is being completed outside of the Stevens Creek Project relicensing process. If relevant resource information pertain the Stevens Creek Project is identified, this information will included in the FLA or filed as supplemental information to FERC's EA.
City of Augusta – 1	Augusta supports the comments of resource agencies including the South Carolina Department of Natural Resources ("SCDNR") in its November 2, 2020 comments regarding the scope of studies on water quality and flow.	Comment noted.
City of Augusta – 2	Augusta concurs that additional Project generation and operational procedure detail (as per Section 3.3. of the PAD) is necessary to assess water management goals and effects (SCDNR Additional Information and Study Request).	Comment noted.
City of Augusta – 3	Augusta is unclear regarding the scope of operational flow assessment for the relicensing environmental documentation. This appears to also be a concern of SCDNR. We would appreciate additional information regarding the scope of analysis of flow for this relicensing.	Water Quality study results and operational flows have been discussed in detail with the RCGs and TWCs, of which representatives of the City of Augusta have been included these comments were received.

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Commenting Entity	Comment	DESC Response
City of Augusta – 4	The Water Quality Study Plan should be amended to include additional downstream data points to determine geographic extent of water quality parameter characteristics to consider operational effects on water quality, particularly in the shoals and Augusta. The Water Quality Study Plan states that monitoring would commence January 2021, which is before the report was dated. Augusta recommends that for remaining data collection periods additional downstream monitors be employed and the monitoring period may have to be adjusted to obtain an appropriate seasonal data set.	Although the Water Quality Study Plan was largely develop consultation with resource agencies and stakeholders, incle experts from GADNR, SCDNR, SCDHEC, USFWS, NMFS USFS, prior to the City becoming involved as a relicensing stakeholder, study results have since been shared and exp with the City. Monitoring sites were selected to aid in the quantification of effects of Stevens Creek Project re-regula operations on water quality both upstream and directly downstream. Additional downstream monitoring sites as pa the aforementioned Water Quality Study Plan would be wit subsequently influenced by the Augusta pool and outside of Stevens Creek Project nexus identified within FERC study
City of Augusta – 5	Detailed assessment of flows is also necessary to determine Stevens' Creek effect on New Savannah Bluff Lock and Dam pool elevation, which is protected under Federal law. The pool elevation, by extension, protects Augusta's water supply, recreation, Augusta Riverwalk, Augusta Canal National Heritage Area, and historic and recreational resources.	DESC respectfully notes that these issues are part of a large discussion involving litigation at the downstream NSBLD are appropriate within the context of this relicensing. DESC has continued to share flow and operational information with the of Augusta to inform their associated studies and analyses
City of Augusta – 6	Augusta also notes that the Recreation Study Plan is limited to in-reservoir recreational features. Consistent with the SCDNR comment regarding flow and operations and Augusta's support of additional flow information and detailed assessment, Stevens Creek largely controls flow for the purpose of recreation from the Stevens Creek dam to the NSBLD and should be included in any assessment.	Recreation and available amenities downstream of the Ster Creek Project boundary are entirely outside of the control of DESC and, therefore, have not been included as a subject study during this relicensing other than for reference to reg and locally available opportunities.

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APPENDIX E-3

AQUATIC HABITAT WHITEPAPER

Aquatic Habitat Whitepaper

Stevens Creek Hydroelectric Project FERC No. 2535

Prepared for:

Dominion Energy South Carolina, Inc. Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina www.KleinschmidtGroup.com

March 2023

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1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535) (Project). The Project, which has an installed capacity of 17.28 megawatts (MW), is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The Project's dam is located approximately one mile upstream of the Augusta Diversion Dam (ADD) and approximately 13 miles downstream of the U.S. Army Corps of Engineers (USACE) J. Strom Thurmond Dam (JSTD or Thurmond Dam). The surface area of the reservoir is 2,400 acres at the normal full pond elevation (EL) of 187.5 feet. The Project drainage area is approximately 7,122 square miles.

DESC operates the Project to generate clean, renewable energy and re-regulate highly variable river flows discharged by the USACE from the JSTD. The normal operating target range for the Project is to provide an hourly discharge of +/- 15 percent of the scheduled daily average discharge from JSTD, if the actual discharge from JSTD is within 500 cubic feet per second (cfs) of the scheduled discharge.

On November 22, 1995, the Federal Energy Regulatory Commission (FERC) issued a 30year license which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. The Project is currently involved in a relicensing process which involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGOs), and interested individuals. DESC established a Water Quality, Fish and Wildlife Resource Conservation Group (RCG), with interested stakeholders to address Project issues related to aquatic and terrestrial resources.

As part of relicensing, DESC has collected existing information and developed several study plans in consultation with the RCG that will be used to characterize the Project area and vicinity. The information collected is summarized below and is intended to assist the licensee, resource management agencies, and other interested entities in understanding the aquatic resource surrounding the Stevens Creek Project as it relates to fish passage goals, diadromous fishes in the region, the baseline aquatic environment, and in decision making processes applicable for the Project's upcoming new license term.

2.0 DESCRIPTION OF THE BASIN

The Savannah River is one of the largest rivers in the southeastern United States, with a drainage area of more than 10,000 square miles (Entrix 2002a). The Savannah River begins at the confluence of the Seneca and Tugaloo rivers in northern Georgia, flowing 300 miles southeasterly through the Piedmont and Coastal Plain physiographic provinces before entering the Atlantic Ocean near Savannah, Georgia. The headwaters of the Savannah River Basin originate in the Blue Ridge Mountains. The Project is within the Middle Savannah River Valley, near the upper end of the Fall Line, a 20-mile-wide geologic boundary that divides the Piedmont and Coastal Plain physiographic provinces; the Fall Line in Georgia and South Carolina is the first location inland from the Atlantic Ocean where sets of rock rapids occur in the Savannah River. The Project is approximately eight river miles (RMs) upstream of Augusta, Georgia, and 209 RMs from the Atlantic Ocean. The Savannah River forms most of the border between Georgia and South Carolina (Figure 1).





2.1 Land Use in the Project Area

The Savannah River Basin is predominantly rural with widely spaced population centers. Augusta, Georgia, with a population of approximately 200,000, is the main urban center near the Project. The Project area includes public and private lands, such as national forest, private timber lands, rural residential developments, and some agriculture lands (FERC 1995). Land on the Georgia side of the Project area is privately owned with intermittent rural residential development. Most of the land in South Carolina is associated with the Sumter National Forest (SNF), which is managed for recreation and timber. Agricultural use of the land is limited, and forested uplands dominate the landscape. DESC owns a small amount of land within the Project boundary and retains flowage easements for the remainder of land within the Project boundary.

2.2 Water Use in the Project Area

DESC operates the Project to generate hydropower and re-regulate flows from USACE dams to downstream water users. The USACE is authorized by Congress to manage the Hartwell, Richard B. Russel, and J. Strom Thurmond Hydroelectric projects for water supply, water quality, hydropower production, flood risk management (originally called flood control), downstream navigation, recreation, and fish and wildlife management.

The Augusta Canal, a 13-mile-long historic and functional canal, is fed by the Savannah River and was designed to harness waterpower at the fall line to drive mills, provide transportation of goods, and provide a municipal water supply. It is the only canal in the United States in continuous use for its original purposes of providing power, transport, and municipal water. Today, the Augusta Canal provides drinking water to the city of Augusta, recreational and tourism opportunities (e.g., guided tours), and hydropower. Average annual river flow diverted to the Augusta Canal ranges from 2,000 to 3,000 cfs (USGS 2022).

Municipalities and industries have water withdrawals and discharge treated wastewater into the Savannah River in compliance with state permitting requirements. Entities near the Project withdrawing from or discharging to the Savannah River include the cities of Augusta and North Augusta, Columbia Water and Sewer, and Edgefield Water and Sewer. Large industries that use the river include Kimberly-Clark in Beach Island, South Carolina, the Vogtle nuclear power plant near Waynesboro, Georgia, and the U.S. Department of Energy's Savannah River Site in Aiken, South Carolina. The Columbia County Water System, Georgia, is currently permitted to withdrawal 45.90 million gallons/day from the Stevens Creek Reservoir (GAEPD 2017).

2.3 Dams and Diversion Structures in the Basin

The USACE operates three hydropower projects upstream of the Project: Hartwell, Richard B. Russel, and J. Strom Thurmond (Figure 2). The three reservoirs form a chain along the Georgia-South Carolina border for a length of 120 miles. Thurmond Dam (JSTD), located at RM 220.9, is the most downstream of these projects and is operated primarily for peaking hydroelectric production and flood risk management. The JSTD is approximately 13 RMs upstream of the Project. There are also two dams and smaller reservoirs downstream of the Project: the Augusta Diversion Dam (ADD) and the New Savannah Bluff Lock and Dam (NSBLD). The ADD is one mile downstream of the Project and the NSBLD is approximately 20 RMs downstream of the Project (Figure 2). The upper portion of the Savannah River is highly regulated by the three USACE hydropower projects. The status of fish passage at these facilities is detailed further within Section 4.1.

2.4 Tributary Rivers and Streams

Stevens Creek is a major tributary of the Savannah River that is within the Project boundary. Stevens Creek is approximately 48 RMs in total length and discharges into the Savannah River just upstream of the Stevens Creek Dam (SCD). The Project boundary encompasses the lowermost 12 RMs of Stevens Creek. Numerous other named and unnamed tributaries occur in the Project area.

The Project is located at the Fall Line, which is the transition between the Piedmont and Coastal Plain physiographic ecoregion. Many of the perennial streams and numerous tributaries in the Project vicinity (and the Fall Line in general), can quickly transition from higher gradient, incised, Piedmont streams, into low gradient Coastal Plain streams as they enter the Savannah River floodplain. In addition, these streams have high sediment loads resulting from historic farming, as well as recent local developments and land clearing. In the upper reaches of the watershed, these streams are greatly incised with steep banks, and are generally flashy during rain events. Increased water velocities result in scour and bank erosion. As these streams approach the Savannah River floodplain, the streams widen, slow, and sediments are deposited and accumulated.



Figure 2 Hydroelectric Projects on the Savannah River

3.0 SPECIES OF INTEREST AND HABITAT NEEDS

3.1 Rare, Threatened, and Endangered Species and Other Species of Interest

For this document, species of concern are limited to aquatic species that are rare, threatened, or endangered (RTE) or species of conservation concern that potentially occur within the Project vicinity. This includes species that are known to occur within a three-mile buffer around the Project boundary and proposed, endangered, threatened, or sensitive (PETS) species that occur in the Long Cane Ranger District of the SNF (See Appendix A for agency coordination). In addition, fishes that are of conservation concern, are important mussel hosts, or migratory species are included.

Table 1Aquatic Species of Interest That May Occur in the Stevens CreekProject Area

Common Name	Scientific Name	US Status	State Status	Category		
Invertebrates						
Brook Floater	Alasmidonta varicosa	-	-	USFS SNF Sensitive		
Atlantic Spike	Elliptio producta	-	_	-		
Roanoke (slabshell	Elliptio roanokensis	-	-	USFS SNF Sensitive		
Yellow Lampmussel	Lampsilis cariosa	-	-	USFS SNF Sensitive		
Rayed Pink Fatmucket	Lampsilis splenda		-	USFS SNF Sensitive		
Carolina Heelsplitter	Lasmigona decorata	E	-	USFS SNF Sensitive		
Eastern Creekshell	Villosa delumbis	-	-	-		
Lean Crayfish	Cambarus strigosus	-	GA T			
Piedmont Prairie Burrowing Crayfish	Distocambarus crockeri	_	-	USFS SNF Sensitive		
Fishes						
Atlantic Sturgeon	Acipenser oxyrinchus oxyrinchus	E	GA E SC E	Migratory (Anadromous)		
Shortnose Sturgeon	Acipenser brevirorostrum	Е	GA E SC E	Migratory (Anadromous)		

Common Name	Scientific Name	US Status	State Status	Category
American Shad	Alosa sapidissima	-	-	Migratory (Anadromous)
Blueback Herring	Alosa aestivalis	-	-	Migratory (Anadromous)
Hickory Shad	Alosa mediocris	-	-	Migratory (Anadromous)
American Eel	Anguilla rostrata	-	-	Migratory (Catadromous)
Rosyface Shiner	Hybopsis rubrifrons	-	-	
Highfin Shiner	Notropis altipinnis	-	-	
Notchlip	Moxostoma			
Redhorse	collapsum	-	-	
Robust	Moxostoma		CAE	Migratory
Redhorse	robustrum	ARS	GAE	(Potamodromous)
Snail Bullhead	Ameiurus brunneus			
Flat Bullhead	Ameiurus platycophalus	-	-	
Striped Bass	Morone savatillis	_		Migratory (Anadromous)
Bartram's Bass	Micronterus coosae	_	_	Migratory (Locally)
Carolina Darter	Etheostoma collis	_	_	
	Etheostoma			
Christmas Darter	hopkinsi	-	-	
Turquoise	Etheostoma			
Darter	inscriptum	-	-	

E = Endangered, T = Threatened, ARS = At-Risk Species

3.2 Unionids

3.2.1 Native Freshwater Mussels within the Project Vicinity

Atlantic Spike

The Atlantic Spike (*Elliptio producta*) is found throughout South Carolina and prefers streams or rivers with sandy, rocky, and/or muddy bottoms in sections where the current is moderate. This species is found throughout Maryland, Pennsylvania, North Carolina, Virginia, and South Carolina. However, it has been extirpated from some reaches where it was previously found, possibly due to environmental factors including decreased water quality associated with sedimentation and pollution. The host fish for this species is not known.

Carolina Heelsplitter

The Carolina Heelsplitter (*Lasmigona decorate*) is found in cool, well-oxygenated reaches of rivers and streams. The current range of this species is limited as compared to its historic range. The decline and loss of populations are associated with factors including pollutants from municipal and industrial wastewater releases. The species is sensitive to silt and is generally found in silt-free areas with banks that are stabilized and shaded by trees and shrubs. One of the ten surviving South Carolina populations of Carolina Heelsplitter is found in Turkey Creek and its tributaries upstream of the Project boundary. The Carolina Heelsplitter population in Turkey Creek was stocked by the U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and the South Carolina Department of Natural Resources (SCDNR) in 2019. These creeks are part of the Savannah River drainage, located in Edgefield County, South Carolina. Numerous stream fishes, predominantly Cyprinids and Centrarchids, serve as host fish for the Carolina Heelsplitter (Eads et al. 2010).

Brook Floater

The Brook Floater (*Alasmidonta varicose*) is a freshwater mussel species that is usually found in high gradient, consistently flowing reaches of rivers and streams. Preferred substrates are characterized by sand and gravel, often with adjacent boulders. This species is sensitive to habitat degradation, including excessive silt and nutrient inputs, and is also sensitive to hypoxia. Brook Floater is considered a host generalist, being able to use a variety of fish species as its reproductive hosts, which varies by drainage (Eads et al. 2007; Wicklow et al. 2017, Skorupa et al. 2022). This species is known to occur in Edgefield and McCormick counties in South Carolina. Specifically, it has been documented in several streams in the Stevens Creek Basin.

Roanoke Slabshell

The Roanoke Slabshell (*Elliptio roanokensis*) is typically found in large rivers and occasionally in small creeks. Host fishes for this species are unknown but are expected to be anadromous fishes. The mussel tolerates large variations in flow levels and higher water temperatures, making it able to survive in some locations near dams and hydroelectric plants. However, the species is rarely found upstream of large barriers, presumably because of restricted upstream movements of migratory host fish species (SC SWAP 2015). In South Carolina, the mussel is found in the Pee Dee River and the Catawba,

Congaree, and Savannah River basins. Although it has the potential to be found in watersheds on the Long Cane Ranger District in the Savannah River Basin, no known records in the SNF exist.

Yellow Lampmussel

The Yellow Lampmussel (*Lampsilis cariosa*) is a freshwater mussel species found primarily in medium to large rivers and streams with a variety of substrates including silt or sand, gravel bars, and bedrock cracks. Not much is known about host species for Yellow Lampmussel, but species may include Yellow Perch (*Perca flavescens*) and White Perch (*Morone americana*) (NRCM 2008). Distribution in South Carolina spans the Savannah, Broad, Wateree, Congaree, and Pee Dee River basins. The species is found in the Long Cane Ranger District in the Lower Stevens Creek and Turkey Creek-Stevens Creek watersheds with the potential to also occur in the Upper Stevens Creek watershed.

Rayed Pink Fatmucket

Rayed Pink Fatmucket (*Lampsilis splendida*) (sometimes referred to as Eastern Lampmussel [*Lampsilis radiata*]) due to taxonomic uncertainty) occurs from the Altamaha River Basin in Georgia northward to the Cape Fear River Basin in North Carolina. This species is found in muddy and sandy areas in streams, rivers, and bankwater swamps, and appear sensitive to channel modification, pollution, sedimentation, and low oxygen conditions (Taxonomic Expertise Committee 2004). The species is known to use Largemouth Bass (*Micropterus salmoides*) as a host species (Johnson et al. 2012).

3.2.2 Existing Information in the Project Vicinity

A mussel study plan for the Project was developed in consultation with the USFWS, Georgia Department of Natural Resources (GADNR), SCDNR, and the RCG. The purpose of study was to gather quantitative and qualitative data on the diversity, spatial distribution, and relative abundance of the mussel fauna occurring in portions of Stevens Creek, Little Kiokee Creek, and Uchee Creek within the Stevens Creek Project boundary. Mussel studies were not proposed for the Savannah River mainstem portion of the Project reservoir. In accordance with the study plan, a mussel survey took place in accessible portions of the aforementioned streams in October 2021. Detailed results of this survey were presented in the 2021 Mussel Study Executive Summary submitted to the RCG in June 2022.

In general, lotic habitats were of poor quality with slow flows or stagnant conditions across all sampling locations. The areas with the greatest potential habitat suitability were surveyed, but the majority of reconned areas were unsuitable for mussels. No live mussels were observed in any of the sampling locations. However, two mussel species (Eastern Elliptio [*Elliptio complanata*] and Eastern Creekshell [*Villosa delumbis*]) were documented in Stevens Creek through the observance of shell fragments. In general, these impounded areas exhibit low base flow, but are subject to flashy discharge events during heavy precipitation, fluctuations in water level, and flows during power generation activities at JSTD. Additionally, benthic habitats were poor, with substrates that were primarily loose, mobile sands, clay bottoms with heavy silts and sediment loads, or dense aquatic vegetation. Further, stream margins and banks were bare of vegetation, formed of dense clay, and exhibited little in-channel structure or protection like rootwads or woody debris. Based on the lack of live mussel specimens and the observed habitat conditions in the accessible portions of Stevens Creek, Little Kiokee Creek, and Uchee Creek, mussel occurrence within the survey areas, particularly RTE species, is unlikely.

Other mussel surveys have taken place in the Project vicinity, but not within the Project area itself. Researchers found nine live freshwater mussel species in the Augusta Shoals area, located near RM 203, in 2002: Carolina Slabshell (*Elliptio congarea*), Sad Elliptio, Roanoke Slabshell, Variable Spike (*Elliptio icterina*), Pod Lance (*Elliptio folliculate*), Carolina Spike, Eastern Elliptio (*Elliptio complanata*), Florida Pondhorn (*Uniomerus carolinanus*), and Eastern Creekshell (*Villosa delumbis*) (Entrix 2002a). No state or federally threatened or endangered freshwater mussel species were found (Entrix 2002a).

In 2006, the Catena Group inventoried freshwater mussels in the Savannah River from the Augusta Shoals area (near RM 203) downstream to estuarine waters (near RM 23). The Catena Group identified 26 species of freshwater mussels during the survey, noting that diverse and viable mussel populations occur throughout the Savannah River. Carolina Slabshell, Eastern Elliptio, and Roanoke Slabshell were the most common native species; however, the most abundant bivalve throughout the Savannah River drainage was the Asian Clam (*Corbicula fluminea*) (Catena Group 2007). The Catena Group identified 15 freshwater mussel species that occur downstream of the Project (i.e., between RM 203 and RM 196.2). Two rare species (Atlantic Pigtoe [*Fusconaia masoni*] and Brother Spike [*Elliptio fraternal*]) were described as "potentially occurring" based on pending DNA testing. The Atlantic Pigtoe, which the USFWS listed as a threatened species in 2021, is presumed extirpated from the southern portion of its range, including the Savannah River Basin. The Brother Spike is a state-threatened species in South Carolina and Georgia.

In 2017, Alderman Environmental Services, Inc. performed freshwater mussel surveys along approximately 38 miles of stream within the SNF in McCormick, Greenwood, and Edgefield counties, South Carolina. Stream miles surveyed are outside of, but adjacent to, the Stevens Creek arm of the Project boundary. Biologists documented four freshwater mussel species during survey activities. These included Eastern Elliptio (23 live/36 shells), Sad Elliptio (1 live), Eastern Creekshell (3 live/1 shell), and Atlantic Spike (8 live). Asian Clam was also observed within most streams surveyed. Substrate compositions observed during survey streams varied from mostly sand and gravel, to silt, sand, gravel, pebble, cobble, boulder, and bedrock. Beaver activity was observed on most survey streams. Alderman noted that the relatively low numbers of mussels observed was likely due to sediment accumulation and transport within stream valleys (Alderman 2017).

3.3 Migratory Fish Species

Historically, the Savannah River Basin supported seven diadromous species: American Shad (*Alosa sapidissima*), Blueback Herring (*Alosa aestivalis*), Hickory Shad (*Alosa mediocris*), American Eel (*Anguilla rostrata*), Striped Bass (*Morone saxatilis*), Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), and Shortnose Sturgeon (*Acipenser brevirostrum*). All seven species are known to occur downstream of the ADD presently. Striped Bass and Blueback Herring occur throughout the USACE reservoirs due to stocking efforts to establish a game fishery. Atlantic Sturgeon and Shortnose Sturgeon are listed as endangered species under the Endangered Species Act (ESA). Atlantic Sturgeon and Shortnose Sturgeon and Shortnose Sturgeon historically migrated throughout the Savannah River to reach spawning or rearing grounds at the Augusta Shoals.

3.4 Sturgeons (Atlantic and Shortnose)

3.4.1 Life History

Juvenile Atlantic Sturgeon may spend its first years in fresh or brackish waters of rivers prior to migrating to the ocean to mature. Adults can participate in long spawning migrations back into freshwater rivers, where they spawn over hard clay, rubble, or gravel bottom with well-oxygenated waters (Vladykov and Greely 1963). Adults in South Carolina inhabit rivers and estuary habitats from March through November and occupy the Atlantic Ocean in the colder months (Collins et al. 2000).

Shortnose Sturgeon prefer deeper areas with soft substrate and vegetated bottom and enters the ocean less frequently than Atlantic Sturgeon (Rhode et al. 2009). In general, adults are found in deep waters during winter and shallow waters in the summer (Dadswell et al. 1984). Juveniles inhabit deep river channels above the salt wedge (Dadswell et al. 1984) or immediately downriver of the freshwater/saltwater boundary (Hall et al. 1991). Upriver spawning migrations in the Savannah River were observed from mid-February to mid-March over submerged timber, scoured sand, and clay and gravel substrates at depths of 6-9 meters and bottom velocities of 82 centimeters per second (Hall et al. 1991).

3.4.2 Existing Information within the Project Vicinity

The National Marine Fisheries Service (NMFS) is responsible for the protection of threatened and endangered anadromous and marine fish species. Atlantic Sturgeon and Shortnose Sturgeon, two species that inhabit freshwater seasonally, are listed under the ESA as threatened and endangered, respectively. These species are not known to occur in the Project area at this time; however, there is potential for the species to occur in the future, following the implementation of fish passage downstream of SCD (i.e., NSBLD and ADD).

Critical habitat for Atlantic Sturgeon (designated in 2017 by NMFS) begins at the mouth of the Savannah River at the Atlantic Ocean and extends upstream to the NSBLD, which is located at RM 180, approximately 20 RMs downstream of the Project. There is no designated critical habitat for Shortnose Sturgeon.

In 2013, the USACE Savannah District committed to monitor the distribution of sturgeon in the Savannah River Estuary as part of the Savannah Harbor Expansion Project (SHEP). Monitoring was contracted to SCDNR and included a telemetry study pre-construction, during construction, and post-construction on both Atlantic and Shortnose Sturgeon (Post et al. 2018). SCDNR documented 13 adult and two juvenile Shortnose migrating upstream. Sturgeon migrate upstream to potential spawning habitat near RM 130 during late winter and early spring over a five-year period (2014 through 2018) (Post et al. 2018). Similarly, SCDNR documented four adult Atlantic Sturgeon make presumed spawning runs to potential spawning habitat between RM 104 and to within approximately 9 RMs of NSBLD during late winter and early spring during the same time period (GADNR 2017; Post et al. 2018). Juveniles of both species tend to stay lower in the river system closer to the estuaries (GDNR 2017, Post et al. 2018, Collins et al. 2002). Hall et al. (1991) reported that Shortnose Sturgeon made spawning runs upstream to between RM 111 and 118 and between RM 170 and 172; Collins and Smith (1993) reported that Shortnose Sturgeon made spawning runs upstream to between RM 111 and 141. GADNR reports that Shortnose and Atlantic Sturgeon may inhabit the Savannah River up to or near the NSBLD at RM 180.

3.5 Alosines

The Savannah River, particularly around the NSBLD, was historically home to a recreational shad fishery. The NSBLD serves as a partial migration barrier, where migrating fish congregate each year during spawning. Until 2014, recreational anglers used the NSBLD site to harvest congregating shad. The USACE closed access to the site due to safety concerns regarding the deteriorating wingwall, which reduced shad angling activities at the NSBLD (GADNR 2022). Although the NSBLD is a barrier, and was designed for navigation, the structure provides very limited fish passage, where migrating fish may utilize the lock structure during high flows. When flows are greater than 453 cubic meters per second, water levels are roughly equal, and allow fish to pass through the lock and dam (ASMFC 2017). The first obstruction without the ability for shads to pass is the ADD. This migration barrier results in migrating adult Alosines (i.e., Blueback Herring, American Shad, and Hickory Shad) having access to only 66 percent of the historical riverine habitat (SCDNR/GADNR 2020).

Because the Savannah River occurs in both Georgia and South Carolina, annual monitoring for Alosids within the river is a combined effort between SCDNR and GADNR, as required by the Atlantic States Marine Fisheries Commission (ASMFC). The Savannah River Alosine fishery is considered sustainable by GADNR and SCDNR at its current population level and existing fishing regulations (SCDNR 2017).

3.5.1 General Life History of Alosines and Existing Information within the Project Vicinity

Blueback Herring

Blueback Herring spend their life within the Atlantic Ocean until ascending coastal rivers during spring spawning migrations. The egg, larva, and small juveniles remain in freshwater. Larger juveniles migrate downstream into estuaries, where they feed, grow, and migrate into the ocean. Spawning usually peaks in the first week of March, and success depends on the presence of clean vegetation and other material for egg adhesions (Bulak and Christie 1981, Rhode et al. 2009). Tidal, freshwater-breached impoundments and relict rice fields are heavily utilized for spawning by Blueback Herring in the Cooper River drainage of South Carolina (Christie et al. 1981). Introduced Blueback Herring occur in the main stem of the Savannah River and as land-locked populations within the upstream USACE reservoirs (i.e., Lake Hartwell, Russell and Thurmond) because of fishery management efforts and angler activities (Rhode et al. 2009, ASMFC 2017). Non-

coastal, land-locked or reservoir-dwelling Blueback Herring living in open waters typically move closer to shore for spawning, utilizing rocky shorelines or ascending flowing tributaries (Rhode et al. 2009). Blueback Herring coming from the ocean typically enter the Savannah River in the spring and out-migrate as young of year fish in the fall. Blueback Herring may pass the NSBLD during high water conditions (locking activities have not occurred at the NSBLD in recent history).

A survey conducted by SCDNR in 2018 evaluated the abundance of forage fishes in the Stevens Creek reservoir between the JSTD and SCD. Blueback Herring were the most predominant forage species, followed by Golden Shiner (*Notemigonus crysoleucas*) and Threadfin Shad (*Dorosoma petenense*) (Bettinger and Bulak, 2019). Density of forage species were highest in August, particularly in the lower section of the reservoir, just upstream of SCD. In November, densities remained the highest in the lower two-thirds of the reservoir, but smaller fishes (<200mm) were more predominant than larger (>200mm) forage fishes (Bettinger and Bulak, 2019).

<u>Hickory Shad</u>

Similar to Blueback Herring, adult Hickory Shad spend their adult life in the Atlantic Ocean, migrating into freshwater from late winter to early spring to spawn. Spawning habitats include tidal freshwaters such as creeks, flooded swamps, sloughs, and other backwater tributaries to a main channel (Rhode et al. 2009). Small juveniles remain in freshwater for the summer but return to higher salinity waters by fall. Hickory Shad are more piscivorous than other Alosines, feeding on fish, small crabs, insects, squid, and fish eggs.

In South Carolina, Hickory Shad have sporadic occurrences in the lower reaches of Coastal Plain rivers. Within the Savannah River, the species is only known to occur below the Fall Line, with one capture in Lake Hartwell, which was presumably from angler introduction (Rhode et al. 2009).

American Shad

American shad are widely distributed along the Atlantic coast and occur in all the Coastal Plain drainages (Rhode et al. 2009). Similar to other Alosines, schools of adults live in the Atlantic Ocean and ascend coastal rivers upon maturity to spawn. After hatching, larvae and young remain in the lower portions of the coastal river and estuaries to feed and grow. American Shad rarely occur above the Fall Line but are highly established in Coastal Plain portions of major rivers and stream systems. In the Savannah River, American Shad begin spawning in tidal freshwater near river kilometer (km) 64 (McCord 2003) and have about 237 km of suitable spawning habitats below NSBLD (SCDNR/GADNR 2020). Fish passage techniques have been employed at the NSBLD to provide an additional 32 km of mainstem Savannah River to the base of the ADD, which is the first barrier with no dedicated fish passage (SCDNR/GDNR 2020). A study within the vicinity of NSBLD tracked tagged American Shad in 2001 and 2002 (Bailey et al. 2004). In 2001, over 50 percent of tagged American Shad passed through the lock and dam structure, whereas 9 percent passed through NSBLD in 2002. The study concluded than American Shad were not uniformly distributed throughout the study area and predominantly grouped immediately below NSBLD and in a large pool approximately 3.75 miles downstream of the lock and dam. The population of American Shad that reached the NSBLD study area was estimated to be 157,685 and 217,077 in 2001 and 2002, respectively (Bailey et al. 2004). This study confirmed that spawning habitat generally follows that found in other studies (Walburg and Nichols 1967, Beasley and Hightower 2000), with the species preferring sand and gravel areas below an obstruction.

3.6 American Eel

3.6.1 Life History

The American Eel (*Anguilla rostrata*) is a catadromous species known to occur within river systems of Georgia and South Carolina. Mature American Eels spawn in the Atlantic Ocean where the egg and pre-larval stages mature into the larvae leptocephalus stage. Larvae drift with ocean currents for approximately one year before metamorphosing into the glass eel stage. Glass eels migrate across the continental shelf, eventually entering estuaries and tidal rivers, where they mature into elvers.

Elvers migrate primarily at night and can overcome obstacles that often prevent passage of other aquatic species. Vertical obstacles, such as a dam, can be traversed by small eels provided the surface of the structure is textured and remains wet. As the small eels continue to mature into yellow eels, they may gradually move upstream over many years, with the greatest movement occurring during the moderate water temperatures of spring and fall (ASMFC 2000). Upstream migrations of small eels in the southeast appear to increase as water temperatures reach 15°C and continue until water temperatures reach approximately 22°C (Haro 1991). Hammond and Welsh (2009) studied the movements of radio-tagged yellow eel near Millville Dam on the Shenandoah River, West Virginia, and found the onset of upstream migration in the spring to be associated with an increase in river discharge when water temperature exceeded 15°C. Walsh and Liller (2013) investigated the association between daily counts of upstream migrant yellow eel at the Mill Dam eel fishway and the environmental variables of lunar illumination, river discharge, and water temperature. They found elevated river discharge to be associated with almost all peaks of daily eel counts when water temperature ranged from 19 to 28°C. Mass upstream migration was observed during an extreme discharge event whereas little yellow eel movement was indicated during low discharge periods. Low lunar illumination was also associated with higher counts of upstream migrants.

3.6.2 Existing Information within the Project Vicinity

Although the American Eel currently does not have special status under the state of Georgia or federal regulations, it has been identified by SCDNR as a priority species (SCDNR 2005). The federal status of this species is currently stable and has been reviewed by the USFWS and NMFS several times over the past decade.

Currently, there is limited information on American Eel populations present within the Stevens Creek Project vicinity. However, fisheries surveys within the Stevens Creek Reservoir and downstream of the Project have confirmed the presence of American Eel both upstream and downstream of the dam. Fisheries surveys completed in 1984 within the Savannah River and the adjacent Augusta Canal, downstream of the Project, showed relatively moderate numbers of American Eel compared to the total composition of the fisheries community (Entrix 2002b). Fish sampling completed in the spring of 2001 immediately downstream of NSBLD resulted in collecting a few adult specimens and observing a large congregation of juvenile eels approximately 6 inches in length (Entrix 2002b). More recent fisheries surveys completed by SCDNR (Bettinger and Bulak 2019) documented the presence of American Eel within the Project reservoir, albeit in relatively low abundances compared to the total fisheries community observed. The presence of American Eel above the Project suggest yellow eels are finding passage upstream. Means of passage could include climbing the dam surface or passage through leaking portions of the abandoned lock and/or turbine bays.

Along with the limited population data for American Eel, little information exists for peak migration periods for American Eel in the Project vicinity. DESC has been involved with the collection and synthesis of dissolved oxygen (DO), pH, conductivity, and water temperature data for the past 22 years at eight monitoring locations throughout the Stevens Creek Reservoir and in the tailwater. Analysis of the water temperature data for the tailwater show that water temperatures typically reach 15°C in April and 22°C in August. Temperatures tend to hover between 20°C and 25°C throughout the summer before dropping to 15°C in November. Given migration patterns of yellow eel, the greatest concentration of upward migrating yellow eel in the tailwaters of SCD likely occur during the April to November time periods.

3.7 Robust Redhorse and other Migratory Suckers

3.7.1 Life History

The Robust Redhorse (*Moxostoma robustum*), a large, heavy-bodied sucker, was once presumed extinct but was rediscovered in the Oconee River below Georgia Power's Sinclair Hydroelectric Project (FERC No. 1951) in the early 1990s. This rediscovery sparked the formation of the Robust Redhorse Conservation Committee (RRCC) in 1995 to guide recovery efforts for the species. Preferred riverine habitat includes riffle areas or in/near outside bends, where depths are greater, and accumulations of logs and other woody debris are present (Evans 1997, Mosely and Jennings 2007). Habitat use shifts throughout the year with Robust Redhorse moving into swift shoals and gravel bars during spawning season and retreating downstream to non-spawning and overwintering habitats (Grabowski and Isley 2006). Spawning occurs between April and June over gravel substrate in deep and shallow waters (Hendricks 1998). Spawning usually lasts for two weeks when water temperature averages 20-24°C, where eggs are scattered in gravel and embryos are left to develop in the interstitial spaces (Ruetz and Jennings 2000).

3.7.2 Existing Information within the Project Vicinity

Robust Redhorse is known to occur within the Savannah River, with a known spawning population present below the NSBLD (Grabowski and Isely 2007) as spawning aggregations have been continually observed in recent years. Additionally, Robust Redhorse has been documented spawning upstream of NSBLD in Augusta Shoals (RRCC 2017). Upstream of the Project, Robust Redhorse occur in Thurmond Reservoir, with a known spawning aggregation in Anthony Shoals where the Broad River (Georgia) enters the reservoir (Straight and Freeman 2013). Although Robust Redhorse is present upstream of JSTD and downstream of the ADD, no individuals have been detected in the Stevens Creek impoundment.

3.8 Other Species of Interest

Several species of interest listed in Table 1 are addressed in the Georgia or South Carolina State Wildlife Action Plan (SWAP), are tracked species, or are of conservation concern. However, several of these species do not have a federal or state protective status, are not migratory, are not known important mussel host species, or they exhibit populations that are relatively secure throughout their range. Because this document focused on protected species, migratory fishes, and mussels, the following species have been excluded from further analysis: Rosyface Shiner (*Notropis rubellus*), Notchlip Redhorse (*Moxostoma collapsum*), Snail Bullhead (*Ameiurus brunneus*), Flat Bullhead (*Ameiurus platycephalus*), Carolina Darter (*Etheostoma collis*), Christmas Darter (*Etheostoma hopkinsi*), and Turquoise Darter (*Etheostoma inscriptum*). Although migratory, Striped Bass (*Morone saxatilis*) was eliminated from this document due to its status as a heavily managed and stocked gamefish, there is an existing wealth of information regarding their persistence throughout the Savannah River system.

4.0 EXISTING HABITAT ENHANCEMENTS, REGIONAL FISH RESTORATION EFFORTS, AND IMPEDIMENTS

DESC and resource agencies identified two priority enhancement areas for the Fisheries Resource Enhancement Plan (2016 to 2025) per the existing FERC license: 1) fisheries and freshwater mussel restoration and/or enhancement, and 2) river bottom habitat enhancement. Recent and expected continued improvement of DO conditions at JSTD due to installation of auto-venting turbines and an oxygen diffuser system have made stocking or re-introduction of fish species a viable option for resource enhancement in the Stevens Creek area. Fish reintroduction was designated as a priority resource enhancement action in the 2016 to 2025 plan. American Shad, Robust Redhorse, and Striped Bass were identified as potential species for re-introduction. Cool-water species such as Walleye (Sander vitreus) or Sauger (Sander canadensis) may be evaluated for introduction, but these species are not addressed in this document. Additional focus of the third ten-year plan will be on the evaluation and enhancement of freshwater mussel resources. DESC identified the use of stone to provide bottom structure in areas of flow as a potential means of improving fish spawning and rearing habitat near the Project. Removal of accumulated sediment was also identified as a potential method for improving spawning and rearing habitat within the Fisheries Resource Enhancement Plan.

4.1 Existing Migration Barriers

Major river channel modifications near Savannah for shipping and commerce have occurred since colonial times. These activities have altered salinity, decreased DO at depth, increased flushing rates in the lower estuary, and reduced freshwater tidal wetlands, all of which have adversely affected migratory fish species and their habitats (SCNDR and GADNR 2014). There are six dams on the Savannah River, of which only the first dam, the NSBLD at RM 187, approximately 21 RMs downstream of the Project, has an upstream fish passage system using its navigation lock. However, due to concerns about structural integrity, the lock has not been operated for fish passage since May 2014. The ADD, which is located approximately 19 RMs upstream of the NSBLD and one mile downstream of the SCD, does not currently have operational fish passage, nor do the three USACE dams upstream of the Stevens Creek Project. The USACE recently completed the SHEP to deepen the 18.5-mile outer harbor to 49 feet at mean low water and the Savannah River channel (i.e., inner harbor) to 47 feet (USACE 2022). As mitigation for the SHEP, the USACE is currently required to provide sturgeon passage at NSBLD (USACE 2022); design of fish passage at NSBLD is ongoing and construction has not been initiated.

DESC's existing license for the Project requires upstream passage following the construction of a fishway at the ADD. The Section 18 prescription in the current Project license includes a requirement to refurbish the navigation lock, which would be operated using attraction flows or other fish attraction mechanisms to provide a minimum of 30 lockages during the shad migration season (SCDNR/GADNR 2020). Relicensing discussions with the USFWS and NMFS indicate that refurbishing the lock may no longer be the preferred method of passage. The USFWS and NMFS submitted a preliminary fishway prescription for the Augusta Canal Project (i.e., the ADD) in 2004 that included a vertical slot fishway on the Georgia side of the river. Based on comments received from the city of Augusta and additional evaluation and review by the USFWS and NMFS, the fishway prescription was modified to include a vertical slot fishway on the South Carolina side of the Savannah River. Negotiations between the USFWS and NMFS and the city of Augusta are ongoing and construction of the fishway has not been initiated.

5.0 WATER QUALITY WITHIN THE PROJECT VICINITY

5.1 Savannah River

A year-long water quality study was performed in the Project area from February 2021 to February 2022. The objective of this study was to assess the water quality in the Stevens Creek arm and Savannah River arm of the Stevens Creek Reservoir and of the Savannah River, immediately downstream of the Project. Water quality was monitored at six sites within Stevens Creek Reservoir, including five sites in the Savannah River and one site in Stevens Creek. Monitoring Site 1 was used as a control and was placed in Stevens Creek Reservoir upstream of the hydro station. Monitoring Site 2 was located directly downstream of the SCD. Monitoring Sites 3 and 4 were located downstream and upstream of the east end of SCD, respectively. Monitoring Site 5 was located in Stevens Creek near Woodlawn Road, approximately 4.5 miles upstream of its confluence with the Savannah River at SCD. Monitoring Site 6 was located in the Savannah River arm of Stevens Creek Reservoir, just upstream of the confluence with Stevens Creek in an area commonly referred to as Deep Step Creek.

YSI EXO3 sondes were deployed continuously1 for the entire year at Sites 1-5. A combination of a YSI EXO3 and a HOBO U26 Temperature and DO logger were deployed at Site 6 periodically from June through October.

Sites 1, 4, 5, and below JSTD presented the most excursions from state standards for DO. DO excursions were most prevalent below JSTD and at Site 5, with Site 1 having the third most excursions at the Project. Notably, there were no DO excursions at monitoring sites below SCD. Given upstream excursions within Stevens Creek and below JSTD, study results indicate that DO levels improve as water passes through the Project powerhouse and spillway, benefitting downstream resources. Low occurrence rates for DO excursions at Site 6 suggests that water quality is not being overly impacted despite heavy aquatic vegetation growth within that portion of the reservoir.

A wealth of water quality data has been collected at the Stevens Creek Project through the term of the existing license and through this relicensing study. The 2021 study results are consistent with monitoring results collected at the Project over the past 23 years. As

¹ Although equipment was deployed continuously, there were several periods of data loss experienced through equipment malfunction or equipment loss at sites 2, 3, 4, and 5. Regardless, the continuous data collected throughout the geographic scope of the study provides a good understanding of water quality in the Project area during the study period.
expanded upon in the Pre-Application Document, results summarized from 2010 to 2019 revealed that DO levels in the Thurmond and Stevens Creek reservoirs generally remain above the instantaneous state standard of 4 milligrams per liter (mg/L) during the winter and spring. The Thurmond Reservoir begins to stratify annually in early summer, resulting in decreased DO levels near the JSTD low-level turbine intakes. DO levels typically become hypoxic/anoxic by mid-August within the hypolimnion of the JSTD forebay. DO levels in discharges from JSTD are typically below 4 mg/L starting in early July and continuing through October. DO excursions within Stevens Creek Reservoir have been documented during this timeframe; however, water quality improvement in downstream reaches has been demonstrated following the 2011 USACE installation of an oxygen diffuser system in the Thurmond Reservoir. When considering project nexus in the context of a relicensing, it is important to consider the connection between the project operations and the potential effects on the resource in question. Water quality within the Stevens Creek arm and Savannah River arm of Stevens Creek Reservoir is significantly influenced by external sources outside of DESC's control; nevertheless, water quality monitoring data demonstrate that re-oxygenation occurs as water passes through Stevens Creek Reservoir, the Stevens Creek powerhouse, and over the Stevens Creek spillway, benefiting aquatic resources within the Savannah River downstream of the Project.

6.0 AQUATIC HABITATS WITHIN THE PROJECT AREA

6.1 Aquatic Habitats within the Impounded Reaches of the Savannah River and its Tributaries

The impounded portions of the Savannah River within the Stevens Creek Project boundary can generally be separated into two habitat reaches, approximately divided where Highway 28 crosses the river. The upstream reach just below JSTD is relatively deep, directly receives the peaking flows from USACE dam operations, and contains a mix of gravels and sands with occasional cobble. Entering the main channel are several perennial tributaries with large drainage areas (i.e., Little Kiokee Creek and Uchee Creek), whose confluence with the Savannah River create broad backwaters with surrounding emergent wetland systems. Another feature of this reach is a 3-mile side channel of the Savannah River (referred to as the Little River) along the Georgia side of the Project. This narrow side channel provides undercut banks, abundant woody structure, and retains the relict stream channel from pre-impounded conditions. As the Savannah River approaches Highway 28, the Savannah River slows and shallows. Substrates transition from gravels and coarse sand to fine sands and accumulated sediments. Aquatic vegetation can be found in the shallow areas and bank margins. Submerged woody structure can be found along the banks and is generally most abundant in areas with steep banks.

Downstream of Highway 28, the Savannah River widens, slows, and the river channel is less consolidated and becomes more braided. Sediment deposition is heavy within this reach with sand, silt, and accumulated organics dominating the substrate. Aquatic vegetation is widespread, dense, and further contributes to sediment capture and retention within Stevens Creek Reservoir. Woody structure can still be found within the channel and along banks but is less abundant and widespread than in the upstream reach of the Savannah River, particularly as the river approaches SCD. See Figure 3 depicting aquatic habitats within the Project area.

6.2 Aquatic Habitats within Stevens Creek

Within the Project boundary, Stevens Creek can be characterized by three reaches with differing habitats (i.e., downstream reach, middle reach, and upstream reach). Although habitat transitions occur along a gradient, the three habitat reaches are from SCD upstream to Woodlawn Road / State Highway S-19-53 (i.e., downstream reach), from Woodlawn Road upstream to the confluence with Horn Creek (i.e., the middle reach), and

from Horn Creek to the upstream Project boundary and beyond towards Garrett Road / State Road S-33-88 (i.e., upstream reach).

The downstream reach of Stevens Creek is similar to the impounded condition of the mainstem Savannah River near the Project dam. The impounded portions of Stevens Creek are broad, still-water pools in baseflow conditions. Substrates are a mix of silt, accumulated sediments, and organic material. Although the historic stream channel in Stevens Creek provides some deep-water habitats, the vast majority of the creek is broad, shallow, and contains abundant aquatic vegetation, particularly along the bank margins. Some woody structure is present and provides cover for fish, basking platforms for turtles, and perches for birds. Additionally, this reach of Stevens Creek contains numerous creek inlets with broad, emergent wetlands, providing additional habitat for aquatic and semi-aquatic species.

The middle reach of Stevens Creek is still affected by the dam, with low-flow impounded conditions, but the stream is generally more confined to a consolidated channel. The consolidated channel contained within the steep banks provides undercut banks, root wads, overhanging shrubs, and large woody debris. Substrates in the reach include sand, some accumulated silt sediments, and bank margins with mixed clays and sands. This middle reach is a transitional area between the shallow upstream reach and the broad impoundment of the downstream reach near the Project dam.

The upstream reach of Stevens Creek from the confluence of Horn Creek to the upstream Project boundary and beyond is shallow, with evidence of sediment deposition in the form of sand bars and benches. Although wide (greater than 50 meters) in some portions, water within the upstream reach of Stevens Creek is often only a couple of inches deep in warmer months. The point bars and woody debris within the channel provide some structure, variable flows, and coarser sands and gravels. Otherwise, this portion of Stevens Creek can be of relatively uniform flow and sandy substrate. In times of drought or low flow, some areas can be braided, or a series of isolated pools connected by subsurface flow within the sandy streambed. The banks are tall but with relatively gentle, stable slopes protected by herbaceous and shrubby vegetation.

6.3 Tributary Streams and Lateral Connectivity

Many of the perennial streams and tributaries in the Project vicinity are transitional between the higher gradient, incised, Piedmont streams, and the low gradient Coastal Plain streams. In addition, these streams tend to have high sediment loads resulting from

historic farming, as well as recent local developments and land clearing. In the upper reaches of the watershed, these streams are greatly incised with steep banks and are generally flashy during rain events. Increased water velocities result in scour and bank erosion. As these streams approach the Savannah River floodplain, they widen, slow, and sediments are deposited and accumulated.



Figure 3 Aquatic Habitats within the Stevens Creek Project Area

7.0 **DISCUSSION**

The following discussion addresses the existing habitat availability, suitability, and the expected habitat use for species of interest following the hypothetical implementation of fish passage at NSBLD, ADD, and SCD. Although the presence of mussel species within the Project boundary are lacking, surveys upstream of the Project area in Stevens Creek exhibit abundant and diverse mussel populations, which do not appear to be limited by the passage of glochidia host fish species. If implementation of fish passage structures at NSBLD, ADD, and SCD were to occur, population-level effect to mussel populations is not anticipated.

Alosines have been a widely studied family of fishes within their ranges because of their importance as forage (i.e., Blueback Herring) or sportfish or commercial fishery (i.e., Hickory Shad and American Shad). As mentioned above, Alosines have been documented passing the NSBLD. Hickory Shad are limited to Coastal Plain portions of Atlantic slope rivers. One capture above the Fall Line occurred in Lake Hartwell but is expected to be from angler introduction. The implementation of fish passage at the three dams is not anticipated to have an effect on Hickory Shad populations.

Although American Shad have been documented passing NSBLD, the species has not been found above the ADD or SCD. Suitable spawning habitats are generally gravel and sandy substrates below obstructions in large rivers (Walburg and Nichols 1967, Beasley and Hightower 2000, Bailey et al. 2004). Dedicated fish passage at NSBLD would aid in passing migrating American Shad to the shoals at the base of the ADD. Likewise, fish passage at the ADD would allow access to another 1-mile portion of river with potentially suitable spawning habitat for American Shad. However, shallow, gravel, and sand spawning habitats are not present in the Savannah River between SCD and JSTD. Fish passage at SCD would not provide access to suitable spawning habitats for American Shad.

Successful Blueback Herring reproduction depends on the presence of clean vegetation and other material for egg adhesion (Rhode et al. 2009). Blueback Herring in the ocean ascend coastal rivers to spawn, whereas landlocked populations move from open water to shorelines for spawning. The presence of Blueback Herring in rivers and impoundments upstream and downstream of the Project, both naturally and via supplemental stocking efforts, has resulted in a population within the Stevens Creek impoundment. The presence of aquatic vegetation may provide a suitable medium for eggs to adhere during the spawn. The 2018 study performed by SCDNR (Bettinger and Bulak 2019) shows that Blueback Herring are the most abundant forage fish species within the Stevens Creek Reservoir. This study shows that a population of Blueback Herring already exist within the Project area. Because populations are currently present upstream, within, and downstream of the Project area, population-level effects to Blueback Herring following the implementation of fish passage at the NSBLD, ADD, and SCD are unknown.

Although data within the Project boundary and beyond is lacking, American Eels have been documented within the Project reservoir in low numbers, and more moderate numbers below the SCD. American Eel's ability to climb and traverse objects allow it to pass the leaky lock structures and low head structures at the NSBL, ADD, and SCD during migrations. The fisheries data collected in the Project vicinity shows that eel populations appear stable. The number of eels migrating through the system and traversing these structures is unknown. As such, the number of eels that may utilize fish passage structures, if proposed, cannot be estimated. Further, population-level effects of the implementation of fish passage structures at NSBLD, ADD, and SCD cannot be determined at this time.

Sturgeon are unable to pass NSBLD and other dams unless dedicated fish passage to accommodate large adult sturgeons is installed. Spawning shoals are limited to the Augusta Shoals at ADD and the shoals downstream of SCD. Because of the series of impoundments along the river all the way to the mountains, no additional spawning habitat is present in the Savannah River upstream of SCD. In addition, no suitable habitat for sturgeons is present in Stevens Creek. The implementation of fish passage to accommodate sturgeon at SCD is not likely to have population-level effects on the species.

Robust Redhorse is known to occur and spawn below NSBLD and Augusta Shoals. However, no observations of Robust Redhorse have been documented between SCD and ADD. Robust Redhorse spawn in swift shoals and gravel bars with moderate current. Although the species could survive upstream of SCD, passage for Robust Redhorse through SCD would not open up additional spawning habitats or preferred non-spawning habitats.

8.0 CONCLUSION

The Steven Creek Dam demarcates the upstream limits of large shoal complexes on the Savannah River. The broad, dynamic shoals systems with extensive bedrock, gravels, and other coarse substrates, and with variable flows and occasional aquatic vegetation provide excellent spawning habitats for Robust Redhorse, sturgeons, and some Alosines. However, these habitats do not exist upstream of SCD and beyond. The implementation of fish passage at NSBLD would open a migratory route and allow access to the extensive Augusta Shoals upstream to ADD. Between ADD and SCD, habitats contain a mix of slow sandy areas, aquatic vegetation, gravelly substrates, and bedrock shoals. If implementation of fish passage occurs at ADD, an additional segment of potentially suitable spawning habitats for Alosines, suckers, and sturgeons would be accessible. However, implementation of fish passage at SCD would not allow access to additional shoal complexes or spawning habitats for migratory suckers (i.e., Robust Redhorse) or sturgeons. Conversely, extensive suitable spawning habitats for migrating Blueback Herring (i.e., aquatic vegetation) would be accessible within the Stevens Creek Reservoir if passage were to be implemented at SCD (following the implementation of passage at NSBLD and ADD). However, Blueback Herring are already present within the Stevens Creek Reservoir and were documented to be the most abundant forage fish species. Implementation of fish passage at SCD may allow access for migrating Blueback Herring to access areas upstream of SCD, but with their existing presence and stocking efforts by SCDNR, population-level effects of fish passage on the species cannot be determined. In summary, many of the species of interest within the Project vicinity and Savannah River Basin generally remain below the Fall Line (i.e., Hickory Shad, American Shad), do not have suitable spawning/rearing habitats upstream of the SCD (i.e., Robust Redhorse, Atlantic Sturgeon, Shortnose Sturgeon), or are already present within the Project area and are able to traverse the series of dams in their current state (i.e., Blueback Herring and American Eel). The population-level response of species of interest to fish passage implementation at SCD cannot be determined at this time. Studies at upstream and downstream locations should occur following passage implementation at NSBLD and ADD to determine if species of interest are successfully passing these proposed structures and if populations are experiencing positive responses. Consideration for dedicated fish passage at SCD should follow the successful implementation of fish passage at NSBLD and ADD, respectively.

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APPENDIX A

AGENCY COORDINATION

Appendices

APPENDIX E-4

WATER QUALITY STUDY REPORT

WATER QUALITY STUDY REPORT

STEVENS CREEK HYDROELECTRIC PROJECT

FERC No. 2535



Prepared for: Dominion Energy South Carolina, Inc.

Prepared by: Kleinschmidt Associates



EXECUTIVE SUMMARY

Water guality data were collected at the Stevens Creek Project (Federal Energy Regulatory Commission [FERC] Project No. 2535) at five continuously monitored sites and one periodic monitoring site from February 2021 through February 2022 as part of the FERC Project relicensing process. These data, in addition to data collected through license compliance monitoring performed by USGS and data provided by the U.S. Army Corps of Engineers (USACE) at J. Strom Thurmond Dam (JST Dam) for the study period, were compiled to provide an understanding of water quality within and downstream of the Project boundary for the purposes of assessing Project-related affects. Water temperature at all sites during the study were below the standard 90°F (32.2°C), except one excursion. There were several dissolved oxygen (DO) excursions throughout the study period, particularly at Site 4 and the JST Dam tailrace. All DO excursions occurred above the Stevens Creek Dam; pH stayed within the standard range throughout the study. Ammonia and orthophosphate were only detected on two occasions during the study period. Phosphorous was detected at Site 5 during the summer and was equal to, or above, the standard set by South Carolina. Nitrate-nitrite and TKN were consistently detected across all sites throughout the study period, with the highest concentrations detected at Site 5. The data discussed in this report indicate that the Stevens Creek Project does not negatively impact water quality downstream of the Stevens Creek Reservoir but rather positively impacts the water being released from the JST Dam, particularly DO.

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ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

C cfs Commission Conductivity CWA	cubic feet per second Federal Energy Regulatory Commission a measure of the ability of water to pass an electrical current; impacted by the presence of inorganic dissolved solids as well as temperature Clean Water Act
D °C °F DESC DO	degrees Celsius degrees Fahrenheit Dominion Energy South Carolina Inc.; Licensee for the Stevens Creek Project dissolved oxygen
E EL	elevation
F FERC	Federal Energy Regulatory Commission
G GDNR GEPD	Georgia Department of Natural Resources Georgia Environmental Protection Division
Н Ново	brand of water quality data logger
J JST Dam	J. Strom Thurmond Dam; also known as Clarks Hill Dam; built and managed by USACE
L Licensee	Dominion Energy South Carolina, Inc.
M mg/L	milligram per liter; used as a unit of measurement for DO and, in this case, ammonia, nitrate-nitrite, orthophosphate, phosphorus, and TKN
MW	megawatt

Ν	
NGO NMFS	Non-Governmental Organization National Marine Fisheries Service, housed within the U.S. Department of Commerce's National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units
Р	
рН	a term used to indicate the alkalinity or acidity of a substance as ranked on a scale from 1.0 to 14.0
Project	Stevens Creek Hydroelectric Project, FERC No. 2535
R	
RCG	Resource Conservation Group
S	
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
Study Plan	Stevens Creek Water Quality Study Plan
Т	
ткл	Total Kjeldahl Nitrogen; the total concentration of organic nitrogen and ammonia
turbidity	the measurement of water clarity
μS/cm	microsiemens per centimeter; unit of measurement for conductivity
USACE USEPA	United States Army Corps of Engineers United States Environmental Protection Agency
USGS	United States Geological Survey
V	
YSI	Yellow Springs Instrument; brand of water quality monitor

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC; Licensee) is the Licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535; Project). The Project has an installed capacity of 17.28 megawatts (MW) and is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The project's dam is located approximately one mile upstream of the Augusta Diversion Dam, and approximately 13 miles downstream of the U.S. Army Corps of Engineers (USACE) J. Storm Thurmond Dam (JST Dam). The Stevens Creek reservoir is approximately 25 miles long, extending upstream to the JST Dam and 12 miles up Stevens Creek. The surface area of the reservoir at normal full pond level (elevation of 187.5 feet) is 2,400 acres. The project drainage area is approximately 7,173 square miles.

DESC operates the Project to generate clean, renewable energy and re-regulate highly variable river flows discharged by the USACE from the JST Dam. The Stevens Creek Project is operated in accordance with an Operating Plan on file with the Federal Energy Regulatory Commission (FERC; Order issued June 22, 2018). The plan was developed in consultation with the USACE, U.S. Fish and Wildlife (USFWS), Georgia Department of Natural Resources (GDNR), South Carolina Department of Natural Resources (SCDNR), and the City of Augusta. The normal operating target range for the Stevens Creek Project is to provide an hourly discharge of ±15 percent of the scheduled daily average discharge from the JST Dam, if the actual discharge from the JST Dam is within 500 cubic feet per second (cfs) of the scheduled discharge.

On November 22, 1995, FERC issued a 30-year license for the Project which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. DESC is currently conducting the relicensing process for the Project which involves cooperation and collaboration between DESC, as Licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. DESC established a Water Quality, Fish and Wildlife Resource Conservation Group (RCG) with interested stakeholders to address potential project resource issues related to aquatic and terrestrial resources. The RCG determined there was a need for supplemental water quality data at the Project, particularly dissolved oxygen (DO) and temperature. Requests were also made from GDNR, SCDNR, and the National Marine Fisheries Service (NMFS) to collect additional water quality data in the Project area. To address these requests, the

RCG developed the Stevens Creek Water Quality Study Plan (Study Plan) which guided this study.

1.1 Goals and Objectives

The objective of this study was to assess the water quality of the Savannah River immediately downstream of the Project and in the Stevens Creek arm and Savannah River arm of Stevens Creek Reservoir.

1.2 Background Water Quality Information

While there are many ways to evaluate the health of a river or lake, this report focuses on a few common water quality indicators: water temperature, dissolved oxygen (DO), conductivity, and pH, among others, to best describe the health of the Project waters. General information on the parameters utilized in this report, along with an explanation of why they are commonly used water quality indicators, is included below.

Dissolved Oxygen

Oxygen found in water is measured in its dissolved form as dissolved oxygen. DO in water is consumed by aquatic animals, decomposition of organic matter, and various other chemical reactions, making it a vital resource within lakes, streams, and rivers. DO levels fluctuate seasonally, as well as diurnally. Aquatic biota can be vulnerable to low DO levels which naturally occur in early mornings of hot summer days, when stream flows are low, water temperatures are high and aquatic plants have not been producing oxygen since sunset the day before (USEPA 1997).

Conductivity

As defined by the United States Environmental Protection Agency (USEPA), conductivity is a measure of the ability of water to pass an electrical current and is affected by the presence of inorganic dissolved solids, such as chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. Temperature also influences conductivity, where the warmer the water, the higher the conductivity, which is why conductivity is typically reported at 25°C. The geology of the area through which the river flows will have a large impact on the conductivity of the water. A range of 50 to 1500 μ S/cm is typical of rivers throughout the United States. Waters with a conductivity measurement outside of this range may indicate that the river is not suitable for various species of fish and macroinvertebrates (USEPA 1997).

рΗ

Another indicator of water quality is pH, a term used to indicate the alkalinity or acidity of a substance as ranked on a scale from 1.0 to 14.0. As the acidity in a water sample increases, the pH decreases. The pH for pure water is 7.0. The pH of a river or lake affects many chemical and biological processes occurring in the water, allowing for different organisms to flourish or deteriorate within different pH ranges. Typically, most aquatic animals prefer a pH range of 6.5-8.0. Low pH can allow for toxic elements and compounds to become available for uptake by aquatic plants and animals, producing lethal conditions for many species (USEPA 1997).

Turbidity

The measurement of water clarity is known as turbidity. Materials suspended in water, such as soil particles, algae, plankton, and microbes typically ranging in size from 0.004 mm to 1.0 mm, can decrease the passage of light through water. Since the suspended particles may absorb heat, high turbidity could increase water temperatures, and thus influence DO concentrations (the solubility of oxygen in water decreases as temperature increases). High turbidity may also inhibit photosynthesis and the production of DO. The reduction of light penetration as a result of increased turbidity also has a potential effect in mediating algal blooms. Suspended materials that might cause high turbidity can also clog fish gills, reducing a fish's ability to resist disease, as well as lowering fish growth rates and negatively affecting egg and larval development (USEPA 1997).

Nitrogen, Phosphorus, and Orthophosphate

Nitrogen is found in several different forms in aquatic ecosystems, including ammonia, nitrates (NO₃) and nitrites (NO₂). Phosphorus usually exists in nature as part of a phosphate molecule (PO₄) and is found in aquatic systems as organic and inorganic phosphate. While nitrogen and phosphorus in their various forms are essential plant nutrients, excessive amounts can cause significant water quality issues. When combined with phosphorus, nitrates in excess amounts can accelerate eutrophication, which causes increases in aquatic plant and algal growth and changes in the types of plants, algae, and animals that inhabit a body of water. Dissolved oxygen, temperature, and other water quality indicators are also affected (USEPA 1997). Orthophosphate is a member of the phosphate family. Increasingly, orthophosphate is added to water systems to delay corrosion of metal pipes and prevent heavy metals like lead from leaching into the water. In high concentrations, however, orthophosphate can cause rapid algae growth in surface waters, which can deplete sunlight and oxygen levels.

2.0 GEOGRAPHIC AND TEMPORAL SCOPE

Water quality was monitored at six sites within the Project boundary and downstream of the Project, including five sites in the Savannah River and one site in Stevens Creek. Monitoring Site 1 was used as a control and was located in Stevens Creek Reservoir upstream of the hydro station. Monitoring Site 2 was located directly downstream of Stevens Creek Dam. Monitoring Sites 3 and 4 were located downstream and upstream of the east end of Stevens Creek Dam, respectively. Monitoring Site 5 was located in Stevens Creek near Woodlawn Road, approximately 4.5 miles upstream of its confluence with the Savannah River at Stevens Creek Dam. Monitoring Site 6 was located in the Savannah River arm of Stevens Creek Reservoir, just upstream of the confluence with Stevens Creek. Monitoring data collected in the JST Dam tailrace by the USACE as well as data collected by the U.S. Geological Survey (USGS) was also incorporated into the study report. The monitoring sites are shown in Figure 2-1

The study was conducted from February 2021 through February 2022.



Figure 2-1 Stevens Creek Hydroelectric Project Water Quality Study Sites

3.0 DATA COLLECTION METHODS AND ANALYSIS

3.1 Data Collection Methods

3.1.1 Continuous Monitoring

Water quality was continuously monitored at Monitoring Sites 1-5, shown in Figure 2-1. Measurements of water temperature, DO, pH, conductivity, and turbidity were recorded using YSI EXO3 multiparameter sondes. The instruments were calibrated according to the manufacturer's specifications and set to record measurements at hourly intervals.

Parameter	Specifications
Water Temperature	-5 to 50 °C; ± 0.2 °C
Dissolved Oxygen	0 to 20 mg/L; \pm 0.1 mg/L or 1% of reading,
	whichever is greater
	0 to 200%: ±1% of reading or 1%
	saturation, whichever is greater
Specific Conductance	0 to 100: ±0.5% of reading or 0.001
	mS/cm; 100 to 200: ±1% of reading
рН	0 to 14 units; \pm 0.1 pH units within \pm 10 °C
	of calibration temperature; 0.2 pH units for
	entire temp range
Turbidity	0 to 999 FNU, ± 0.3 FNU or 2% of reading,
	whichever is greater

 Table 3-1
 Specifications of Probes on YSI EXO3 Multiparameter Sondes

The instruments were cleaned, checked for accuracy, and downloaded a minimum of once per month. A separate, calibrated meter was used to record DO, water temperature, pH, conductivity, and turbidity readings during each maintenance visit to the sites to compare to data from the deployed instruments as an accuracy check and for use in postprocessing and correction of any fouling or calibration drift.

3.1.2 Periodic Monitoring

Water quality was monitored periodically at Monitoring Site 6 (Figure 2-1; Figure 4-7) for temperature, DO, and pH during the summer months for 24-48 hour periods using a combination of a YSI EXO3 and a HOBO U26 Temperature and DO continuous water quality monitoring instruments. This periodic monitoring was requested by South Carolina DNR to better understand water quality dynamics in this area which is a popular location

for anglers. Periodic data were collected June through October. The instruments were calibrated according to the manufacturer's specifications and set to record measurements at hourly intervals.

A separate, calibrated meter was used to record DO and water temperature readings during each deployment and retrieval visit to Monitoring Site 6 to check accuracy and gather data for use in post-processing and correction of any fouling or calibration drift.

3.1.3 Nutrient Sampling

Water samples were collected monthly at Monitoring Site 1 through 5 and at Site 6 during periodic sampling. The samples were submitted to a certified laboratory for analysis of ammonia, nitrate-nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, and total phosphorus.

3.1.4 Existing Monitoring Data

Data collected by the USGS in 2021 and 2022 as required by Article 404 of the existing license is summarized as part of this study. USGS collects vertical profiles of temperature, DO, specific conductance, and pH at 6 sites within the Project boundary (Figure 2-1). Profile data are collected by USGS on two consecutive days, once daily in each month from November to May. Profiles are collected diurnally (morning and afternoon) twice a month on two consecutive days from June through October. In addition, the USACE collects vertical profiles of DO and temperature in the JST Dam forebay and conducts continuous monitoring of DO and water temperature in the tailrace (Savannah River below JST Dam).

3.2 GEPD Water Quality Standards for Freshwaters

The Georgia Environmental Protection Division (GEPD) monitors water quality as outlined in Chapter 391-3-6-.03 of Georgia's Rules and Regulations for Water Quality Control (GEPD 2021). Designated use is the first component of the water quality standards, and it assigns the environmental use of the waterbody into one of six classifications: drinking water supplies, recreation, fishing, wild river, scenic river, and coastal fishing. The Savannah River within the vicinity of the Project is classified as drinking water (GEPD 2021). Table 3-2 describes the water quality standards for a drinking water designated river. The criterion for turbidity is based on a visual assessment of the waterbody rather than a numeric value. Essentially, the upstream appearance of the waterbody should be compared to a point which is located sufficiently downstream from the Project so as to provide an appropriate mixing zone. The upstream and downstream point should be visually similar (GEPD 2021). The GEPD does not currently have standards for the nutrients analyzed in this study: ammonia-nitrogen, nitrate-nitrite, total Kjeldahl nitrogen, total phosphorus, and total orthophosphate. However, GEPD has developed a plan (GEPD 2013) to adopt water quality standards for nutrients based on the USEPA guidance in the National Strategy for the Development of Regional Nutrient Criteria (USEPA 1998). The USEPA's current standards for nitrate-nitrite is < 10 milligrams per liter (mg/L) (USEPA 1980). As a guideline, total phosphorus should not exceed 0.1 mg/L in streams or 0.05 mg/L in lakes and reservoirs (USEPA 1988).

Parameter	Standard
Temperature	Not to exceed 90°F (32.2°C); No increase
	> 5°F above intake temperature
рН	6.0 - 8.5
Dissolved Oxygen (warm water species)	Daily average of 5.0 mg/L; not < 4.0 mg/L
Turbidity (reservoirs only)	All waters shall be free from turbidity
Turbidity (excluding reservoirs)	which results in a substantial visual
	contrast in a water body due to a man-
	made activity.

 Table 3-2
 GEPD Water Quality Standards for Drinking Water Designated River

Source: GEPD 2021

3.3 SCDHEC Water Quality Standards for Freshwaters

South Carolina's water quality standards are published in S.C. Regulation 61-68 in *Water Classifications and Standards* (SCDHEC 2020a). The regulation assigns classifications to water bodies in the state and establishes water quality standards for those classifications. The South Carolina Department of Environmental Control (SCDHEC) developed the water quality standards as set forth in the Clean Water Act (CWA). The Savannah River from the headwaters of Lake Russel down to the Seaboard Coastline Railroad located just north of Port Wentworth, Georgia is classified as freshwaters (SCDHEC 2020b) (Table 3-3).

Parameter	Standard
Temperature	The water temperature of all freshwaters
	which are free flowing shall not be
	increased more than 5°F (2.8°C) above
	natural temperature conditions and shall
	not exceed a maximum of 90°F (32.2°C)
	as a result of the discharge of heated
	liquids unless a different site-specific
	temperature standard as provided in C.12.
	has been established, a mixing zone as
	provided in C.10. has been established, or
	a Section 316(a) determination under the
	Federal Clean Water Act has been
	completed.
рН	Between 6.0 and 8.5.
Dissolved Oxygen	Daily average not less than 5.0 mg/L with
	a low of 4.0 mg/L.
Turbidity (reservoirs only)	Not to exceed 25 NTUs provided existing
	uses are maintained.
Turbidity (excluding reservoirs)	Not to exceed 50 NTUs provided existing
	uses are maintained.

Table 3-3 SCDHEC Water Quality Standards for Freshwaters

Table 3-4SCDHEC Nutrient Standards for Waters in the Piedmont and
Southeastern Plains Ecosystem

Parameter	Standard
Ammonia – Nitrogen (NH3)	pH, temperature, and life-stage dependent;
	The one-hour average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on average, the criterion maximum concentration (CMC) calculated using the following equation: CMC = 0.411 + 58.4
	1+10 ^{7.204-pri} 1+10 ^{pri-7.204}
Nitrate-Nitrite (NOx)	
Total Kjeldahl Nitrogen (TKN)	
Total Phosphorus	≤ 0.06 mg/L
Orthophosphate	

4.0 **RESULTS**

Box plots were utilized to summarize the hourly measurements of water temperature, dissolved oxygen, specific conductance, pH, and turbidity. Since some readers may be unfamiliar with this type of plot, the figure provided below describes what each component of the boxplot represents statistically.



Figure 4-1 Key to Boxplot Charts

4.1 Water Temperature

4.1.1 Continuous Monitoring Data

4.1.1.1 Study Site 1 (Above Powerhouse)

Continuous monitoring was conducted at Study Site 1 from January 29, 2021 through February 10, 2022. No exceedances of 32.2°C occurred at the site during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-1. A boxplot of monthly temperature data can be found in Figure 4-2. A time series plot of temperature can be found in Appendix A.

Month	Monthly Temperature (°C) Average (Min – Max)
2021-01*	10.2 (9.8 - 10.8)
2021-02	9.9 (9.1 - 11.0)
2021-03	11.6 (9.8 - 13.9)
2021-04	13.9 (12.2 - 17.3)
2021-05	16.0 (14.4 - 18.4)
2021-06	17.4 (15.7 - 19.7)
2021-07	18.9 (17.3 - 21.0)
2021-08	20.5 (18.9 - 22.6)
2021-09	21.8 (20.9 - 23.1)
2021-10	22.2 (20.7 - 23.0)
2021-11	18.0 (15.2 - 21.4)
2021-12	14.7 (13.1 - 16.0)
2022-01	12.2 (9.6 - 15.3)
2022-02*	10.4 (9.7 - 11.4)

 Table 4-1
 Monthly Water Temperature at Study Site 1

*Note that due to equipment deployment and retrieval scheduling, temperature data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



4.1.1.2 Study Site 2 (Below Powerhouse)

Continuous monitoring was conducted at Study Site 2 from January 29, 2021 through February 10, 2022. No data was recovered at the site from March 26 through June 14 due to equipment malfunction. No exceedances of 32.2°C were recorded during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-2. A boxplot of monthly temperature data can be found in Figure 4-3. A time series plot of temperature can be found in Appendix A.

Month	Monthly Temperature (°C) Average (Min – Max)
2021-01**	10.2 (9.8 - 10.8)
2021-02	9.8 (8.7 - 10.9)
2021-03	11.4 (9.8 - 13.5)
2021-04	ND
2021-05	ND

 Table 4-2
 Monthly Water Temperature at Study Site 2

	Monthly Temperature (°C)
Month	Average (Min – Max)
2021-06	18.0 (16.3 - 20.8)
2021-07	19.2 (17.4 - 21.8)
2021-08	20.6 (18.9 - 22.9)
2021-09	21.9 (21.0 - 23.1)
2021-10	22.2 (20.3 - 23.0)
2021-11	18.0 (15.2 - 21.4)
2021-12	14.7 (13.0 - 16.0)
2022-01	12.2 (9.5 - 15.6)
2022-02**	10.5 (9.8 - 11.4)

*ND = No Data

** Note that due to equipment deployment and retrieval scheduling, temperature data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-3 Monthly Water Temperature at Study Site 2
4.1.1.3 Study Site 3 (Below Spillway)

Continuous monitoring was conducted at Study Site 3 from January 29, 2021 through November 22, 2022. The sonde was lost after the November sampling event, likely due to high flows damaging the anchoring system. The loss was discovered at the attempted December sampling event and a replacement sonde was not able to be obtained for deployment prior to the scheduled conclusion of sampling. No exceedances of 32.2°C were recorded at the site during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-3. A boxplot of monthly temperature data can be found in Figure 4-4. A time series plot of temperature can be found in Appendix A.

Month	Monthly Temperature (°C) Average (Min – Max)	
2021-01*	10.0 (9.6 - 10.8)	
2021-02	9.6 (7.0 - 12.4)	
2021-03	13.1 (9.8 - 19.1)	
2021-04	15.8 (12.7 - 19.5)	
2021-05	18.5 (14.8 - 21.4)	
2021-06	20.3 (17.1 - 24.0)	
2021-07	21.5 (18.2 - 26.1)	
2021-08	22.7 (19.3 - 25.9)	
2021-09	22.9 (21.3 - 25.2)	
2021-10	22.2 (19.2 - 24.3)	
2021-11	18.2 (15.0 - 21.5)	

Table 4-3 Monthly Water Temperature at Study Site 3

*Note that due to equipment deployment and retrieval scheduling, temperature data summarized for January 2021 only include three (3) days.



Figure 4-4 Monthly Water Temperature at Study Site 3



Continuous monitoring was conducted at Study Site 4 from February 3, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through June 14. No exceedances of 32.2°C were recorded at the site during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-4. A boxplot of monthly temperature data can be found in Figure 4-5. A time series plot of temperature can be found in Appendix A.

	Monthly Temperature (°C)	
Month	Average (Min – Max)	
2021-02	9.6 (7.1 - 12.6)	
2021-03	13.3 (9.8 - 19.1)	
2021-04	16.3 (12.7 - 22.8)	
2021-05*	18.7 (15.0 - 22.6)	
2021-06*	21.5 (16.7 - 26.2)	
2021-07	22.4 (17.9 - 27.1)	

 Table 4-4
 Monthly Water Temperature at Study Site 4

	Monthly Temperature (°C)	
Month	Average (Min – Max)	
2021-08	23.4 (19.3 - 27.6)	
2021-09	23.2 (21.4 - 25.4)	
2021-10	22.3 (18.9 - 25.4)	
2021-11	17.1 (12.1 - 21.4)	
2021-12	14.3 (10.5 - 16.2)	
2022-01	10.7 (6.1 - 16.9)	
2022-02**	10.2 (7.3 - 12.4)	

*Data was not collected from May 21, 2021 through June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, temperature data summarized for February 2022 only included ten (10) days.



Figure 4-5Monthly Water Temperature at Study Site 4

4.1.1.5 Study Site 5 (Stevens Creek)

Continuous monitoring was conducted at Study Site 5 from February 9, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21

through July 26. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-5. A boxplot of monthly temperature data can be found in Figure 4-6. A time series plot of temperature can be found in Appendix A.

Month	Monthly Temperature (°C) Average (Min – Max)	
2021-02	9.8 (7.5 - 13.7)	
2021-03	14.7 (9.9 - 19.6)	
2021-04	18.6 (14.0 - 23.1)	
2021-05**	20.9 (17.6 - 23.6)	
2021-06	ND	
2021-07**	29.5 (28.3 - 31.5)	
2021-08	28.2 (25.2 - 31.8)	
2021-09	24.9 (21.4 - 28.6)	
2021-10	20.7 (16.0 - 24.3)	
2021-11	12.7 (9.0 - 17.3)	
2021-12	11.1 (8.1 - 15.9)	
2022-01	8.5 (4.9 - 16.9)	
2022-02	8.3 (5.0 - 12.3)	

Table 4-5Monthly Water Temperature at Study Site 5

*ND = No Data

**Data was not collected from May 21, 2021 through July 26, 2021 due to equipment malfunction.



Figure 4-6 Monthly Water Temperature at Study Site 5

4.1.1.6 Study Site 6 (Deep Step) – Periodic

Periodic monitoring was conducted at Study Site 6 from June 14, 2021 through October 29, 2022. No exceedances of 32.2°C were recorded at the site during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-6. A boxplot of monthly temperature data can be found in Figure 4-7. A time series plot of temperature can be found in Appendix A.

	Monthly Temperature (°C)	
Month	Average (Min – Max)	
2021-06	20.0 (17.6 - 30.6)	
2021-07	20.8 (19.7 - 25.3)	
2021-08	22.2 (20.2 - 25.1	
2021-09	21.8 (21.3 - 23.6)	
2021-10	21.4 (20.9 - 22.1)	

 Table 4-6
 Monthly Water Temperature at Study Site 6



4.1.1.7 USACE Below JST Dam

The USACE conducted continuous monitoring in the JST Dam tailrace from January 1, 2021 through December 31, 2021. No data was recovered at the site from August 17 through August 25 due to equipment malfunction. The USACE noted that flows to the sampling well were impacted by lower tailwater elevations at JST Dam during Stevens Creek Dam maintenance work. No exceedances of 32.2°C were recorded at the

site during the study period. Monthly average, maximum, and minimum temperatures measured at the site can be found in Table 4-7. A boxplot of monthly temperature data can be found in Figure 4-8. A time series plot of temperature can be found in Appendix A.

Month	Monthly Temperature (°C) Average (Min – Max)	
2021-01	11.6 (10.4 - 12.8)	
2021-02	10.5 (9.7 - 15.4)	
2021-03	11.8 (10.2 - 14.5)	
2021-04	14.2 (12.5 - 18.5)	
2021-05	18.7 (10.7 - 26.2)	
2021-06	20.0 (15.4 - 28.2)	
2021-07	18.8 (17.2 - 23.0)	
2021-08*	22.1 (19.7 - 26.0)	
2021-09	21.6 (19.1 - 26.0)	
2021-10	22.4 (21.8 - 23.6)	
2021-11	18.8 (16.2 - 21.9)	
2021-12	15.1 (14.2 - 16.4)	

 Table 4-7
 Monthly Water Temperature at JST Dam Tailrace

*Data was not collected from August 17-25, 2021 due to equipment malfunction.



Figure 4-8 Monthly Water Temperature at JST Dam Tailrace

4.1.2 USGS Data

Periodic water temperature data were collected at the USGS sampling sites 1-6 (Figure 4-9 – Figure 4-14). No exceedances of 32.2°C were recorded at any of the sites during the study period. Vertical profile data for temperature was filed with FERC as part of the Licensee's Article 404 and Article 405 requirements and is included in Appendix F.



Figure 4-10 Periodic Water Temperature at USGS Site 2



0

Figure 4-13 Periodic Water Temperature at USGS Site 5

35

30

25



Figure 4-14 Periodic Water Temperature at USGS Site 6

4.2 Dissolved Oxygen (DO)

4.2.1 Continuous Monitoring Data

4.2.1.1 Study Site 1 (Above Powerhouse)

Continuous monitoring was conducted at Study Site 1 from January 29, 2021 through February 10, 2022. There were 61 excursions (16% of monitored days) when Site 1 fell below the daily average DO threshold of 5 mg/L during the study period. All the daily average excursions were recorded from August through October. There were 19 instantaneous measurements, or 0.22% of hourly measurements, that fell below the DO minimum of 4 mg/L. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-8. A boxplot of monthly DO data can be found in Figure 4-15. A time series plot of DO can be found in Appendix B.

Month	Monthly DO (mg/L) Average (Min – Max)	
2021-01	10.5 (10.2 - 10.7)	
2021-02	10.7 (10.0 - 11.2)	
2021-03	10.5 (9.2 - 11.1)	
2021-04	9.8 (8.4 - 11.0)	
2021-05	8.0 (6.6 - 9.5)	
2021-06	7.0 (5.8 - 9.0)	
2021-07	5.7 (4.7 - 7.4)	

Table 4-8	Monthly DO at Study Site 1

Month	Monthly DO (mg/L) Average (Min – Max)	
2021-08	4.9 (4.1 - 6.1)	
2021-09	4.8 (3.9 - 5.8)	
2021-10	4.8 (3.7 - 6.5)	
2021-11	8.4 (5.9 - 9.4)	
2021-12	9.1 (8.4 - 9.9)	
2022-01	10.2 (8.8 - 11.4)	
2022-02	11.1 (10.8 - 11.5)	

*Note that due to equipment deployment and retrieval scheduling, DO data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-15 Monthly DO (mg/L) at Study Site 1

4.2.1.2 Study Site 2 (Below Powerhouse)

Continuous monitoring was conducted at Study Site 2 from January 29, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from March 26 through June 14. There were zero daily average or instantaneous DO excursions

at Site 2 during the monitoring period. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-9. A boxplot of monthly DO data can be found in Figure 4-16. A time series plot of DO can be found in Appendix B.

Month	Monthly DO (mg/L) Average (Min – Max)	
2021-01**	11.0 (10.8 - 11.2)	
2021-02	11.3 (10.4 - 11.8)	
2021-03*	11.2 (9.6 - 11.8)	
2021-04	ND	
2021-05	ND	
2021-06*	7.3 (6.3 - 8.5)	
2021-07	6.4 (5.1 - 7.8)	
2021-08	5.7 (4.6 - 6.8)	
2021-09	5.6 (4.8 - 6.4)	
2021-10	5.9 (4.6 - 8.1)	
2021-11	8.8 (6.5 - 9.7)	
2021-12	9.7 (9.0 - 10.5)	
2022-01	10.7 (9.4 - 12.0)	
2022-02**	11.6 (11.2 - 12.1)	

Table 4-9Monthly DO at Study Site 2

ND = NO Data

*Data was not recorded at the site from March 26, 2021 through June 14, 2021 due to equipment malfunction.

** Note that due to equipment deployment and retrieval scheduling, DO data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-16 Monthly DO (mg/L) at Study Site 2



Continuous monitoring was conducted at Study Site 3 from January 29, 2021 through November 22, 2022. The sonde was lost after the November data retrieval event, likely due to high flows damaging the sonde anchoring system. The loss was discovered at the attempted December sampling event and a replacement sonde was not able to be obtained for deployment prior to the scheduled conclusion of sampling. There were zero daily average or instantaneous DO excursions recorded at Site 3 during the monitoring period. Monthly average, maximum, and minimum DO measured at the site can be found in Table 4-10. A boxplot of monthly DO data can be found in Figure 4-17. A time series plot of DO can be found in Appendix B.

Month	Monthly DO (mg/L) Average (Min – Max)	
2021-01*	10.7 (9.3 - 11.3)	
2021-02	11.0 (10.1 - 11.7)	
2021-03	10.2 (8.7 - 11.4)	

Table 4-10	Monthly D	O at Study Site 3
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2021-04	9.5 (7.9 - 10.6)
2021-05	9.0 (7.2 - 9.8)
2021-06	8.6 (6.0 - 9.7)
2021-07	7.9 (4.9 - 9.2)
2021-08	7.4 (4.9 - 9.0)
2021-09	7.0 (5.0 - 8.7)
2021-10	8.1 (5.2 - 9.2)
2021-11	9.1 (6.7 - 10.2)

*Note that due to equipment deployment and retrieval scheduling, DO data summarized for January 2021 only include three (3) days.



Figure 4-17 Monthly DO (mg/L) at Study Site 3

4.2.1.4 Study Site 4 (Above Spillway)

Continuous monitoring was conducted at Study Site 4 from February 3, 2021 through February 10, 2022. No data was recovered at the site from May 21 through June 14 due to equipment malfunction. There were 14 excursions within the recorded data set, or 4% of monitored days, that Site 4 fell below the daily average DO threshold of 5 mg/L during

the study period. All daily average excursions occurred from late July through October. There were 64 instantaneous measurements, or 0.77% of hourly measurements, that fell below the instantaneous DO minimum of 4 mg/L. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-11. A boxplot of monthly DO data can be found in Figure 4-18. A time series plot of DO can be found in Appendix B.

	Monthly DO (mg/L)
Month	Average (Min – Max)
2021-02	10.5 (8.7 - 12.1)
2021-03	9.5 (6.7 - 12.2)
2021-04	9.3 (6.1 - 12.0)
2021-05*	8.0 (4.7 - 11.3)
2021-06*	6.7 (3.6 - 9.8)
2021-07	6.1 (4.0 - 8.5)
2021-08	5.8 (3.6 - 7.8)
2021-09	5.4 (3.6 - 7.8)
2021-10	5.3 (0.4 - 7.9)
2021-11	8.4 (5.2 - 10.4)
2021-12	8.9 (7.1 - 11.0)
2022-01	9.8 (7.1 - 11.3)
2022-02	10.2 (8.6 - 11.4)

Table 4-11 Monthly DO at Study Site 4

*Data was not collected at the site from May 21, 2021 through June 14, 2021 due to equipment malfunction.



Figure 4-18 Monthly DO (mg/L) at Study Site 4



Continuous monitoring was conducted at Study Site 5 from February 9, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through July 26. There were 89 excursions within the recorded data set, or 29% of monitored days, that Site 5 failed to reach the daily average DO threshold of 5 mg/L during the study period. There were 1,133 instantaneous measurements, or 15% of hourly measurements, that failed to reach the instantaneous DO minimum of 4 mg/L. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-12. A boxplot of monthly DO data can be found in Figure 4-19. A time series plot of DO can be found in Appendix B.

Month	Monthly DO (mg/L) Average (Min – Max)
2021-02	10.6 (9.3 - 11.5)
2021-03	8.7 (6.3 - 10.3)
2021-04	6.9 (5.1 - 8.6)

Table 4-12	Monthl	y DO at	t Study	Site	5
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	Monthly DO (mg/L)
Month	Average (Min – Max)
2021-05*	5.5 (3.4 - 7.3)
2021-06	ND
2021-07*	4.1 (3.2 - 6.0)
2021-08	3.8 (2.5 - 5.9)
2021-09	4.3 (2.4 - 6.6)
2021-10	4.3 (2.3 - 7.1)
2021-11	7.2 (3.9 - 9.1)
2021-12	10.0 (8.2 - 12.2)
2022-01	12.3 (9.6 - 13.4)
2022-02**	12.1 (11.0 - 12.9)

ND = No Data

*Data was not recorded at the site from May 21, 2021 through July 26, 2021 due to equipment malfunction

**Note that due to equipment deployment and retrieval scheduling, DO data summarized for February 2022 only includes ten (10) days.



Figure 4-19 Monthly DO (mg/L) at Study Site 5

4.2.1.6 Study Site 6 (Deep Step) – Periodic

Periodic monitoring was conducted at Study Site 6 from June 14, 2021 through October 29, 2022. There were three excursions, or 10% of monitored days, that were below the daily average DO threshold of 5 mg/L during the study period. There were 14 instantaneous measurements, or 1% of instantaneous measurements, that were below the instantaneous DO minimum of 4 mg/L. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-13. A boxplot of monthly DO data can be found in Figure 4-20. A time series plot of DO can be found in Appendix B.

Monthly DO (mg/L) Average (Min – Max)
8.5 (6.4 - 11.8)
5.9 (4.8 - 9.1)
5.3 (3.8 - 9.0)
5.2 (4.2 - 6.7)
5.6 (4.7 - 7.1)

 Table 4-13
 Monthly DO at Study Site 6



Figure 4-20 Monthly DO (mg/L) at Study Site 6

4.2.1.7 USACE JST Dam Tailrace

Continuous monitoring was conducted in the JST Dam tailrace from January 1, 2021 through December 31, 2021. Equipment malfunction led to no data recovery at the site from August 17 through August 25. The USACE noted that flows to the sampling well were impacted by lower tailwater elevations at JST Dam during Stevens Creek Dam maintenance work. There were 157 excursions, or 44% of monitored days, that Below JST Dam were below the daily average DO threshold of 5 mg/L during the study period. There were 9,251 instantaneous measurements, or 27% of instantaneous measurements, were below the instantaneous DO minimum of 4 mg/L. Instantaneous measurements below JST Dam were taken at 15-minute intervals. Monthly average, maximum, and minimum DO measurements at the site can be found in Table 4-14. A boxplot of monthly DO data can be found in Figure 4-21. A time series plot of DO can be found in Appendix B.

Month	Monthly DO (mg/L) Average (Min – Max)	
2021-01	9.8 (8.4 - 11.5)	
2021-02	10.8 (9.1 - 11.9)	
2021-03	10.2 (8.2 - 12.5)	
2021-04	7.9 (6.0 - 9.5)	
2021-05	4.5 (0.4 - 8.8)	
2021-06	3.6 (0.4 - 7.3)	
2021-07	4.0 (2.2 - 6.9)	
2021-08*	3.2 (0.5 - 5.4)	
2021-09	3.8 (1.9 - 9.1)	
2021-10	4.0 (1.8 - 6.9)	
2021-11	6.9 (4.4 - 8.6)	
2021-12	7.9 (6.7 - 9.5)	

*Data was not recorded at the site from August 17-25, 2021 due to equipment malfunction.



Figure 4-21 Monthly DO (mg/L) in JST Dam Tailrace

4.2.2 USGS Data

Periodic DO data was collected at the USGS Sites 1-6 (Figure 4-22 – Figure 4-27). All sites except USGS Site 2 had instantaneous DO measurements that were at or below 4 mg/L. USGS Site 4 had several instances of DO levels below 4 mg/L, which occurred from August to October 2021 (Figure 4-25). Vertical profile data for dissolved oxygen was filed with FERC as part of the Licensee's requirement under Articles 404 and 405 and is included in Appendix F.



Figure 4-24 Periodic Dissolved Oxygen at USGS Site 3



Figure 4-27 Periodic Dissolved Oxygen at USGS Site 6

4.3 Specific Conductance

4.3.1 Continuous Monitoring Data

4.3.1.1 Study Site 1 (Above Powerhouse)

Continuous monitoring was conducted at Study Site 1 from January 29, 2021 through February 10, 2022. Monthly average, maximum, and minimum specific conductance measurements at the site can be found in Table 4-15. A boxplot of monthly specific conductance data can be found in Figure 4-28. A time series plot of specific conductance can be found in Appendix C.

	Monthly Specific Conductance (µS/cm)	
Month	Average (Min – Max)	
2021-01*	44.6 (43.6 - 47.0)	
2021-02	44.8 (43.1 - 48.8)	
2021-03	44.3 (42.8 - 75.7)	
2021-04	45.0 (43.7 - 48.6)	
2021-05	43.9 (42.3 - 48.6)	
2021-06	43.1 (41.1 - 48.6)	
2021-07	44.8 (43.2 - 49.2)	
2021-08	47.0 (45.8 - 50.6)	
2021-09	48.1 (46.0 - 51.8)	
2021-10	47.9 (46.0 - 51.8)	
2021-11	48.7 (47.9 - 50.2)	
2021-12	48.0 (43.9 - 52.5)	
2022-01	48.1 (46.5 - 52.6)	
2022-02*	47.6 (46.7 - 49.8)	

 Table 4-15
 Monthly Specific Conductance at Study Site 1

*Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-28 Monthly Specific Conductance at Study Site 1

4.3.1.2 Study Site 2 (Below Powerhouse)

Continuous monitoring was conducted at Study Site 2 from January 29, 2021 through February 10, 2022. No data was recovered at the site from March 26 through June 14 due to equipment malfunction. Monthly average, maximum, and minimum Specific conductance measurements at the site can be found in Table 4-16. A boxplot of monthly Specific conductance data can be found in Figure 4-29. A time series plot of Specific conductance can be found in Appendix C.

Month	Monthly Specific Conductance (µS/cm) Average (Min – Max)
2021-01**	44.9 (43.9 - 47.1)
2021-02	45.1 (43.3 - 68.7)
2021-03*	44.8 (31.1 - 74.9)
2021-04	ND
2021-05	ND

Table 4-16	Monthly Spe	cific Conductance	at Study Site 2
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Month	Monthly Specific Conductance (µS/cm) Average (Min – Max)
2021-06*	44.4 (42.5 - 49.5)
2021-07	45.5 (43.5 - 53.8)
2021-08	47.4 (45.9 - 53.2)
2021-09	48.4 (46.9 - 55.1)
2021-10	48.0 (46.9 - 55.1)
2021-11	47.6 (46.7 - 51.5)
2021-12	47.1 (45.2 - 54.4)
2022-01	47.4 (45.3 - 63.3)
2022-02**	46.8 (45.7 - 60.6)

ND = No Data

* Data was not recorded at the site from March 26, 2021 through June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, Data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-29 Monthly Specific Conductance at Study Site 2

4.3.1.3 Study Site 3 (Below Spillway)

Continuous monitoring was conducted at Study Site 3 from January 29, 2021 through November 22, 2022. The sonde was lost sometime during December, likely due to high flows damaging the sonde anchoring system. The loss was discovered at the attempted December sampling event and a replacement sonde was not able to be obtained for deployment prior to the scheduled conclusion of sampling. Monthly average, maximum, and minimum specific conductance measurements at the site can be found in Table 4-17. A boxplot of monthly specific conductance data can be found in Figure 4-30. A time series plot of specific conductance can be found in Appendix C.

Month	Monthly Specific Conductance (µS/cm) Average (Min – Max)
2021-01*	58 (44 - 91)
2021-02	52 (37 - 92)
2021-03	55 (36 - 98)
2021-04	53 (44 - 104)
2021-05	52 (43 – 87)
2021-06	50 (41 - 80)
2021-07	48 (43 - 80)
2021-08	49 (45 - 69)
2021-09	50 (44 -76)
2021-10	49 (44 - 93)
2021-11	49 (47 - 61)

 Table 4-17
 Monthly Specific Conductance at Study Site 3

*Note that due to equipment deployment and retrieval scheduling, Data summarized for January 2021 only include three (3) days.



Figure 4-30 Monthly Specific Conductance at Study Site 3

4.3.1.4 Study Site 4 (Above Spillway)

Continuous monitoring was conducted at Study Site 4 from February 3, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through June 14. Monthly average, maximum, and minimum specific conductance measurements at the site can be found in Table 4-18. A boxplot of monthly specific conductance data can be found in Figure 4-31. A time series plot of specific conductance can be found in Appendix C.

	Monthly Specific Conductance (µS/cm)
Month	Average (Min – Max)
2021-02	52 (37 - 90)
2021-03	58 (36 - 101)
2021-04	58 (43 - 113)
2021-05 ¹	60 (43 - 95)
2021-06 ¹	55 (41 - 89)
2021-07	51 (41 - 82)

 Table 4-18
 Monthly Specific Conductance at Study Site 4

Month	Monthly Specific Conductance (µS/cm) Average (Min – Max)
2021-08	51 (44 – 79)
2021-09	52 (44 - 79)
2021-10	49 (43 - 98)
2021-11	50 (46 - 83)
2021-12	56 (45 - 109)
2022-01	58 (45 - 99)
2022-02**	58 (46 -107)

*Data was not recorded at the site from May 21, 2021 through June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 on include ten (10) days.



Figure 4-31 Monthly Specific Conductance at Study Site 4

4.3.1.5 Study Site 5 (Stevens Creek)

Continuous monitoring was conducted at Study Site 5 from February 9, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21

through July 26. Monthly average, maximum, and minimum specific conductance measurements at the site can be found in Table 4-19. A boxplot of monthly specific conductance data can be found in Figure 4-32. A time series plot of specific conductance can be found in Appendix C.

	Monthly Specific Conductance (µS/cm)
Month	Average (Min – Max)
2021-02	62 (20 - 93)
2021-03	77 (20 - 112)
2021-04	101 (47 - 131)
2021-05*	102 (82 - 109)
2021-06	ND
2021-07*	77 (70 - 88)
2021-08	82 (46 - 96)
2021-09	83 (44 - 100)
2021-10	83 (34 - 105)
2021-11	108 (96 - 121)
2021-12	107 (62 - 124)
2022-01	79 (55 - 103)
2022-02	79 (57 - 116)

 Table 4-19
 Monthly Specific Conductance at Study Site 5

ND = No Data

* Data was not recorded at the site from May 21, 2021 through July 26, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 only include ten (10) days.



Figure 4-32 Monthly Specific Conductance at Study Site 5

4.3.1.6 USACE JST Dam Tailrace

Continuous monitoring was conducted by USACE in the JST Dam tailrace from January 1, 2021 through December 31, 2021. Equipment malfunction led to no data recovery at the site from August 17 through August 25. The USACE noted that flows to the sampling well were impacted by lower tailwater elevations at JST Dam during Stevens Creek Dam maintenance work. Monthly average, maximum, and minimum specific conductance measurements at the site can be found in Table 4-20. A boxplot of monthly specific conductance data can be found in Figure 4-33. A time series plot of specific conductance can be found in Appendix C.

Month	Monthly Specific Conductance (µS/cm) Average (Min – Max)
2021-01	42 (41 – 43)
2021-02	42 (0 – 43)
2021-03	42 (41 – 43)
2021-04	43 (42 – 49)

 Table 4-20
 Monthly Specific Conductance at JST Dam Tailrace

	Monthly Specific Conductance (µS/cm)
Month	Average (Min – Max)
2021-05	44 (42 – 49)
2021-06	44 (39 – 55)
2021-07	43 (41 – 48)
2021-08*	46 (44 – 50)
2021-09	46 (0 – 49)
2021-10	47 (45 – 49)
2021-11	48 (47 – 49)
2021-12	46 (45 – 49)

*Data was not recorded at the site from August 17-25, 2021 due to equipment malfunction.



Figure 4-33 Monthly Specific Conductance at JST Dam Tailrace

4.3.2 USGS Data

Periodic specific conductivity data was collected at the USGS Sites 1-6 (Figure 4-34 – Figure 4-39). Vertical profile data for specific conductivity was filed with FERC as part of DESC's requirement under Articles 404 and 405 and is included in Appendix F.



Figure 4-35 Periodic Specific Conductance at USGS Site 2



Figure 4-38 Periodic Specific Conductance at USGS Site 5



Figure 4-39 Periodic Specific Conductance at USGS Site 6

4.4pH

4.4.1 Continuous Data

4.4.1.1 Study Site 1 (Above Powerhouse)

Continuous monitoring was conducted at Study Site 1 from January 29, 2021 through February 10, 2022. Monthly average, maximum, and minimum pH measurements at the site can be found in Table 4-21. A boxplot of monthly pH data can be found in Figure 4-40. A time series plot of pH can be found in Appendix D.

	Monthly pH
Month	Average (Min – Max)
2021-01*	7.3 (7.2 - 7.4)
2021-02	7.3 (7.0 - 7.4)
2021-03	7.1 (6.8 - 7.3)
2021-04	6.9 (6.7 - 7.2)
2021-05	6.7 (6.3 - 7.0)
2021-06	6.6 (6.4 - 6.8)
2021-07	6.5 (6.1 - 6.7)
2021-08	6.5 (6.0 - 6.6)
2021-09	6.5 (6.0 - 6.7)
2021-10	6.6 (6.1 - 6.9)
2021-11	7.1 (6.7 - 7.2)
2021-12	7.1 (7.0 - 7.2)
2022-01	7.3 (7.0 - 7.5)
2022-02*	7.3 (7.3 - 7.4)

Table 4-21 Monthly pH at Study Site 1

*Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-40 Monthly pH at Study Site 1



Continuous monitoring was conducted at Study Site 2 from January 29, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from March 26 through June 14. Monthly average, maximum, and minimum pH measurements at the site can be found in Table 4-22. A boxplot of monthly pH data can be found in Figure 4-41. A time series plot of pH can be found in Appendix D.

Month	Monthly pH Average (Min – Max)
2021-01**	7.3 (7.2 - 7.4)
2021-02	7.3 (7.0 - 7.5)
2021-03*	7.2 (6.9 - 7.4)
2021-04	ND
2021-05	ND
2021-06*	6.6 (6.5 -6.8)
2021-07	6.5 (6.4 - 6.8)
Month	Monthly pH Average (Min – Max)
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2021-08	6.6 (6.4 - 6.8)
2021-09	6.7 (6.6 - 6.9)
2021-10	6.7 (6.6 - 7.0)
2021-11	7.1 (6.8 - 7.4)
2021-12	7.0 (6.8 - 7.4)
2022-01	7.1 (6.9 - 7.2)
2022-02**	7.1 (7.0 - 7.3)

ND = No Data

*Data was not collected at the site from March 26, 2021 through

June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-41 Monthly pH at Study Site 2

4.4.1.3 Study Site 3 (Below Spillway)

Continuous monitoring was conducted at Study Site 3 from January 29, 2021 through November 22, 2022. The sonde was lost sometime during December, likely due to high flows damaging the sonde anchoring system. The loss was discovered at the attempted December sampling event and a replacement sonde was not able to be obtained for deployment prior to the scheduled conclusion of sampling. Monthly average, maximum, and minimum pH measurements at the site can be found in Table 4-23. A boxplot of monthly pH data can be found in Figure 4-42. A time series plot of pH can be found in Appendix D.

	Monthly pH
Month	Average (Min – Max)
2021-01*	7.4 (7.3 - 7.5)
2021-02	7.3 (6.7 - 7.6)
2021-03	7.3 (6.7 - 7.9)
2021-04	7.3 (7.0 - 7.8)
2021-05	7.2 (6.9 - 7.8)
2021-06	7.1 (6.5 - 8.2)
2021-07	6.9 (6.5 - 7.3)
2021-08	6.9 (6.2 - 7.4)
2021-09	6.8 (6.4 - 7.3)
2021-10	6.8 (6.4 - 7.3)
2021-11	7.3 (6.8 - 7.5)

Table 4-23Monthly pH at Study Site 3

*Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 only include three (3) days.



Figure 4-42 Monthly pH at Study Site 3



Continuous monitoring was conducted at Study Site 4 from February 3, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through June 14. Monthly average, maximum, and minimum pH measurements at the site can be found in Table 4-24. A boxplot of monthly pH data can be found in Figure 4-43. A time series plot of pH can be found in Appendix D.

	Monthly pH
Month	Average (Min – Max)
2021-02	7.1 (6.6 - 7.6)
2021-03	7.0 (6.5 - 7.9)
2021-04	7.2 (6.8 - 8.4)
2021-05	7.0 (6.6 - 8.2)
2021-06	6.8 (6.4 - 7.1)
2021-07	6.6 (6.2 - 7.0)
2021-08	6.6 (6.2 - 6.8)

Table	4-24	Monthly	nH at	Study	Site	Δ
Iable	4-24	wonting	μπαι	Sluuy	Sile	4

Month	Monthly pH Average (Min – Max)
2021-09	6.6 (6.3 - 6.9)
2021-10	6.6 (6.3 - 6.9)
2021-11	7.0 (6.7 - 7.4)
2021-12	7.1 (6.9 - 7.3)
2022-01	7.1 (6.8 - 7.4)
2022-02**	7.1 (6.9 - 7.5)

*Data was not collected at the site from May 21, 2021 through

June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 only include ten (10) days.



Figure 4-43 Monthly pH at Study Site 4

4.4.1.5 Study Site 5 (Stevens Creek)

Continuous monitoring was conducted at Study Site 5 from February 9, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through July 26. Monthly average, maximum, and minimum pH measurements at the site

can be found in Table 4-25. A boxplot of monthly pH data can be found in Figure 4-44. A time series plot of pH can be found in Appendix D.

	Monthly pH
Month	Average (Min – Max)
2021-02	6.9 (6.6 - 7.2)
2021-03	6.9 (6.4 - 7.2)
2021-04	7.0 (6.9 - 7.2)
2021-05*	6.9 (6.8 - 7.0)
2021-06	ND
2021-07*	6.7 (6.7 - 6.9)
2021-08	6.7 (6.3 - 6.9)
2021-09	6.8 (6.5 - 6.9)
2021-10	6.7 (6.4 - 6.9)
2021-11	6.9 (6.6 - 7.1)
2021-12	7.0 (6.9 - 7.1)
2022-01	7.0 (6.9 - 7.2)
2022-02**	7.1 (7.0 - 7.2)

Table 4-25 Monthly pH at Study Site 5

ND = No Data

*Data was not collected at the site from May 21, 2021 through July 26, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 only include ten (10) days.



Figure 4-44 Monthly pH at Study Site 5

4.4.1.6 Study Site 6 (Deep Step)

Periodic monitoring was conducted at Study Site 6 from June 14, 2021 through October 29, 2022. However, due to equipment issues at other continuous monitoring sites, an instrument capable of measuring pH was not available between August and October. Monthly average, maximum, and minimum pH measurements at the site can be found in Table 4-26. A boxplot of monthly pH data can be found in Figure 4-45. A time series plot of pH can be found in Appendix D.

	Monthly pH
Month	Average (Min – Max)
2021-06	7.18 (6.67 – 9.07)
2021-07*	7.26 (6.93 – 7.84)
2021-08	ND
2021-09	ND
2021-10	ND

Table 4-26	Monthly	nH at Str	udy Site 6
1 abie 4-20	wonting	priacou	iuy sile u



Figure 4-45 Monthly pH at Study Site 6

4.4.2 USGS Data

Periodic pH measurements were recorded at the USGS Sites 1-6 (Figure 4-46 – Figure 4-51). At sites 1, 2, and 6, pH was more acidic than the standard of 6.0 on a single occasion in July. Vertical profile data for pH was filed with FERC as part of the Licensee's Articles 404 and 405 requirement and is included in Appendix F.



Figure 4-47 Periodic pH at USGS Site 2





8.0





4.5 Turbidity

4.5.1 Continuous Monitoring Data

4.5.1.1 Study Site 1 (Above Powerhouse)

Continuous monitoring was conducted at Study Site 1 from January 29, 2021 through February 10, 2022. Monthly average, maximum, and minimum turbidity measurements at the site, reported in Formazin Nephelometric Units (FNU), can be found in Table 4-27. A boxplot of monthly turbidity data can be found in Figure 4-52. A time series plot of turbidity can be found in Appendix E.

	Monthly Turbidity (FNU)	
Month	Average (Min – Max)	
2021-01*	2.8 (2.0 - 4.3)	
2021-02	5.7 (1.6 - 42.6)	
2021-03	2.1 (1.2 - 12.8)	
2021-04	1.9 (1.4 - 4.0)	
2021-05	1.4 (0.7 - 17.8)	
2021-06	1.3 (0.6 - 84.3)	
2021-07	1.7 (0.5 - 59.3)	
2021-08	1.4 (0.5 - 8.9)	
2021-09	2.3 (0.5 - 175.5)	
2021-10	2.0 (0.3 - 160.4)	
2021-11	1.6 (0.9 - 12.2)	
2021-12	2.3 (1.0 - 45.0)	
2022-01	3.0 (1.1 - 20.1)	
2022-02*	1.6 (1.1 - 9.5)	

Table 4-27 Monthly Turbidity at Study Site 1

*Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-52 Monthly Turbidity at Study Site 1

4.5.1.2 Study Site 2 (Below Powerhouse)

Continuous monitoring was conducted at Study Site 2 from January 29, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from March 26 through June 14. Monthly average, maximum, and minimum turbidity measurements at the site can be found in Table 4-28. A boxplot of monthly turbidity data can be found in Figure 4-53. A time series plot of turbidity can be found in Appendix E.

	Monthly Turbidity (FNU)
Month	Average (Min – Max)
2021-01**	2.8 (2.0 - 4.5)
2021-02	6.0 (1.7 - 40.5)
2021-03*	3.2 (1.4 - 63.7)
2021-04	ND
2021-05	ND
2021-06*	0.9 (0 – 5.5)
2021-07	1.6 (0 – 32.9)

Table 4-28	Monthly Turbid	litv at Studv	Site 2
	internet in a side	nty at blaay	

	Monthly Turbidity (FNU)
Month	Average (Min – Max)
2021-08	0.8 (0 – 10.6)
2021-09	0.8 (0 – 6.2)
2021-10	1.1 (0 – 22.4)
2021-11	0.4 (0 – 2.2)
2021-12	1.1 (0 – 19.5)
2022-01	2.3 (0 – 16.8)
2022-02**	0.9 (0 – 16.0)

ND = No Data

*Data was not collected at the site from March 26, 2021 through June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 and February 2022 only include three (3) and ten (10) days, respectively.



Figure 4-53 Monthly Turbidity at Study Site 2

4.5.1.3 Study Site 3 (Below Spillway)

Continuous monitoring was conducted at Study Site 3 from January 29, 2021 through November 22, 2022. The sonde was lost sometime during December, likely due to high flows damaging the sonde anchoring system. The loss was discovered at the attempted December sampling event and a replacement sonde was not able to be obtained for deployment prior to the scheduled conclusion of sampling. Monthly average, maximum, and minimum turbidity measurements at the site can be found in Table 4-29. A boxplot of monthly turbidity data can be found in Figure 4-54. A time series plot of turbidity can be found in Appendix E.

	Monthly Turbidity (FNU)
Month	Average (Min – Max)
2021-01*	7 (2 - 18)
2021-02	30 (2 - 114)
2021-03	15 (2 - 138)
2021-04	4 (2 - 21)
2021-05	4 (1 - 14)
2021-06	4 (1 - 20)
2021-07	6 (1 - 94)
2021-08	4 (1 - 50)
2021-09	4 (1 - 55)
2021-10	5 (1 - 112)
2021-11	2 (1 - 4)

Table 4-29 Monthly Turbidity at Study Site 3

*Note that due to equipment deployment and retrieval scheduling, data summarized for January 2021 only include three (3) days.



Figure 4-54 Monthly Turbidity at Study Site 3



Continuous monitoring was conducted at Study Site 4 from February 3, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through June 14. Monthly average, maximum, and minimum turbidity measurements at the site can be found in Table 4-30. A boxplot of monthly turbidity data can be found in Figure 4-55. A time series plot of turbidity can be found in Appendix E.

Month	Monthly Turbidity (FNU) Average (Min – Max)
2021-02	33 (2 - 136)
2021-03	18 (2 - 155)
2021-04	4 (0 - 20)
2021-05*	5 (0 - 24)
2021-06*	6 (0 - 37)
2021-07	8 (0 - 94)
2021-08	4 (0 - 78)

Table 4-30	Monthly Turbidity at Study Site 4

Month	Monthly Turbidity (FNU) Average (Min – Max)
2021-09	6 (0 - 95)
2021-10	4 (0 - 111)
2021-11	0 (0 - 4)
2021-12	6 (0 - 86)
2022-01	20 (0 - 94)
2022-02**	23 (0 - 85)

*Data was not collected at the site from May 21, 2021 through

June 14, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 only include ten (10) days.



Figure 4-55 Monthly Turbidity at Study Site 4

4.5.1.5 Study Site 5 (Stevens Creek)

Continuous monitoring was conducted at Study Site 5 from February 9, 2021 through February 10, 2022. Equipment malfunction led to no data recovery at the site from May 21 through July 26. Monthly average, maximum, and minimum turbidity measurements at

the site can be found in Table 4-31. A boxplot of monthly turbidity data can be found in Figure 4-56. A time series plot of turbidity can be found in Appendix E.

Month	Monthly Turbidity (FNU) Average (Min – Max)					
2021-02	46 (14 – 197)					
2021-03	33 (9 - 183)					
2021-04	30 (10 - 185)					
2021-05*	39 (14 - 153)					
2021-06	ND					
2021-07*	17 (13 - 24)					
2021-08	21 (7 - 145)					
2021-09	24 (11 - 124)					
2021-10	22 (10 - 189)					
2021-11	11 (6 - 16)					
2021-12	16 (4 - 128)					
2022-01	33 (14 - 179)					
2022-02**	39 (12 - 155)					

Table 4-31Monthly Turbidity at Study Site 5

ND = No Data

*Data was not collected at the site from May 21, 2021 through July 26, 2021 due to equipment malfunction.

**Note that due to equipment deployment and retrieval scheduling, data summarized for February 2022 only include ten (10) days.



Figure 4-56 Monthly Turbidity at Study Site 5

4.6 DESC Discrete Samples Data

The results from the discrete samples collected each month are summarized in Table 4-32. In general, ammonia and orthophosphate were only detected on two occasions at the Project: ammonia at Site 3 in July and orthophosphate at Sites 2 and 5 in May and October, respectively. Phosphorous was only detected at Site 5 and only during the warmer months. Nitrate-nitrite and TKN were consistently detected across all sites every month. Nitrate-nitrite ranged from 0.032 to 0.41 mg/L across the Project; TKN ranged from 0.110 to 0.930 mg/L. Both nutrients were typically highest at Site 5.

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	
Ammonia (mg/L)		N/D	N/D	0.68	N/D	N/D	N/D
	Min	0.09	0.10	0.09	0.09	0.03	0.10
Nitrate-Nitrite (mg/L)	Avg	0.16	0.17	0.18	0.19	0.19	0.18
	Max	0.24	0.35	0.34	0.34	0.41	0.30
Orthophosphate (mg/L)		N/D	0.19	N/D	N/D	0.16	N/D
	Min	-	-	-	-	0.055	-
Phosphorus (mg/L)	Avg	N/D	N/D	N/D	N/D	0.062	N/D
	Max	-	-	-	-	0.066	-
	Min	0.11	0.15	0.17	0.12	0.24	0.11
TKN (mg/L)	Avg	0.21	0.27	0.34	0.41	0.59	0.24
	Max	0.41	0.66	0.61	0.65	0.93	0.31

Table 4-32Summary of Results from Discrete Samples

N/D = Non-Detect

4.7 Additional Data

A depiction of daily average discharge from JST Dam and Stevens Creek Powerhouse is provided in Figure 4-57. Daily average discharge from JST Dam ranged from a minimum of 3,745 cubic feet per second (cfs) to a maximum of 22,160 cfs and averaged 8,525 cfs in 2021. Estimated daily average discharge from the Stevens Creek Powerhouse ranged from a minimum of 1,490 cfs to a maximum of 10,000 cfs and averaged 7,022 cfs in 2021.



Figure 4-57 Daily Average Discharge through JST Dam and the Stevens Creek Project Powerhouse

5.0 ANALYSIS AND DISCUSSION

The objective of this study was to assess the water quality in the Stevens Creek arm and Savannah River arm of Stevens Creek Reservoir and of the Savannah River, immediately downstream of the Stevens Creek Hydroelectric Project. Water quality was monitored at six sites within Stevens Creek Reservoir, including five sites in the Savannah River and one site in Stevens Creek. Monitoring Site 1 was used as a control and was placed in Stevens Creek Reservoir upstream of the hydro station. Monitoring Site 2 was located directly downstream and upstream of the east end of Stevens Creek Dam, respectively. Monitoring Site 5 was located in Stevens Creek near Woodlawn Road, approximately 4.5 miles upstream of its confluence with the Savannah River at Stevens Creek Dam. Monitoring Site 6 was located in the Savannah River arm of Stevens Creek Reservoir, just upstream of the confluence with Stevens Creek in an area commonly referred to as Deep Step Creek.

YSI EXO3 sondes were deployed continuously for one year from February 2021 to February 2022 at Sites 1-5. A combination of a YSI EXO3 and a HOBO U26 Temperature and DO logger were deployed at Site 6 periodically from June through October. Due to equipment malfunction or loss, periods of data were lost at sites 2, 3, 4, and 5.

Equipment malfunction at Sites 2, 4, and 5 appear to have been related to the YSI handheld initially used to offload data and field calibrate the deployed sondes. While it isn't completely clear what caused the error, the data from the sondes appears to have been corrupted upon transfer to the handheld during monthly monitoring events. Initial conversations with YSI tech support noted that that the data was likely recoverable via a different handheld and that the sonde would continue to log data if it was in the deployed state. After failed attempts to recover the missing data utilizing alternate equipment, the sondes were temporarily pulled from service during the June monitoring event and reset. The combined reset and use of a PC connection to offload data resulted in no more corrupted data losses. Data loss from June 14th to July 26th at Site 5 was related to battery failure shortly after redeployment. The Site 3 sonde was lost prior to the December sample, seemingly due to damage to the anchoring system during high flows. Supply chain constraints and YSI repair turn-around times did not allow for deployment of a replacement prior to the study period concluding.

Sites 1, 4, 5, and Below JST Dam presented the most excursions from state standards for DO. DO excursions were most prevalent below JST Dam and at Site 5, with Site 1 having the third most excursions at the Project. Notably, there were no DO excursions at monitoring sites below Stevens Creek Dam. Given upstream excursions within Stevens Creek and below JST Dam, study results indicate that DO levels improve as water passes through the project powerhouse and spillway, benefitting downstream resources. Low occurrence rates for DO excursions at Site 6 suggests that water quality is not being overly impacted despite heavy aquatic vegetation growth within that portion of the reservoir.

A wealth of water quality data has been collected at the Stevens Creek Project through the term of the existing license and through this relicensing study. 2021 study results are consistent with monitoring results collected at the Project over the past 23 years. As expanded upon in the Pre-Application Document, results summarized from 2010 to 2019 revealed that DO levels in the Thurmond Dam and Stevens Creek reservoirs generally remain above the instantaneous state standard of 4 mg/L during the winter and spring. The J. Strom Thurmond Reservoir begins to stratify annually in early summer, resulting in decreased DO levels near the JST Dam low-level turbine intakes. DO levels typically become hypoxic/anoxic by mid-August within the hypolimnion of the J. Strom Thurmond forebay. DO levels in discharges from J. Strom Thurmond are typically below 4 mg/L starting in early July and continuing through October. DO excursions within Stevens Creek Reservoir have been documented during this timeframe; however, water quality improvement in downstream reaches has been demonstrated after the 2011 USACE installation of an oxygen diffuser system in the Thurmond Dam Reservoir. When considering project nexus in the context of a relicensing, it is important to consider the connection between the project operations and the potential effects on the resource in question. Water quality within Stevens Creek arm and Savannah River arm of Stevens Creek Reservoir is significantly influenced by external sources outside of DESC's control; nevertheless, water quality monitoring data demonstrate that re-oxygenation occurs as water passes through Stevens Creek Reservoir, the Stevens Creek powerhouse and over the Stevens Creek spillway, benefiting aquatic resources within the Savannah River downstream of the Project.

6.0 **REFERENCES**

- U.S. Environmental Protection Agency (USEPA). 1980. Nitrogen Ammonia Nitrate Nitrite: Water Quality Standards Criteria Summaries: A Compilation of State/Federal Criteria. USEPA 800-R-80-902. September 1980.
- USEPA. 1988. Phosphorus: Water Quality Standards Criteria Summaries: A Compilation of State/Federal Criteria. USEPA 810-R-80-101. September 1988.
- USEPA. 1997. Monitoring Water Quality. *Volunteer Stream Monitoring: A Methods Manual*. [Online] URL: <u>http://water.epa.gov/type/rsl/monitoring/stream_index.cfm.</u> <u>Accessed July 2013</u>.
- USEPA. 1998. National Strategy for the Development of Regional Nutrient Criteria. USEPA 822-R-98-002. June 1998.
- Georgia Environmental Protection Division (GEPD). 2013. Georgia's Plan for the Adoption of Water Quality Standards for Nutrients, Revision 2.0. GEPD. July 2013.
- GEPD. 2021. Rules of the Department of Natural Resources Environmental Protection Division Relating to Water Quality Control, Chapter 391-3-6.
- South Carolina Department of Environmental Control (SCDHEC). 2020a. Regulation 61-68, Water Classifications and Standards. SCDHEC 4887-44-6. June 2020.
- SCDHEC. 2020b. Regulations 61-69, Classified Waters. SCDHEC 4885-44-6. June 2020.

APPENDIX A

TEMPERATURE SERIES PLOTS



Study Site 1







Study Site 4





Study Site 6



JST Dam Tailrace

APPENDIX B

DISSOLVED OXYGEN MONTHLY DATA



Study Site 1







Study Site 4


Study Site 5



Study Site 6



JST Dam Tailrace

APPENDIX C

SPECIFIC CONDUCTANCE SERIES DATA



Study Site 1



Study Site 2



Study Site 3



Study Site 4





JST Dam Tailrace

APPENDIX D

PH SERIES PLOTS



Study Site 1



Study Site 2





Study Site 4



Study Site 5



Study Site 6

APPENDIX E

TURBIDITY SERIES PLOTS



Study Site 1



Study Site 2



Study Site 3



Study Site 4



Study Site 5

APPENDIX F

LICENSE ARTICLES 404 AND 405 2021 COMPLIANCE REPORT

Electronically Filed

Dominion Energy South Carolina, Inc. DESC Power Generation 220 Operation Way, MC B223, Cayce SC 29033 DominionEnergySC.com



April 1, 2022

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

Subject: Dominion Energy South Carolina, Inc. Stevens Creek Hydroelectric Project FERC Project No. 2535 License Article 404 - Dissolved Oxygen Enhancement License Article 405 - Water Quality Monitoring Plan

Dear Secretary Bose:

As required by Project No. 2535 License Articles 404 and 405, and FERC orders issued July 18, 1996 (76 FERC ¶62,042), August 7, 1996 (76 FERC ¶61,194) and December 13, 2012 (141 FERC ¶62,187) concerning these articles and Order issued January 21, 2022 (2535-016), Dominion Energy South Carolina, Inc. (DESC) hereby files electronically its annual Stevens Creek Water Quality Status Report including 1) status of the Savannah River Basin Watershed Project, and 2) annual water quality monitoring data for the Stevens Creek Project for the calendar year 2021. Copies of this report are also being sent to the US Environmental Protection Agency (EPA); the SC Department of Health & Environmental Control (SCDHEC); the SC Department of Natural Resources (SCDNR); the Georgia Department of Natural Resources, Fisheries Management Section (GADNR); the Georgia Department of Natural Resources, Environmental Protection Division (GAEPD); the US Fish & Wildlife Service (FWS); the United States Geological Survey, Water Resources Division (USGS-WRD); and the US Army Corps of Engineers (USACE) for their information.

Savannah River Basin Watershed Project

The Savannah River Basin Comprehensive Study is coordinated by the Savannah District, USACE. In the past, DESC has participated in the Study as a member of Action Team No. 5, which addresses issues related to water use, water supply, flow regimes, hydro facility operation, flood damage, etc. Many of the Priority 1 Recommendations from the Initial Assessment Report (including recommendations of the Water Quality Team) are to be addressed by this Comprehensive Basin Study. The USACE maintains a web site with completed and planned activities along with milestones for this web site. the studv on http://www.sas.usace.army.mil/Home/CongressionalVisits/Georgia/District10CorpsProjects/Sav annahRiverBasinComprehensiveStudy,GASC.aspx.

Stevens Creek Water Quality Data

The enclosed 2021 water quality monitoring data for the Stevens Creek Hydroelectric Project includes monthly summary sheets showing the variation of temperature and dissolved oxygen at sites one through eight (sites are located on the enclosed map) as water passes from J. Strom Thurmond Reservoir through the Stevens Creek Reservoir and into the Savannah River downstream of Stevens Creek; and the actual data from USACE and U.S. Geological Survey (USGS) data collection. Also included are hourly discharge tables for both Thurmond (data

reported to DESC directly from Thurmond personnel) and Stevens Creek (Provisional Data from USGS Gage No. 02197000, Savannah River at Augusta) for the days that water quality monitoring occurred. The USACE forebay data may have been collected on different days than the USGS data collected for DESC.

The Stevens Creek dam includes a 2,000-foot-long overflow spillway section with 1,000 feet of four-foot-high flashboards and 1,000 feet of five-foot-high flashboards. Starting in late August of 2020, DESC's contractors began work to install post tensioned rock anchors in the western half of the spillway and the east non-overflow section. At times this work required DESC to operate the reservoir in a lower operating range than normal. To facilitate this work, DESC also manually tripped all the 4-foot flashboards to allow higher flows from Thurmond Dam to spill over the eastern half of the spillway and limit the reservoir level when Thurmond discharge exceeds the flow that can pass through the Stevens Creek turbines. The anchoring work was completed in November 2021.

During 2021, DESC did not observe any environmental impact above or below the dam while this work was in progress. DESC received concurrence from the USACE, US Fish and Wildlife Service (USFWS), SC Department of Natural Resources (SCDNR), Georgia Wildlife Resources Division (GWRD) and the City of Augusta to modify the lower limit of the operating range to 180 feet NGVD for the construction outside of the spawning period (March, April and May). All agency correspondence is included in the Article 403 2021 Annual Operations Report filed with the FERC January 31, 2022.

Flows to the USACE tailwater sampling well during 2021 were impacted at times due to the lower water elevations resulting from the DESC work on the Stevens Creek Dam. The USACE informed DESC that the data from August 17 – 25, 2021 was not retrievable from their tailwater instrument.

As shown in the enclosed data, Stevens Creek water quality during 2021 showed that dissolved oxygen (DO) levels in both the Thurmond and Stevens Creek Reservoirs were above state standards in the winter and through spring. Thurmond Reservoir began to stratify in early summer and oxygen levels decreased near the low-level turbine intakes. By early August DO levels reached a minimum of 0 mg/l within the Thurmond forebay (Site 8). DO levels in the discharge of the Thurmond tailrace (Site 7) measured minimum readings below 4 mg/l during sample dates in June through late October. During these seasonally low DO months the main body of the Stevens Creek Reservoir located in the Savannah River remained above the state standards for all but two samplings at Site 1 with a minimum reading of 3.8 mg/l. In general, this data clearly indicates that reoxygenation occurred as the water passed through Stevens Creek Reservoir and the Stevens Creek hydroelectric plant. The DO levels measured below the Stevens Creek Reservoir in 2021 were measured about 3 miles up the Stevens Creek tributary at Site 5. Thurmond Reservoir destratified in the late fall and the oxygen levels in both Thurmond and Stevens Creek Reservoir sreturned to levels higher than state standards.

In addition to dissolved oxygen the USGS also samples for temperature, pH and specific conductivity. The values for these parameters throughout 2021 were within the normal range through the main body of the reservoir and below the Stevens Creek plant.

DESC recently completed a water quality study at the Project related to the FERC relicensing process. A summary of the data collected during most of 2021 is included. During relicensing

Kimberly D. Bose License Article 404 & 405 Page 3 of 3

consultation with the resource agencies, DESC will be discussing the possibility of reducing the frequency of monitoring as described in the Monitoring Program per Article 405 of the current license.

If you have any questions about the contents of this filing, please call Amy Bresnahan at (803) 217-9965.

Sincerely,

marell upma 8.

Raymond R. Ammarell, P.E., Manager Dam Safety and Civil Engineering

AIB/ab

Enclosures

I. H. Griffin/J. W. Miller/H. E. Delk, Jr./ R. R. Ammarell C: R. K. McMillan/J. T. Brock C. Gaston J. H. Hamilton SC File J. S. Drewel, USGS-WRD J. A. Sykes, USACE M. Mehta, SCDHEC M. Olds, USFWS K. Shell, EPA Region 4 J. Payne/P. Marcinek, GA WRD J. Williams, GA EPD E. Miller, SCDNR

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Collected Through Relicensing Studies Summary February 2021 – February 2022

Water quality was collected as part of the Stevens Creek relicensing from February 2021 until February 2022. Six locations were monitored both upstream and downstream of the Dam: above and below the powerhouse and spillway, Stevens Creek 4.5 miles above the confluence, and periodically at site within in the Deep Step Creek area of the reservoir. Temperature measurements ranged from 4.9 °C to 32.95 °C. Dissolved Oxygen ranged from 0.37 mg/L to 13.42 mg/L. Summary statistics of the annual data collected through the relicensing studies can be found in the table below.

	Temperature (°C)			Dissolved Oxygen (mg/L)		
Site	Average	Max	Min	Average	Max	Min
Site 1 (Above Powerhouse)	15.55	23.05	6.17	8.25	11.75	3.70
Site 2 (Below Powerhouse)	15.72	23.05	8.71	8.76	12.07	4.61
Site 3 (Below Spillway)	17.71	27.97	7.05	8.94	11.69	4.87
Site 4 (Above Spillway)	17.15	27.61	6.07	8.00	12.19	0.37
Site 5 (Stevens Creek)	17.33	32.95	4.90	7.48	13.42	2.32



STEVENS CREEK HYDROELECTRIC PROJECT

FERC PROJECT NO. 2535 - GA, SC

WATER QUALITY DATA SUMMARY

2021





Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary January 2021

Location	<u>Temper</u> (°C	<u>ature</u>)	Disso	<u>olved Ox</u> (mg/L)	<u>kygen</u>
Thurmond Forebay (Site 8)	10.00	4.0 70	10.0		10.0
(1/21/21)	10.28 —	10.72	10.0		10.6
Thurmond Tailrace (Site 7) (1/13/21 - 1/14/21)	_			_	
Stevens Creek Res. (Site 6) (1/13/21 - 1/14/21)	11.02 —	11.11	10.3		10.4
Stevens Creek Res. (Site 1) (1/13/21 - 1/14/21)	10.99 —	11.07	10.3		10.5
Stevens Creek Res. (Site 2) (1/13/21 - 1/14/21)	10.44 —	10.67	10.4	. —	10.5
Stevens Creek Tailrace (Site 3) (1/13/21 - 1/14/21)	10.55 —	10.68	10.6		10.7
Stevens Creek (Site 5) (1/13/21 - 1/14/21)	6.81 —	6.98	11.0		11.0
Stevens Creek (Site 4) (1/13/21 - 1/14/21)	6.67 —	10.14	10.2	_	10.8

Stevens Creek Project Water Quality Data (Provided by USGS-WRD)

Date: 1/13/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 17F104114

Site							
No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:55	0	6.8	7.0	72	11.0	91
		1	6.9	7.0	72	11.0	90
		2	6.9	7.0	72	11.0	90
		3	6.9	7.0	72	11.0	91
		4	6.9	7.0	72	11.0	90
3	8:48		7.0	10.7	45	10.7	96
4	9:25	0	6.9	6.7	69	10.7	88
		1	6.9	6.7	70	10.7	88
		2	6.9	6.7	70	10.7	88
		3	6.9	6.7	70	10.8	88
		4	6.9	6.7	70	10.7	88
		5	6.9	6.7	69	10.7	88
2	9:39	0	7.1	10.7	46	10.5	95
		1	7.1	10.7	46	10.5	95
		2	7.1	10.7	46	10.5	95
		3	7.1	10.7	46	10.5	94
		4	7.1	10.7	46	10.5	94
1	10:20	0	7.2	11.1	43	10.3	94
		1	7.2	11.1	43	10.3	94
		2	7.2	11.1	43	10.3	94
		3	7.2	11.1	43	10.3	94
1A	10:06	0	7.2	11.1	43	10.4	95
		1	7.2	11.1	43	10.4	94
		2	7.2	11.1	43	10.4	94
		3	7.2	11.1	43	10.4	94

Stevens Creek Project Water Quality Data (Provided by USGS-WRD)

Date: 1/14/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:45	0	6.9	6.8	75	11.0	90
		1	6.9	6.8	75	11.0	91
		2	6.9	6.8	75	11.0	91
		3	6.9	6.8	75	11.0	90
		4	6.9	6.8	75	11.0	90
3	8:30		7.1	10.6	44	10.6	95
4	9:58	0	7.1	10.1	47	10.2	90
		1	7.1	9.7	49	10.2	90
		2	7.1	9.3	53	10.2	89
		3	7.0	8.7	57	10.3	88
		4	7.0	8.3	59	10.3	88
		5	7.0	7.9	63	10.3	87
2	9:49	0	7.1	10.4	45	10.4	93
		1	7.2	10.4	45	10.4	93
		2	7.2	10.4	45	10.4	93
		3	7.1	10.4	45	10.4	93
1	9:34	0	7.2	11.0	43	10.5	95
		1	7.2	11.0	43	10.5	95
		2	7.2	11.0	43	10.4	94
		3	7.2	11.0	43	10.4	94
1A	9:23	0	7.1	11.0	43	10.3	94
		1	7.1	11.0	43	10.3	94
		2	7.1	11.0	43	10.4	94
		3	7.1	11.0	43	10.3	94

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JST Forebay Water Quality Data (Provided By USACE-ERDC)

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
71955	10.72	10.6	42	0.2
72025	10.62	10.53	42	2
72047	10.61	10.53	41.9	4
72110	10.61	10.58	42	6
72134	10.57	10.56	42	8
72200	10.57	10.46	42	10
72227	10.56	10.44	42.1	12
72252	10.53	10.4	42.1	14
72311	10.53	10.35	42	16
72340	10.53	10.27	42.1	18
72359	10.52	10.27	42	20
72437	10.52	10.19	42	22
72455	10.46	10.2	42.1	24
72520	10.46	10.16	42	26
72541	10.46	10.17	42.1	28
72603	10.45	10.19	42	30
72634	10.39	10.13	42.3	32
72706	10.33	10.09	42	34
72740	10.33	10.04	42.3	36
72808	10.32	10.07	42	38
72840	10.3	10.03	41.9	40
72914	10.28	9.96	42	42
72931	10.28	9.95	41.9	43.1
Max:	10.72	10.6	42.3	43.1
Min:	10.28	9.95	41.9	0.2

January 21,2021

Date LDO Time Temp SpCond MMDDYY HHMMSS °C μS/cm mg/l 9.64 1/13/2021 0:00:00 11.7 42.1 1/13/2021 0:15:00 11.7 42.5 9.57 1/13/2021 0:30:00 11.73 42.2 9.38 11.74 1/13/2021 0:45:00 42 9.32 11.74 42.5 9.29 1/13/2021 1:00:00 1:15:00 11.74 42.5 9.27 1/13/2021 9.18 1/13/2021 1:30:00 11.76 42.3 11.76 9.18 1/13/2021 1:45:00 42.6 42.5 9.15 1/13/2021 2:00:00 11.75 9.16 1/13/2021 2:15:00 11.74 42.6 1/13/2021 2:30:00 11.73 42.7 9.11 9.09 1/13/2021 2:45:00 11.72 42.7 11.72 42.5 9.06 1/13/2021 3:00:00 1/13/2021 11.7 42.7 9.12 3:15:00 9.04 1/13/2021 3:30:00 11.7 42.7 42.6 8.99 1/13/2021 3:45:00 11.68 11.67 42.8 8.96 1/13/2021 4:00:00 1/13/2021 4:15:00 11.63 42.2 8.98 8.99 1/13/2021 4:30:00 11.61 42.3 42.3 8.9 1/13/2021 4:45:00 11.61 1/13/2021 5:00:00 11.59 42.3 9.01 1/13/2021 5:15:00 11.58 42 8.81 42.4 1/13/2021 5:30:00 11.56 8.83 1/13/2021 5:45:00 11.58 42.4 8.65 1/13/2021 6:00:00 11.37 42.3 8.89 8.93 1/13/2021 6:15:00 11.33 42 11.4 42.1 8.95 1/13/2021 6:30:00 1/13/2021 6:45:00 11.42 42.4 8.96 42.2 8.96 1/13/2021 7:00:00 11.43 42.1 1/13/2021 7:15:00 11.43 8.9 11.45 42.2 8.87 1/13/2021 7:30:00 1/13/2021 7:45:00 11.46 42.1 8.9 1/13/2021 8:00:00 11.47 42.4 8.9 8.87 1/13/2021 8:15:00 11.48 42.1 42.2 8.9 1/13/2021 8:30:00 11.46 8.94 1/13/2021 8:45:00 42.1 11.47 1/13/2021 9:00:00 11.46 42.2 8.89 42.1 8.87 1/13/2021 9:15:00 11.46 8.87 1/13/2021 9:30:00 11.47 42.4 1/13/2021 9:45:00 11.47 42.2 8.89 1/13/2021 10:00:00 11.46 42.2 8.86

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	Temp SpCond	
MMDDYY	HHMMSS	°C	μS/cm	mg/l
1/13/2021	10:15:00	11.46	42.4	8.9
1/13/2021	10:30:00	11.46	42.2	8.89
1/13/2021	10:45:00	11.45	42.5	8.89
1/13/2021	11:00:00	11.46	42.4	8.9
1/13/2021	11:15:00	11.45	42.4	8.92
1/13/2021	11:30:00	11.45	42.1	8.88
1/13/2021	11:45:00	11.45	42.5	8.89
1/13/2021	12:00:00	11.46	42.2	8.89
1/13/2021	12:15:00	11.47	42.2	8.92
1/13/2021	12:30:00	11.49	42.4	8.85
1/13/2021	12:45:00	11.51	42.2	8.88
1/13/2021	13:00:00	11.52	42.4	8.89
1/13/2021	13:15:00	11.54	42.4	8.89
1/13/2021	13:30:00	11.58	42.5	8.9
1/13/2021	13:45:00	11.58	42.4	8.9
1/13/2021	14:00:00	11.57	42.4	8.92
1/13/2021	14:15:00	11.57	42.5	8.97
1/13/2021	14:30:00	11.56	42.4	8.94
1/13/2021	14:45:00	11.56	42.2	8.91
1/13/2021	15:00:00	11.55	42.2	8.92
1/13/2021	15:15:00	11.53	42.5	8.95
1/13/2021	15:30:00	11.53	42.2	8.9
1/13/2021	15:45:00	11.53	42.4	8.95
1/13/2021	16:00:00	11.54	42.4	8.97
1/13/2021	16:15:00	11.53	42.5	8.95
1/13/2021	16:30:00	11.53	42.5	8.99
1/13/2021	16:45:00	11.52	42.5	8.94
1/13/2021	17:00:00	11.53	42.4	8.98
1/13/2021	17:15:00	11.51	42.4	8.99
1/13/2021	17:30:00	11.5	42.1	8.96
1/13/2021	17:45:00	11.51	42.2	8.98
1/13/2021	18:00:00	11.5	42.4	8.96
1/13/2021	18:15:00	11.5	42.1	8.96
1/13/2021	18:30:00	11.49	42.5	8.98
1/13/2021	18:45:00	11.49	42.2	8.96
1/13/2021	19:00:00	11.48	42.6	8.98
1/13/2021	19:15:00	11.47	42.5	8.92
1/13/2021	19:30:00	11.45	42.2	8.93
1/13/2021	19:45:00	11.44	42.2	8.95
1/13/2021	20:00:00	11.44	42.4	8.92
1/13/2021	20:15:00	11.46	42.4	9.09
1/13/2021	20:30:00	11.46	42.5	9.05
1/13/2021	20:45:00	11.46	42.6	9.02
1/13/2021	21:00:00	11.46	42.2	8.98
		7		
Date	Time	Temp	Temp SpCond	
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MMDDYY	HHMMSS	°C	μS/cm	mg/l
1/13/2021	21:15:00	11.46	42.2	9.03
1/13/2021	21:30:00	11.45	42.4	8.98
1/13/2021	21:45:00	11.43	42.3	9
1/13/2021	22:00:00	11.42	42.5	8.99
1/13/2021	22:15:00	11.59	42.7	9.59
1/13/2021	22:30:00	11.6	42.5	9.83
1/13/2021	22:45:00	11.57	42.2	9.86
1/13/2021	23:00:00	11.58	42.2	9.67
1/13/2021	23:15:00	11.58	42.2	9.91
1/13/2021	23:30:00	11.57	42.5	9.92
1/13/2021	23:45:00	11.56	42.1	9.9
1/14/2021	0:00:00	11.56	42.4	10.02
1/14/2021	0:15:00	11.53	42.4	9.94
1/14/2021	0:30:00	11.52	42.5	9.96
1/14/2021	0:45:00	11.5	42.7	9.99
1/14/2021	1:00:00	11.51	42.6	9.72
1/14/2021	1:15:00	11.53	42.7	9.52
1/14/2021	1:30:00	11.53	43	9.45
1/14/2021	1:45:00	11.53	42.5	9.4
1/14/2021	2:00:00	11.51	42.6	9.34
1/14/2021	2:15:00	11.52	42.7	9.22
1/14/2021	2:30:00	11.52	42.6	9.18
1/14/2021	2:45:00	11.51	42.6	9.21
1/14/2021	3:00:00	11.5	42.7	9.14
1/14/2021	3:15:00	11.49	42.7	9.2
1/14/2021	3:30:00	11.49	42.7	9.1
1/14/2021	3:45:00	11.49	42.8	9.1
1/14/2021	4:00:00	11.47	43.1	9.02
1/14/2021	4:15:00	11.47	42.2	9.02
1/14/2021	4:30:00	11.46	42.5	9
1/14/2021	4:45:00	11.46	42.2	9
1/14/2021	5:00:00	11.45	42.5	9.02
1/14/2021	5:15:00	11.25	42.3	9.25
1/14/2021	5:30:00	11.34	41.9	9.29
1/14/2021	5:45:00	11.36	42	9.27
1/14/2021	6:00:00	11.36	42.1	9.29
1/14/2021	6:15:00	11.37	42.4	9.24
1/14/2021	6:30:00	11.38	42	9.19
1/14/2021	6:45:00	11.39	42	9.24
1/14/2021	7:00:00	11.4	42.1	9.24
1/14/2021	7:15:00	11.38	42.4	9.35
1/14/2021	7:30:00	11.38	42.3	9.02
1/14/2021	7:45:00	11.41	42.1	8.96
1/14/2021	8:00:00	11.43	42.1	8.97
		8		

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
1/14/2021	8:15:00	11.45	42.1	9.1
1/14/2021	8:30:00	11.45	42.2	9.1
1/14/2021	8:45:00	11.45	42.2	9.1
1/14/2021	9:00:00	11.44	42.1	9.07
1/14/2021	9:15:00	11.44	42.4	8.99
1/14/2021	9:30:00	11.42	42.4	8.94
1/14/2021	9:45:00	11.43	42.4	8.94
1/14/2021	10:00:00	11.43	42	8.96
1/14/2021	10:15:00	11.44	42.1	8.95
1/14/2021	10:30:00	11.46	42.1	8.97
1/14/2021	10:45:00	11.48	42.2	9.01
1/14/2021	11:00:00	11.51	42.4	8.98
1/14/2021	11:15:00	11.53	42.4	9
1/14/2021	11:30:00	11.54	42.5	8.99
1/14/2021	11:45:00	11.52	42.4	8.98
1/14/2021	12:00:00	11.54	42.4	9
1/14/2021	12:15:00	11.55	42.2	8.96
1/14/2021	12:30:00	11.58	42.5	8.99
1/14/2021	12:45:00	11.59	42.6	8.98
1/14/2021	13:00:00	11.61	42.3	8.98
1/14/2021	13:15:00	11.66	42.5	8.97
1/14/2021	13:30:00	11.69	42.5	8.99
1/14/2021	13:45:00	11.68	42.3	9
1/14/2021	14:00:00	11.67	42.3	9.01
1/14/2021	14:15:00	11.69	42.2	9
1/14/2021	14:30:00	11.69	42.5	9.04
1/14/2021	14:45:00	11.72	42.3	9.59
1/14/2021	15:00:00	11.71	42.2	9.07
1/14/2021	15:15:00	11.7	42.6	9.04
1/14/2021	15:30:00	11.69	42.2	9.05
1/14/2021	15:45:00	11.68	42.5	9.02
1/14/2021	16:00:00	11.67	42.2	9.05
1/14/2021	16:15:00	11.65	42.6	9
1/14/2021	16:30:00	11.62	42.2	9.05
1/14/2021	16:45:00	11.61	42.2	9.02
1/14/2021	17:00:00	11.58	42.6	9.03
1/14/2021	17:15:00	11.55	42.4	9.02
1/14/2021	17:30:00	11.52	42.4	8.97
1/14/2021	17:45:00	11.51	42.6	8.96
1/14/2021	18:00:00	11.49	42.5	8.95
1/14/2021	18:15:00	11.48	42.4	8.98
1/14/2021	18:30:00	11.47	42.4	8.96
1/14/2021	18:45:00	11.45	42.5	8.92
1/14/2021	19:00:00	11.44	42.5	8.99
		9		

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
1/14/2021	19:15:00	11.43	42.4	8.96
1/14/2021	19:30:00	11.43	42.2	8.96
1/14/2021	19:45:00	11.42	42.1	8.97
1/14/2021	20:00:00	11.43	42.4	8.96
1/14/2021	20:15:00	11.48	42.4	9.13
1/14/2021	20:30:00	11.65	42.2	10.1
1/14/2021	20:45:00	11.63	42.3	10.15
1/14/2021	21:00:00	11.61	42.5	10.16
1/14/2021	21:15:00	11.61	42.2	10.4
1/14/2021	21:30:00	11.6	42.4	10.32
1/14/2021	21:45:00	11.59	42.4	10.14
1/14/2021	22:00:00	11.59	42.2	10.06
1/14/2021	22:15:00	11.57	42.2	10.17
1/14/2021	22:30:00	11.56	42.4	10.12
1/14/2021	22:45:00	11.54	42.4	10.1
1/14/2021	23:00:00	11.53	42.4	10.15
1/14/2021	23:15:00	11.51	42.7	10.12
1/14/2021	23:30:00	11.56	42.6	9.86
1/14/2021	23:45:00	11.57	42.6	9.64
	Max	11.76	43.1	10.4
	Min	11.25	41.9	8.65

Stevens Creek Operations Data (Provided By DESC & USACE)

1/13/2021					
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	184.7	159.3	14653	10000
2:00	0	184.6	159	11855	8592
3:00	0	184.3	158.9	11535	8378
4:00	0	184.1	158.9	11387	8363
5:00	8	183.8	158.8	11048	8177
6:00	589	183.5	159.1	13225	9867
7:00	12355	183.7	159.2	13330	9895
8:00	18802	184	159.2	13549	9988
9:00	26280	184.5	159.2	13951	10000
10:00	23980	185	159.2	14406	10000
11:00	18345	185.4	159.4	14750	10000
12:00	18320	185.7	159.3	15092	10000
13:00	18140	186	159.4	15215	10000
14:00	18050	186.2	159.4	15407	10000
15:00	18320	186.4	159.6	15490	10000
16:00	18140	186.5	159.6	15400	10000
17:00	18320	186.7	159.7	15700	10000
18:00	17960	186.8	159.7	15584	10000
19:00	18230	186.9	159.7	15729	10000
20:00	18260	186.9	159.8	15173	10000
21:00	18350	187	159.9	15270	10000
22:00	18050	187	159.9	15139	10000
23:00	12260	187	159.8	15089	10000
24:00:00	0	186.9	159.9	16097	10000
daily avg.	13032	186	159	14336	9719
Total Generation	n	344074		1	

Total Generation	344074
Projected discharge	15035
Thurmond discharge	13032

Thurmond discharge

Stevens Creek Operations Data (Provided By DESC & USACE)

1/14/2021					
Hour T	hurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	186.5	159.7	14996	10000
2:00	0	186.2	159.5	14783	10000
3:00	0	185.8	159.4	14628	10000
4:00	0	185.5	159.4	14422	10000
5:00	441	185.2	159.3	14162	10000
6:00	12648	184.9	159.3	13887	10000
7:00	31940	185.1	159.3	14202	10000
8:00	33020	185.6	159.3	14826	10000
9:00	28200	186.2	159.3	14807	10000
10:00	18620	186.6	159.6	16017	10000
11:00	18630	186.8	159.7	16158	10000
12:00	18530	187	159.8	16169	10000
13:00	18710	187.1	160	16220	10000
14:00	18530	187.1	159.9	16219	10000
15:00	18710	187.1	160	16196	10000
16:00	18470	187.2	160	16172	10000
17:00	18530	187.2	160	16160	10000
18:00	18440	187.2	160	16180	10000
19:00	18620	187.2	160	16180	10000
20:00	18530	187.2	160.1	16129	10000
21:00	18290	187.3	160.1	16270	10000
22:00	736	187.2	160	16060	10000
23:00	0	186.9	159.9	15887	10000
24:00:00	0	186.5	159.7	15608	10000
daily avg.	13733	187	160	15514	10000
Total Generati	i <u>on</u> 31	72338			
Projected discha	r <u>ge</u>	15255			

14330

USGS Gage 02197000 Provisional Hourly Flow Data (Provided by USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
1/13/2021 0:00	12000
1/13/2021 1:00	12100
1/13/2021 2:00	12100
1/13/2021 3:00	12200
1/13/2021 4:00	12000
1/13/2021 5:00	11900
1/13/2021 6:00	11600
1/13/2021 7:00	11100
1/13/2021 8:00	10800
1/13/2021 9:00	10100
1/13/2021 10:00	9750
1/13/2021 11:00	9500
1/13/2021 12:00	9520
1/13/2021 13:00	10800
1/13/2021 14:00	10300
1/13/2021 15:00	10400
1/13/2021 16:00	10500
1/13/2021 17:00	10600
1/13/2021 18:00	11300
1/13/2021 19:00	12400
1/13/2021 20:00	12900
1/13/2021 21:00	13300
1/13/2021 22:00	13800
1/13/2021 23:00	14200
1/14/2021 0.00	15000
1/14/2021 1:00	15400
1/14/2021 2:00	16000
1/14/2021 3:00	16200
1/14/2021 4:00	16400
1/14/2021 5:00	16100
1/14/2021 6:00	15500
1/14/2021 7:00	14900
1/14/2021 8:00	14500
1/14/2021 9:00	14300
1/14/2021 10:00	14000
1/14/2021 10:00	14700
1/14/2021 12:00	13100
1/14/2021 12:00	12800
1/14/2021 13:00	12700
1/14/2021 14:00	13600
1/14/2021 15:00	14700
1/14/2021 10:00	15100
1/1/2021 17.00	16400
1/1/2021 10:00	17000
1/14/2021 19.00	17300
1/1/2021 20.00	17700
1/14/2021 21.00	17900
1/14/2021 22:00	17000
1/14/2021 23.00	1/200

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary February 2021

	<u>Ten</u>	nperat (°C)	ure	<u>Dissol</u>	<u>ved Oxy</u> (mg/L)	<u>rgen</u>
<u>Location</u>						
Thurmond Forebay (Site 8)						
(2/19/21)	9.33	_	9.55	10.3	_	10.4
Thurmond Tailrace (Site 7)						
(2/24/21 - 2/25/21)		_			_	
Stevens Creek Res. (Site 6)	10.03	_	10.25	11.6	_	11.9
(2/24/21 - 2/25/21)						
(_, _ , _ , , , ,						
Stevens Creek Res (Site 1)	10.25	_	10.48	11 6	_	11.8
(2/24/21 - 2/25/21)	10.25		20.10	11.0		11.0
Stavans Crack Pas (Sita 2)	10.25		10.00	11 /		117
2/24/24 = 2/25/24	10.55	_	10.88	11.4	_	11.7
(2/24/21-2/25/21)						
	10.20		10.04	44 F		44.0
Stevens Creek Tailrace (Site 3)	10.20	_	10.94	11.5	_	11.6
(2/24/21 - 2/25/21)						
Stevens Creek (Site 5)	9.76	—	11.22	10.1	_	10.3
(2/24/21 - 2/25/21)						
Stevens Creek (Site 4)	9.60	_	11.60	9.9	—	10.6
(2/24/21 - 2/25/21)						

Date: 02/24/2021

Field Team: REH / EGM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	10:38	surface	6.7	9.9	63	10.3	91
		1M	6.7	9.8	63	10.3	91
		2M	6.7	9.8	63	10.3	91
		3M	6.7	9.8	63	10.3	91
		4M	6.7	9.8	63	10.3	90
		5M	6.7	9.8	63	10.2	90
3	11:25	1M	6.9	10.2	42	11.5	103
4	13:45	surface	7.0	11.6	43	10.6	98
		1M	6.9	11.0	47	10.5	95
		2M	6.8	9.9	57	10.2	90
		3M	6.7	9.7	58	10.1	89
		4M	6.7	9.6	58	10.0	88
		5M	6.7	9.6	58	9.9	87
2	14:06	surface	7.2	10.4	38	11.4	102
		1M	7.2	10.4	40	11.5	103
		2M	7.2	10.4	43	11.6	103
		3M	7.2	10.4	43	11.6	104
1	11:45	surface	7.3	10.3	41	11.6	103
		1M	7.3	10.3	42	11.6	103
		2M	7.2	10.3	42	11.6	104
		3M	7.2	10.3	42	11.6	104
		4M	7.1	10.3	42	11.7	104
1A	14:27	surface	7.3	10.0	41	11.6	103
		1M	7.2	10.0	41	11.6	103
		2M	7.2	10.0	42	11.6	103
		3M	7.2	10.0	42	11.6	103
		4M	7.2	10.0	42	11.6	103
		5M	7.2	10.1	42	11.6	103

Date: 02/25/2021 Field Team: REH/EGM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:14	surface	6.9	11.2	68	10.1	92
		1M	6.9	11.1	68	10.1	92
		2M	6.9	11.1	68	10.1	92
		3M	6.9	11.1	68	10.1	92
		4M	6.9	11.0	68	10.1	92
		5M	6.9	11.0	68	10.1	92
3	15:00	1M	7.1	10.9	33	11.6	105
4	15:30	surface	6.9	11.1	62	10.1	92
		1M	6.9	10.8	63	10.0	91
		2M	6.9	10.5	62	10.0	90
		3M	6.9	10.4	62	10.0	90
		4M	6.9	10.4	62	10.0	89
		5M	6.8	10.3	63	9.9	88
2	15:36	surface	7.3	10.9	44	11.7	105
		1M	7.3	10.9	44	11.7	106
		2M	7.3	10.8	43	11.7	106
		3M	7.3	10.8	43	11.7	106
		4M	7.3	10.8	44	11.7	106
1	16:45	surface	7.2	10.5	39	11.6	104
		1M	7.2	10.5	40	11.7	105
		2M	7.2	10.5	40	11.8	106
		3M	7.2	10.5	41	11.8	106
		4M	7.3	10.4	41	11.7	105
1A	16:30	surface	7.3	10.2	37	11.7	104
		1M	7.3	10.2	37	11.8	105
		2M	7.2	10.3	38	11.9	106
		3M	7.3	10.3	38	11.9	106

JST Forebay Water Quality Data (Provided By USACE-ERDC)

February 19, 2021

Time	Temp	LDO	SpCond	Depth	
HHMMSS	°C	mg/l	μS/cm	meters	
105844	9.55	10.35	41.9	0.2	
105919	9.54	10.39	41.7	2	
105950	9.37	10.31	41.7	4	
110016	9.36	10.3	41.7	6	
110047	9.36	10.3	41.7	8	
110120	9.36	10.29	41.8	10	
110147	9.34	10.3	41.9	12	
110221	9.34	10.26	41.9	14	
110256	9.35	10.3	41.8	16	
110330	9.34	10.3	41.9	18	
110400	9.34	10.28	41.9	20	
110439	9.33	10.25	41.8	22	
110513	9.33	10.27	41.8	24	
110551	9.33	10.28	41.7	26	
110634	9.33	10.31	41.8	28	
110712	9.33	10.26	41.8	30	
110746	9.34	10.31	41.7	32	
110820	9.33	10.3	42	34	
110901	9.33	10.29	41.8	36	
110931	9.33	10.28	41.8	38	
111011	9.33	10.28	42	40	
111047	9.33	10.3	41.8	42	
111122	9.33	10.25	41.7	44	
Max:	9.55	10.39	42	44	
Min:	9.33	10.25	41.7	0.2	

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
2/24/2021	0:00:00	10.56	42.5	11.25
2/24/2021	0:15:00	10.54	42.6	11.14
2/24/2021	0:30:00	10.53	42.7	11.15
2/24/2021	0:45:00	10.5	42.4	11.13
2/24/2021	1:00:00	10.52	42.5	11.29
2/24/2021	1:15:00	10.51	42.6	11.33
2/24/2021	1:30:00	10.5	42.6	10.9
2/24/2021	1:45:00	10.49	42.6	10.77
2/24/2021	2:00:00	10.48	42.7	10.69
2/24/2021	2:15:00	10.46	42.9	10.65
2/24/2021	2:30:00	10.45	42.8	10.55
2/24/2021	2:45:00	10.44	42.6	10.49
2/24/2021	3:00:00	10.44	42.9	10.3
2/24/2021	3:15:00	10.41	42.9	9.97
2/24/2021	3:30:00	10.23	42.5	10.51
2/24/2021	3:45:00	10.13	42.4	10.6
2/24/2021	4:00:00	10.26	42.4	10.66
2/24/2021	4:15:00	10.06	42.6	10.77
2/24/2021	4:30:00	10.03	42.6	10.79
2/24/2021	4:45:00	10.02	42.7	10.71
2/24/2021	5:00:00	10.03	42.7	10.76
2/24/2021	5:15:00	10.03	42.6	10.62
2/24/2021	5:30:00	10.05	42.5	10.33
2/24/2021	5:45:00	10.05	42.5	10.31
2/24/2021	6:00:00	10.07	42.3	10.27
2/24/2021	6:15:00	10.08	42.2	10.28
2/24/2021	6:30:00	10.09	42.3	10.37
2/24/2021	6:45:00	10.11	42.1	10.24
2/24/2021	7:00:00	10.13	42.4	10.34
2/24/2021	7:15:00	10.15	42.2	10.33
2/24/2021	7:30:00	10.18	42.6	10.36
2/24/2021	7:45:00	10.23	42.2	10.42
2/24/2021	8:00:00	10.25	42.3	10.33
2/24/2021	8:15:00	10.28	42.2	10.64
2/24/2021	8:30:00	10.29	42.4	10.82
2/24/2021	8:45:00	10.32	42.4	10.77
2/24/2021	9:00:00	10.38	42.2	10.69
2/24/2021	9:15:00	10.42	42.4	10.81
2/24/2021	9:30:00	10.44	42.3	10.84
2/24/2021	9:45:00	10.47	42.5	10.8
2/24/2021	10:00:00	10.48	42.3	10.82
2/24/2021	10:15:00	10.51	42.6	10.81

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	Temp SpCond	
MMDDYY	HHMMSS	°C	μS/cm	mg/l
2/24/2021	10:30:00	10.52	42.4	10.79
2/24/2021	10:45:00	10.57	42.5	10.8
2/24/2021	11:00:00	10.57	42.6	10.81
2/24/2021	11:15:00	10.62	42.6	10.87
2/24/2021	11:30:00	10.67	42.5	10.79
2/24/2021	11:45:00	10.72	42.6	10.78
2/24/2021	12:00:00	10.7	42.6	10.85
2/24/2021	12:15:00	10.74	42.5	10.38
2/24/2021	12:30:00	10.8	42.5	10.32
2/24/2021	12:45:00	10.83	42.6	10.36
2/24/2021	13:00:00	10.85	42.6	10.35
2/24/2021	13:15:00	10.85	42.3	10.37
2/24/2021	13:30:00	10.87	42.3	10.36
2/24/2021	13:45:00	10.83	42.5	10.37
2/24/2021	14:00:00	10.83	42.3	10.3
2/24/2021	14:15:00	10.78	42.5	10.31
2/24/2021	14:30:00	10.74	42.3	10.31
2/24/2021	14:45:00	10.73	42.2	10.29
2/24/2021	15:00:00	10.72	42.5	10.29
2/24/2021	15:15:00	10.73	42.3	10.32
2/24/2021	15:30:00	10.71	42.6	10.27
2/24/2021	15:45:00	10.71	42.5	10.29
2/24/2021	16:00:00	10.72	42.6	10.27
2/24/2021	16:15:00	10.71	42.2	10.34
2/24/2021	16:30:00	10.72	42.2	10.32
2/24/2021	16:45:00	10.67	42.4	10.35
2/24/2021	17:00:00	10.65	42.6	10.28
2/24/2021	17:15:00	10.62	42.5	10.28
2/24/2021	17:30:00	10.6	42.4	10.24
2/24/2021	17:45:00	10.57	42.5	10.34
2/24/2021	18:00:00	10.54	42.5	10.37
2/24/2021	18:15:00	10.5	42.5	10.31
2/24/2021	18:30:00	10.49	42.4	10.35
2/24/2021	18:45:00	10.45	42.1	10.26
2/24/2021	19:00:00	10.43	42.4	10.31
2/24/2021	19:15:00	10.45	42.3	10.57
2/24/2021	19:30:00	10.43	42.4	10.93
2/24/2021	19:45:00	10.43	42.5	10.88
2/24/2021	20:00:00	10.41	42.6	10.92
2/24/2021	20:15:00	10.42	42.4	11.03
2/24/2021	20:30:00	10.38	42.4	11.05
2/24/2021	20:45:00	10.36	42.5	11.1
2/24/2021	21:00:00	10.35	42.5	11.17
2/24/2021	21:15:00	10.38	42.5	11.23

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
2/24/2021	21:30:00	10.7	42.7	11.18
2/24/2021	21:45:00	10.72	42.7	11.15
2/24/2021	22:00:00	10.72	42.3	11.09
2/24/2021	22:15:00	10.72	42.6	11.2
2/24/2021	22:30:00	10.71	42.5	11.09
2/24/2021	22:45:00	10.69	42.4	11.08
2/24/2021	23:00:00	10.68	42.4	10.9
2/24/2021	23:15:00	10.67	42.4	10.98
2/24/2021	23:30:00	10.67	42.2	11.04
2/24/2021	23:45:00	10.67	42.8	11.02
2/25/2021	0:00:00	10.66	42.6	10.74
2/25/2021	0:15:00	10.64	42.4	10.77
2/25/2021	0:30:00	10.62	42.5	10.72
2/25/2021	0:45:00	10.62	42.6	10.79
2/25/2021	1:00:00	10.61	42.8	10.71
2/25/2021	1:15:00	10.59	42.7	10.48
2/25/2021	1:30:00	10.58	42.5	10.55
2/25/2021	1:45:00	10.57	42.9	10.47
2/25/2021	2:00:00	10.56	42.9	10.25
2/25/2021	2:15:00	10.55	42.6	10.15
2/25/2021	2:30:00	10.54	43	10.01
2/25/2021	2:45:00	10.53	43	10.12
2/25/2021	3:00:00	10.52	43	10.06
2/25/2021	3:15:00	10.5	43.2	9.94
2/25/2021	3:30:00	10.5	42.9	10.01
2/25/2021	3:45:00	10.49	42.9	9.85
2/25/2021	4:00:00	10.49	43.1	9.73
2/25/2021	4:15:00	10.17	42.9	9.43
2/25/2021	4:30:00	10.14	42.2	10.83
2/25/2021	4:45:00	10.14	42.3	10.88
2/25/2021	5:00:00	10.13	42.3	10.79
2/25/2021	5:15:00	10.13	42.3	10.69
2/25/2021	5:30:00	10.13	42.7	10.65
2/25/2021	5:45:00	10.13	42.6	10.54
2/25/2021	6:00:00	10.12	42.3	10.67
2/25/2021	6:15:00	10.14	42.6	10.66
2/25/2021	6:30:00	10.15	42.7	10.58
2/25/2021	6:45:00	10.16	42.4	10.37
2/25/2021	7:00:00	10.18	42.4	10.52
2/25/2021	7:15:00	10.21	42.5	10.74
2/25/2021	7:30:00	10.24	42.4	10.56
2/25/2021	7:45:00	10.26	42.4	10.77
2/25/2021	8:00:00	10.3	42.3	10.64
2/25/2021	8:15:00	10.33	42.2	9.82

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
2/25/2021	8:30:00	10.35	42.5	10.74
2/25/2021	8:45:00	10.39	42.3	10.63
2/25/2021	9:00:00	10.46	42.5	10.71
2/25/2021	9:15:00	10.48	42.4	10.7
2/25/2021	9:30:00	10.51	42.6	10.65
2/25/2021	9:45:00	10.54	42.4	10.73
2/25/2021	10:00:00	10.56	42.7	10.76
2/25/2021	10:15:00	10.58	42.4	10.77
2/25/2021	10:30:00	10.61	42.5	10.64
2/25/2021	10:45:00	10.63	42.5	10.58
2/25/2021	11:00:00	10.66	42.5	10.75
2/25/2021	11:15:00	10.69	42.3	10.74
2/25/2021	11:30:00	10.73	42.5	10.73
2/25/2021	11:45:00	10.74	42.6	10.83
2/25/2021	12:00:00	10.75	42.6	10.83
2/25/2021	12:15:00	10.78	42.3	10.79
2/25/2021	12:30:00	15.38	0.4	9.95
2/25/2021	12:45:00	10.85	42.1	10.92
2/25/2021	13:00:00	10.88	41.7	11.05
2/25/2021	13:15:00	10.89	41.8	11.07
2/25/2021	13:30:00	10.9	41.8	11.08
2/25/2021	13:45:00	10.89	41.8	11.07
2/25/2021	14:00:00	10.85	42	11.06
2/25/2021	14:15:00	10.81	42	11.11
2/25/2021	14:30:00	10.82	41.8	11.1
2/25/2021	14:45:00	10.81	41.8	11.07
2/25/2021	15:00:00	10.79	41.9	11.09
2/25/2021	15:15:00	10.78	41.9	11.15
2/25/2021	15:30:00	10.77	41.9	11.14
2/25/2021	15:45:00	10.77	42	11.07
2/25/2021	16:00:00	10.76	41.9	11.09
2/25/2021	16:15:00	10.75	42	11.09
2/25/2021	16:30:00	10.71	41.9	11.08
2/25/2021	16:45:00	10.71	41.7	11.09
2/25/2021	17:00:00	10.68	42	11.09
2/25/2021	17:15:00	10.63	42.1	11.08
2/25/2021	17:30:00	10.6	41.8	11.09
2/25/2021	17:45:00	10.57	41.8	11.09
2/25/2021	18:00:00	10.55	41.8	11.13
2/25/2021	18:15:00	10.52	41.8	11.11
2/25/2021	18:30:00	10.49	41.8	11.07
2/25/2021	18:45:00	10.47	41.9	11.06
2/25/2021	19:00:00	10.46	41.7	11.08
2/25/2021	19:15:00	10.43	41.8	11.07

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
2/25/2021	19:30:00	10.42	41.9	11.1
2/25/2021	19:45:00	10.41	41.9	11.09
2/25/2021	20:00:00	10.4	41.9	11.03
2/25/2021	20:15:00	10.39	41.8	11.11
2/25/2021	20:30:00	10.38	41.8	11.05
2/25/2021	20:45:00	10.37	41.9	11.08
2/25/2021	21:00:00	10.36	41.8	11.05
2/25/2021	21:15:00	10.66	42.1	11.14
2/25/2021	21:30:00	10.76	42	11.57
2/25/2021	21:45:00	10.78	42	11.61
2/25/2021	22:00:00	10.79	41.7	11.43
2/25/2021	22:15:00	10.81	41.8	11.35
2/25/2021	22:30:00	10.8	41.7	11.47
2/25/2021	22:45:00	10.79	41.9	11.58
2/25/2021	23:00:00	10.78	42.1	11.45
2/25/2021	23:15:00	10.72	42	11.58
2/25/2021	23:30:00	10.7	41.9	11.57
2/25/2021	23:45:00	10.69	41.9	11.35
	Max	15.38	43.2	11.61
	Min	10.02	0.4	9.43

Stevens Creek Operations Data (Provided By DESC & USACE)

2/24/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	187.7	160	13457	9074
2:00	0	187.4	159.7	13405	9078
3:00	8967	187	159.5	13291	9063
4:00	13912	186.7	159.3	13158	9059
5:00	27030	186.5	159.2	13045	9088
6:00	26940	186.5	159.2	13156	9109
7:00	26940	186.6	159.2	13188	9128
8:00	22957	186.9	159.3	13359	9186
9:00	22720	187.2	159.5	13425	9139
10:00	22810	187.5	159.6	13469	9135
11:00	23317	187.7	159.8	13496	9123
12:00	22810	187.8	159.8	13571	9145
13:00	22810	187.9	159.9	13566	9130
14:00	22720	188	160	13609	9126
15:00	25810	188.1	160	13626	9102
16:00	22810	188.1	160.1	13615	9111
17:00	22810	188.2	160.1	13618	9085
18:00	22630	188.2	160.2	13588	9077
19:00	17027	188.2	160.2	13617	9069
20:00	7580	188.2	160.2	13625	9065
21:00	0	188.2	160.3	13604	9062
22:00	0	188.2	160.3	13575	9036
23:00	0	187.8	160	13407	9024
24:00:00	0	187.5	159.8	13349	9013
daily avg.	15942	188	160	13451	9093
Total Generation		322819]	
Projected discharge	<u>e</u>	17618			
Thurmond discharg	<u>3e</u>	15942			

Stevens Creek Operations Data (Provided By DESC & USACE)

2/25/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	187	159.5	13184	9018
2:00	0	187.9	159.3	13126	9026
3:00	0	187.6	159.2	13019	9043
4:00	736	187.6	159.1	13001	90.59
5:00	15760	187.1	159	12961	9043
6:00	15290	185.9	158.9	12894	9046
7:00	15180	186.1	159	13029	90098
8:00	15290	186.3	159	13065	9084
9:00	14780	186.5	159.1	13053	9070
10:00	13070	186.6	159.1	13140	9089
11:00	13150	186.7	159.2	13190	9081
12:00	13070	186.7	159.2	13194	9071
13:00	13150	186.8	159.3	13226	9081
14:00	13150	186.8	159.3	13279	9128
15:00	13070	186.9	159.3	13258	9118
16:00	13070	186.9	159.3	13215	9091
17:00	13230	186.9	159.3	13221	9083
18:00	12990	186.9	159.3	13162	9085
19:00	13150	186.9	159.3	13159	9099
20:00	13150	186.9	159.4	13283	9147
21:00	12760	187	159.4	13175	9128
22:00	441	187	159.4	1330	9095
23:00	0	186.8	159.4	13265	9052
24:00:00	0	186.5	159.2	13019	9012
daily avg.	9770	187	159	12644	12078
				-	

Total Generation	303448
Projected discharge	10980
Thurmond discharge	9770

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
2/24/2021 0:00	20500
2/24/2021 1:00	21200
2/24/2021 2:00	21200
2/24/2021 3:00	21400
2/24/2021 4:00	21300
2/24/2021 5:00	21100
2/24/2021 6:00	20500
2/24/2021 7:00	19900
2/24/2021 8:00	19400
2/24/2021 9:00	19000
2/24/2021 10:00	18200
2/24/2021 11:00	17700
2/24/2021 12:00	17400
2/24/2021 13:00	17600
2/24/2021 14:00	17400
2/24/2021 15:00	18000
2/24/2021 16:00	18200
2/24/2021 10:00	18500
2/24/2021 17:00	10100
2/24/2021 18:00	19100
2/24/2021 19:00	10200
2/24/2021 20:00	20000
2/24/2021 21:00	20900
2/24/2021 22:00	21200
2/24/2021 23.00	21500
2/25/2021 0:00	21000
2/25/2021 1:00	21900
2/25/2021 2:00	21800
2/25/2021 3:00	21700
2/25/2021 4:00	21700
2/25/2021 5:00	21000
2/25/2021 6:00	20400
2/25/2021 /:00	19600
2/25/2021 8:00	18600
2/25/2021 9:00	18000
2/25/2021 10:00	16800
2/25/2021 11:00	15900
2/25/2021 12:00	15300
2/25/2021 13:00	14800
2/25/2021 14:00	14500
2/25/2021 15:00	14200
2/25/2021 16:00	14100
2/25/2021 17:00	14300
2/25/2021 18:00	14200
2/25/2021 19:00	14200
2/25/2021 20:00	14200
2/25/2021 21:00	14600
2/25/2021 22:00	14900
2/25/2021 23:00	15000

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary March 2021

	<u>Ter</u>	<u>Temperature</u> (°C)		Dissolved	<u>Dissolved Oxygen</u> (n	
Location		, γ				
Thurmond Forebay (Site 8)						
(3/16/21)	9.50	_	10.60	9.3	_	10.8
Thurmond Tailrace (Site 7) (3/24/21 - 3/25/21)		_			_	
Stevens Creek Res. (Site 6) (3/24/21 - 3/25/21)	11.21	_	11.86	10.9	_	10.9
Stevens Creek Res. (Site 1) (3/24/21 - 3/25/21)	11.24	_	12.09	10.4	_	11.0
Stevens Creek Res. (Site 2) (3/24/21 - 3/25/21)	12.79	_	12.83	10.4	_	10.7
Stevens Creek Tailrace (Site 3) (3/24/21 - 3/25/21)	12.64	_	13.05	10.7	_	10.8
Stevens Creek (Site 5) (3/24/21 - 3/25/21)	15.92	_	16.65	7.9	_	8.2
Stevens Creek (Site 4) (3/24/21 - 3/25/21)	13.36	_	16.09	7.7	_	9.5

Date: 3/24/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H110937 handheld: 17K102282

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:39	0	6.7	15.9	81	8.2	83
		1	6.7	15.9	81	8.2	83
		2	6.8	15.9	81	8.2	83
		3	6.8	15.9	81	8.2	83
3	9:11		6.7	13.1	46	10.7	101
4	7:41	0	6.8	15.4	76	8.0	80
		1	6.8	15.4	76	8.0	80
		2	6.8	15.4	76	8.0	80
		3	6.8	15.4	76	8.0	80
		4	6.8	15.4	76	7.9	79
2	7:53	0	7.1	12.8	45	10.4	99
		1	7.1	12.8	45	10.4	99
		2	7.1	12.8	45	10.4	99
		3	7.1	12.8	45	10.4	98
		4	7.1	12.8	45	10.4	98
1-A	8:19	0	7.1	11.2	43	10.9	99
		1	7.1	11.2	43	10.9	99
		2	7.1	11.2	43	10.9	99
		3	7.1	11.2	43	10.9	99
1	8:31	0	7.1	11.3	43	11.0	100
		1	7.1	11.2	43	11.0	101
		2	7.1	11.2	43	11.0	100
		3	7.1	11.2	43	11.0	100

Date: 3/25/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H110937 handheld: 17K102282

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:27	0	6.8	16.6	83	7.9	82
		1	6.8	16.7	83	7.9	81
		2	6.9	16.7	83	7.9	81
		3	6.9	16.7	83	7.9	81
		4	6.9	16.7	83	7.9	81
3	7:10		7.1	12.6	44	10.8	102
4	7:49	0	6.9	16.1	77	7.7	78
		1	6.9	16.1	77	7.7	78
		2	6.9	16.0	77	7.7	78
		3	6.9	16.0	77	7.7	77
		4	6.9	15.6	73	7.9	79
		5	7.0	13.5	48	9.5	91
		6	7.0	13.4	48	9.5	91
2	8:05	0	7.2	12.8	44	10.7	102
		1	7.2	12.8	44	10.7	102
		2	7.2	12.8	44	10.7	102
		3	7.2	12.8	44	10.7	101
		4	7.2	12.8	44	10.7	101
1	8:29	0	7.1	12.1	44	10.4	97
		1	7.1	12.1	44	10.4	97
		2	7.1	12.1	44	10.4	97
		3	7.1	12.1	44	10.4	97
1-a	8:40	0	7.1	11.9	43	10.9	101
		1	7.1	11.9	43	10.9	101
		2	7.1	11.9	43	10.9	101

JST Forebay Water Quality Data (Provided By USACE-ERDC)

March 16.2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
64658	10.59	10.75	41.7	0.2
64716	10.6	10.33	41.7	2
64742	10.6	10.24	41.7	4
64757	10.59	10.22	41.9	6
64818	10.58	10.18	41.7	8
64832	10.27	10.18	41.4	10
64853	9.98	9.83	41.7	12
64913	9.94	9.72	41.5	14
64928	9.83	9.69	41.6	16
64957	9.8	9.69	41.4	18
65025	9.69	9.64	41	20
65040	9.66	9.6	41.2	22
65104	9.64	9.55	41.1	24
65127	9.63	9.56	41.1	26
65152	9.63	9.54	41.1	28
65214	9.59	9.57	40.9	30
65230	9.55	9.62	41	32
65244	9.5	9.57	40.9	34
65307	9.5	9.4	40.9	36
65322	9.5	9.37	40.9	38
65344	9.5	9.31	40.8	40
65358	9.5	9.3	40.9	42
65417	9.5	9.32	40.6	44
65442	9.51	9.34	47.2	45.5
Max:	10.6	10.75	47.2	45.5
Min:	9.5	9.3	40.6	0.2

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
3/24/2021	0:00:00	12.99	42.5	10.2
3/24/2021	0:15:00	13	42.6	10.2
3/24/2021	0:30:00	12.99	42.6	10.1
3/24/2021	0:45:00	12.95	42.6	10.04
3/24/2021	1:00:00	12.99	42.6	10
3/24/2021	1:15:00	12.92	42.5	9.94
3/24/2021	1:30:00	12.89	42.6	9.71
3/24/2021	1:45:00	12.91	42.6	9.62
3/24/2021	2:00:00	12.8	42.4	9.56
3/24/2021	2:15:00	12.81	42.6	9.48
3/24/2021	2:30:00	12.84	42.6	9.44
3/24/2021	2:45:00	12.87	42.5	9.39
3/24/2021	3:00:00	12.85	42.8	9.19
3/24/2021	3:15:00	12.8	42.5	9.16
3/24/2021	3:30:00	12.85	42.4	9.69
3/24/2021	3:45:00	12.91	42.5	9.91
3/24/2021	4:00:00	12.94	42.3	10.03
3/24/2021	4:15:00	12.87	42.4	10.12
3/24/2021	4:30:00	12.82	42.4	10.17
3/24/2021	4:45:00	12.81	42.1	10.18
3/24/2021	5:00:00	12.77	42.2	10.17
3/24/2021	5:15:00	12.61	42.4	9.94
3/24/2021	5:30:00	12.6	42.1	9.63
3/24/2021	5:45:00	12.58	42.1	9.55
3/24/2021	6:00:00	12.6	42.4	9.48
3/24/2021	6:15:00	12.12	41.9	9.47
3/24/2021	6:30:00	12.11	42.2	9.47
3/24/2021	6:45:00	12.07	42.2	9.44
3/24/2021	7:00:00	12.04	42.1	9.44
3/24/2021	7:15:00	12.04	42.2	9.48
3/24/2021	7:30:00	11.98	42.2	9.54
3/24/2021	7:45:00	11.97	42.3	9.58
3/24/2021	8:00:00	12.02	42.1	9.54
3/24/2021	8:15:00	12.12	42.3	9.62
3/24/2021	8:30:00	12.28	42	10.2
3/24/2021	8:45:00	12.64	42.2	10.16
3/24/2021	9:00:00	12.59	42.1	10.2
3/24/2021	9:15:00	12.7	42	10.35
3/24/2021	9:30:00	12.75	42.4	10.39
3/24/2021	9:45:00	12.81	42	10.38
3/24/2021	10:00:00	12.87	42.1	10.41
3/24/2021	10:15:00	12.92	42.2	10.41

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
3/24/2021	10:30:00	13	42.1	10.38
3/24/2021	10:45:00	13.05	42.3	10.38
3/24/2021	11:00:00	13.06	42.3	10.41
3/24/2021	11:15:00	13.13	42.3	10.36
3/24/2021	11:30:00	13.21	42.2	10.31
3/24/2021	11:45:00	13.16	42.5	10.33
3/24/2021	12:00:00	13.12	42.1	10.3
3/24/2021	12:15:00	13.05	42.2	10.39
3/24/2021	12:30:00	13.09	42.1	10.35
3/24/2021	12:45:00	13.17	42.2	10.26
3/24/2021	13:00:00	13.28	42.2	10.1
3/24/2021	13:15:00	13.34	42.2	10.04
3/24/2021	13:30:00	13.39	42.1	9.94
3/24/2021	13:45:00	13.35	42.2	9.83
3/24/2021	14:00:00	13.34	42.3	9.78
3/24/2021	14:15:00	13.35	42.3	9.73
3/24/2021	14:30:00	13.36	42.3	9.65
3/24/2021	14:45:00	13.36	42.4	9.58
3/24/2021	15:00:00	13.34	42.4	9.62
3/24/2021	15:15:00	13.31	42.2	9.6
3/24/2021	15:30:00	13.29	42.4	9.56
3/24/2021	15:45:00	13.26	42.3	9.49
3/24/2021	16:00:00	13.3	42.6	9.32
3/24/2021	16:15:00	13.26	42.3	9.46
3/24/2021	16:30:00	13.25	42.4	9.82
3/24/2021	16:45:00	13.18	42.2	10.07
3/24/2021	17:00:00	13.18	42.5	10.13
3/24/2021	17:15:00	13.1	42.2	10.21
3/24/2021	17:30:00	13.06	42.3	10.25
3/24/2021	17:45:00	13.04	42.5	10.32
3/24/2021	18:00:00	13.04	42.3	10.25
3/24/2021	18:15:00	13.05	42.3	10.34
3/24/2021	18:30:00	12.99	42.2	10.35
3/24/2021	18:45:00	12.97	42.2	10.32
3/24/2021	19:00:00	12.91	42.5	10.34
3/24/2021	19:15:00	12.89	42.2	10.32
3/24/2021	19:30:00	12.82	42.4	10.31
3/24/2021	19:45:00	12.79	42.2	10.36
3/24/2021	20:00:00	12.76	42.4	10.36
3/24/2021	20:15:00	12.74	42.2	10.34
3/24/2021	20:30:00	12.71	42.4	10.39
3/24/2021	20:45:00	12.71	42.2	10.35
3/24/2021	21:00:00	12.67	42.2	10.36
3/24/2021	21:15:00	12.72	42.2	10.44

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
3/24/2021	21:30:00	12.82	42.2	10.44
3/24/2021	21:45:00	12.81	42.2	10.38
3/24/2021	22:00:00	12.74	42.5	10.35
3/24/2021	22:15:00	12.71	42.4	10.33
3/24/2021	22:30:00	12.69	42.1	10.3
3/24/2021	22:45:00	12.71	42.1	10.3
3/24/2021	23:00:00	12.69	42.2	10.28
3/24/2021	23:15:00	12.68	42.4	10.26
3/24/2021	23:30:00	12.72	42.2	10.28
3/24/2021	23:45:00	12.72	42.4	10.27
3/25/2021	0:00:00	12.72	42.2	10.2
3/25/2021	0:15:00	12.71	42.2	10.19
3/25/2021	0:30:00	12.68	42.5	10.15
3/25/2021	0:45:00	12.68	42.4	10.1
3/25/2021	1:00:00	12.63	42.3	10.05
3/25/2021	1:15:00	12.63	42.4	9.93
3/25/2021	1:30:00	12.56	42.1	9,79
3/25/2021	1.35.00	12.50	42.1	9.68
3/25/2021	2.00.00	12.10	42.6	9.63
3/25/2021	2:00:00	12.54	42.0	9.53
3/25/2021	2:13:00	12.5	42.5	9.54
3/25/2021	2:30:00	12.44	42.1	9.40 Q /
3/25/2021	2.45.00	12.42	42.5	9.4 Q /
3/25/2021	3.15.00	12.40	42.4	9 35
3/25/2021	3.13.00	12.43	42.5	9.35
3/25/2021	3:45:00	12.57	42.5	9.31
3/25/2021	4.00.00	12.47	42.5	9.20
3/25/2021	4:15:00	12.45	42.5	9.23
3/25/2021	4.10.00	12.33	42.5	9.25
3/25/2021	4:45:00	12.31	42.4	9.23
3/25/2021	5.00.00	12.50	42.0	9.09
3/25/2021	5:15:00	12.42	42.0	9.05
3/25/2021	5.30.00	12.55	42.4	9.20
3/25/2021	5:45:00	12.42	42.4	9.54
3/25/2021	6.00.00	12.41	42.4	9.07
2/25/2021	6.15.00	12.42	42.1	0.06
2/25/2021	6.20.00	12.45	42.1	10.02
2/25/2021	6.45.00	12.52	42.1	10.02
2/25/2021	7.00.00	12.33	42 10 1	10.09
2/25/2021	7.00.00	12.52	42.1	10.15
2/25/2021	7.15:00	12.57	42.3	10.17
3/25/2021	7:30:00	12.59	42.1	10.18
3/25/2021	7:45:00	12.57	42	10.17
3/25/2021	8:00:00	12.59	42.1	10.10
3/25/2021	8:15:00	12.64	42	10.23

Date	Time	ne Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
3/25/2021	8:30:00	12.68	42	10.16
3/25/2021	8:45:00	12.71	42.1	10.19
3/25/2021	9:00:00	12.75	42.2	10.24
3/25/2021	9:15:00	12.79	42.2	10.19
3/25/2021	9:30:00	12.84	42.2	10.2
3/25/2021	9:45:00	12.85	42.1	10.18
3/25/2021	10:00:00	12.92	42.1	10.17
3/25/2021	10:15:00	12.96	42.1	10.19
3/25/2021	10:30:00	13.01	42.1	10.18
3/25/2021	10:45:00	13.04	42.2	10.18
3/25/2021	11:00:00	13.04	42.1	10.24
3/25/2021	11:15:00	13.09	42	10.16
3/25/2021	11:30:00	13.12	42.1	10.19
3/25/2021	11:45:00	13.14	42.1	10.18
3/25/2021	12:00:00	13.19	42	10.18
3/25/2021	12:15:00	13.19	42	10.17
3/25/2021	12:30:00	13.2	42	10.16
3/25/2021	12:45:00	13.27	42.1	10.15
3/25/2021	13:00:00	13.25	42.1	10.16
3/25/2021	13:15:00	13.35	42	10.15
3/25/2021	13:30:00	13.33	42.3	10.1
3/25/2021	13:45:00	13 29	42.0	10 11
3/25/2021	14:00:00	13.24	42.3	10.13
3/25/2021	14:15:00	13.25	42.2	10.14
3/25/2021	14:30:00	13.2	42.3	10.09
3/25/2021	14:45:00	13.13	42.3	10.13
3/25/2021	15:00:00	13.18	42.5	10.1
3/25/2021	15:15:00	13.24	42.2	10.09
3/25/2021	15:30:00	13.23	42.3	10.12
3/25/2021	15:45:00	13.26	42.3	10.07
3/25/2021	16:00:00	13.28	42.4	10.06
3/25/2021	16:15:00	13.28	42.2	10.08
3/25/2021	16:30:00	13.24	42.4	10.05
3/25/2021	16:45:00	13.24	42.2	10.08
3/25/2021	17:00:00	13.2	42.3	10.07
3/25/2021	17:15:00	12.85	42.1	9.78
3/25/2021	17:30:00	12.52	41.9	9.55
3/25/2021	17:45:00	12,46	42.1	9,41
3/25/2021	18:00:00	12.37	42.3	9.37
3/25/2021	18:15:00	12.34	42.3	9.32
3/25/2021	18:30.00	12.37	42.5	9.32
3/25/2021	18:45:00	12.3	47.4	9.20
3/25/2021	19.00.00	12.23	Δ7 Δ	9.25
3/25/2021	19.15.00	17.7	Δ2. 7	9.20
5,25,2021	10.10.00		74.4	5.22

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
3/25/2021	19:30:00	12.17	42.3	9.24
3/25/2021	19:45:00	12.07	42.2	9.22
3/25/2021	20:00:00	12.03	42.4	9.25
3/25/2021	20:15:00	12.04	42.2	9.29
3/25/2021	20:30:00	12	42.2	9.3
3/25/2021	20:45:00	12.01	42.2	9.27
3/25/2021	21:00:00	12.03	42.4	9.31
3/25/2021	21:15:00	12.44	42.4	9.31
3/25/2021	21:30:00	12.73	42.1	9.89
3/25/2021	21:45:00	12.76	42.4	10.15
3/25/2021	22:00:00	12.81	42.2	10.18
3/25/2021	22:15:00	12.94	42.2	10.07
3/25/2021	22:30:00	12.94	42.3	10.08
3/25/2021	22:45:00	12.87	42.5	10.21
3/25/2021	23:00:00	12.8	42.4	10.27
3/25/2021	23:15:00	12.83	42.2	10.28
3/25/2021	23:30:00	12.81	42.4	10.27
3/25/2021	23:45:00	12.75	42.5	10.1
	Max	13.39	42.8	10.44
	Min	11.97	41.9	9.09

Stevens Creek Operations Data (Provided By DESC & USACE)

3/24/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	183.6	158.6	10073	7433
2:00	0	183.3	158.6	9802	7373
3:00	0	183.1	158.4	8474	6335
4:00	147	182.8	158.4	8277	6250
5:00	2964	182.6	158.4	8096	6187
6:00	11092	182.5	158.4	8006	6178
7:00	28470	182.6	158.4	8276	6268
8:00	27880	183.3	158.1	5309	4035
9:00	16760	184.1	157.9	5832	4270
10:00	7470	184.7	157.9	5963	4235
11:00	0	185.1	157.8	5521	3888
12:00	0	185.1	157.8	5372	3822
13:00	0	185	157.7	4174	3012
14:00	0	184.9	157.6	4085	2801
15:00	0	184.8	157	3974	2797
16:00	0	184.7	157.3	3708	2720
17:00	0	184.6	157.3	3764	2721
18:00	2720	184.6	157.2	3738	2717
19:00	2850	184.7	157.1	3789	2760
20:00	230	184.7	157.1	3824	2770
21:00	2850	184.7	157.1	3816	2750
22:00	2850	184.7	157	3800	2731
23:00	0	184.7	157	3762	2639
24:00:00	0	184.6	156.9	3778	2753
daily avg.	4428	184	158	5634	4144
Total Generation		135213]	
Projected discharg	<u>e</u>	4554			
Thurmond dischar	<u>ge</u>	4428			

Thurmond discharge

3/25/2021

Stevens Creek Operations Data (Provided By DESC & USACE)

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	184.5	157	3771	2764
2:00	0	184.4	156.9	3745	2775
3:00	0	184.4	156.9	3799	2808
4:00	0	184.3	156.9	3757	2784
5:00	147	184.2	156.9	3659	2799
6:00	4194	184	157.3	6599	4853
7:00	10270	183.8	158.4	9706	7159
8:00	10200	183.8	158.4	9991	7396
9:00	10190	183.9	158.5	10028	7369
10:00	10270	184	158.6	10084	7326
11:00	10250	184.2	158.6	10225	7392
12:00	10320	184.4	158.6	10252	7413
13:00	10260	184.6	158.7	10473	7493
14:00	10320	184.7	158.7	11029	7972
15:00	10260	184.8	158.6	11082	7929
16:00	10260	185	158.7	11213	8024
17:00	10517	185.1	158.7	11317	8061
18:00	19150	185.2	158.7	11400	8082
19:00	18940	185.5	158.7	11588	8162
20:00	18720	185.7	158.8	11728	8228
21:00	17320	186	158.8	11952	8302
22:00	588	186.3	158.9	12051	8310
23:00	0	186.5	158.9	12076	8316
24:00:00	0	186.2	158.9	11955	8260
daily avg.	8007	185	158	9312	6666
<u>To</u>	tal Generation	223480]	
Proj	jected discharge	8667			

36

8007

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
3/24/2021 0:00	6530
3/24/2021 1:00	6500
3/24/2021 2:00	6520
3/24/2021 3:00	6580
3/24/2021 4:00	6570
3/24/2021 5:00	6580
3/24/2021 6:00	6600
3/24/2021 7:00	6550
3/24/2021 8:00	6580
3/24/2021 9:00	6610
3/24/2021 10:00	6580
3/24/2021 11:00	6560
3/24/2021 12:00	6530
3/24/2021 13:00	6460
3/24/2021 14:00	6440
3/24/2021 15:00	6350
3/24/2021 16:00	5580
3/24/2021 17:00	5160
3/24/2021 18:00	4860
3/24/2021 19:00	4680
3/24/2021 20:00	4530
3/24/2021 21:00	4410
3/24/2021 22:00	4330
3/24/2021 23:00	4260
3/25/2021 23:00	4190
3/25/2021 1:00	4130
3/25/2021 2:00	4090
3/25/2021 3:00	4070
3/25/2021 3:00	4030
3/25/2021 5:00	4010
3/25/2021 5:00	3980
3/25/2021 7:00	3960
3/25/2021 7:00	3940
3/25/2021 8:00	3910
3/25/2021 5.00	3880
3/25/2021 10:00	3850
3/25/2021 11:00	3870
3/25/2021 12:00	39/0
3/25/2021 13:00	4020
3/25/2021 14.00	4240
3/25/2021 15:00	5120
3/25/2021 10:00	6140
3/25/2021 17:00	6490
3/25/2021 10:00	6710
2/25/2021 19.00	6850
2/25/2021 20:00	6000
2/25/2021 21.00	7180
2/25/2021 22.00	7260
J/ ZJ/ ZUZI ZJ.UU	7200

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary April 2021

Location	<u>Ten</u>	nperati (°C)	<u>ure</u>	Dissolved	d Oxyge	<u>en</u> (mg/L)
Thurmond Forebay (Site 8)						
(4/19/21)	10.93	_	20.04	6.7	_	9.6
Thurmond Tailrace (Site 7) (4/27/21 - 4/28/21)		_			_	
Stevens Creek Res. (Site 6) (4/27/21 - 4/28/21)	13.88	_	13.95	8.2	_	8.6
Stevens Creek Res. (Site 1) (4/27/21 - 4/28/21)	14.12	_	14.42	8.2	-	8.4
Stevens Creek Res. (Site 2) (4/27/21 - 4/28/21)	14.15	-	14.42	8.6	_	8.7
Stevens Creek Tailrace (Site 3) (4/27/21 - 4/28/21)	14.63	_	14.96	9.0	_	9.1
Stevens Creek (Site 5) (4/27/21 - 4/28/21)	17.90	_	18.97	6.7	_	7.7
Stevens Creek (Site 4) (4/27/21 - 4/28/21)	18.58	_	19.74	6.7	_	7.0

Date: 04/27/2021 Field Team: REH/DFS Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:50	surface	7.1	17.9	123	7.7	78
		1M	7.1	17.9	123	7.4	78
		2M	7.1	17.9	123	7.3	78
		3M	7.1	17.9	124	7.3	77
		4M	7.1	17.9	124	7.3	77
3	11:04	1M	6.9	15.0	44	9.1	91
4	9:27	surface	7.0	19.1	105	6.7	73
		1M	7.0	18.7	108	6.7	72
		2M	7.0	18.6	108	6.7	72
		3M	7.0	18.6	108	6.7	72
2	9:43	surface	6.8	14.4	44	8.7	85
		1M	6.7	14.4	44	8.7	85
		2M	6.7	14.4	44	8.7	85
		3M	6.7	14.4	44	8.7	85
		4M	6.7	14.4	44	8.7	85
		5M	6.7	14.4	44	8.7	85
1	10:09	surface	6.8	14.3	45	8.3	81
		1M	6.8	14.2	45	8.3	81
		2M	6.7	14.3	46	8.2	81
		3M	6.7	14.3	46	8.2	80
		4M	6.7	14.4	47	8.2	81
1A	10:23	surface	6.7	14.0	43	8.6	83
		1M	6.8	13.9	43	8.6	84
		2M	6.7	13.9	43	8.6	83
		3M	6.7	13.9	43	8.6	83

Date: 04/28/2021 Field Team: REH/DFS Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:20	surface	7.1	19.0	106	6.8	73
		1M	7.1	19.0	106	6.8	73
		2M	7.1	18.9	106	6.7	72
		3M	7.1	18.9	107	6.7	72
		4M	7.1	18.9	107	6.7	72
3	9:56	1M	6.9	14.6	44	9.0	89
4	8:16	surface	7.1	19.7	109	6.9	76
		1M	7.1	19.7	108	6.9	76
		2M	7.1	19.5	102	7.0	76
		3M	7.1	19.5	101	7.0	76
2	9:28	surface	6.8	14.2	44	8.6	84
		1M	6.8	14.2	44	8.6	84
		2M	6.8	14.2	44	8.6	84
		3M	6.8	14.2	44	8.6	84
		4M	6.7	14.2	44	8.6	83
1	9:07	surface	6.8	14.1	44	8.3	81
		1M	6.8	14.1	44	8.3	81
		2M	6.7	14.1	45	8.4	81
		3M	6.7	14.2	45	8.4	81
		4M	6.7	14.2	45	8.3	81
1A	8:54	surface	6.9	13.9	43	8.3	80
		1M	6.8	13.9	43	8.3	80
		2M	6.8	13.9	43	8.3	80
		3M	6.8	13.9	43	8.2	80

JST Forebay Water Quality Data (Provided By USACE-ERDC)

April 19, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
50753	20.02	9.54	44.1	2
50813	20.03	9.55	44.1	4
50843	20.04	9.57	44.3	6
50857	20.02	9.58	44.1	8
50912	16.04	9.32	43.1	10
50933	15.16	8.39	42.9	12
50948	14.26	8.23	42.6	14
51013	13.76	7.81	42.4	16
51029	13.51	7.67	42.2	18
51046	13.22	7.62	42.1	20
51056	12.92	7.61	42	22
51111	12.73	7.62	42	24
51124	12.38	7.65	42.7	26
51139	12.24	7.75	42.8	28
51148	12.07	7.78	43.1	30
51200	11.83	7.85	43.2	32
51215	11.61	7.85	43.6	34
51230	11.28	7.64	44	36
51243	11.18	7.49	43.7	38
51259	11.01	7.3	43.8	40
51315	10.93	6.71	43.8	42
Max:	20.04	9.58	44.3	42
Min:	10.93	6.71	42	2

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
4/27/2021	0:00:00	15.35	43.1	8.24
4/27/2021	0:15:00	15.35	42.9	8.18
4/27/2021	0:30:00	15.28	42.9	7.7
4/27/2021	0:45:00	15.16	42.8	7.39
4/27/2021	1:00:00	15.04	42.6	7.4
4/27/2021	1:15:00	14.98	42.5	7.32
4/27/2021	1:30:00	14.96	42.4	7.33
4/27/2021	1:45:00	14.93	42.5	7.25
4/27/2021	2:00:00	14.92	42.4	7.2
4/27/2021	2:15:00	14.91	42.3	7.15
4/27/2021	2:30:00	14.89	42.6	7.1
4/27/2021	2:45:00	14.88	42.4	7.02
4/27/2021	3:00:00	14.86	42.3	7.02
4/27/2021	3:15:00	14.85	42.5	6.96
4/27/2021	3:30:00	14.81	42.2	6.94
4/27/2021	3:45:00	14.79	42.2	6.92
4/27/2021	4:00:00	14.77	42.4	6.87
4/27/2021	4:15:00	14.76	42.3	6.87
4/27/2021	4:30:00	14.74	42.4	6.83
4/27/2021	4:45:00	14.73	42.9	6.86
4/27/2021	5:00:00	14.72	42.5	6.77
4/27/2021	5:15:00	14.71	42.6	6.58
4/27/2021	5:30:00	14.77	42.6	7
4/27/2021	5:45:00	14.87	42.8	7.68
4/27/2021	6:00:00	14.93	42.9	7.94
4/27/2021	6:15:00	14.97	42.6	8.01
4/27/2021	6:30:00	15	42.8	8.16
4/27/2021	6:45:00	15.02	42.9	8.13
4/27/2021	7:00:00	15.06	42.9	8.11
4/27/2021	7:15:00	15.13	43	8.2
4/27/2021	7:30:00	15.17	43	8.18
4/27/2021	7:45:00	15.21	42.8	8.27
4/27/2021	8:00:00	15.31	43.1	8.15
4/27/2021	8:15:00	15.38	42.9	8.35
4/27/2021	8:30:00	15.39	43	7.8
4/27/2021	8:45:00	15.38	42.9	7.55
4/27/2021	9:00:00	15.36	43.1	7.5
4/27/2021	9:15:00	15.33	43	7.41
4/27/2021	9:30:00	15.33	42.9	7.27
4/27/2021	9:45:00	15.35	42.9	7.21
4/27/2021	10:00:00	15.4	42.9	7.19
			-	

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
4/27/2021	10:15:00	15.44	43.3	7.15
4/27/2021	10:30:00	15.5	43	7.17
4/27/2021	10:45:00	15.54	43	7.18
4/27/2021	11:00:00	15.57	43.1	7.16
4/27/2021	11:15:00	15.58	43.1	7.22
4/27/2021	11:30:00	15.63	43.1	7.17
4/27/2021	11:45:00	15.66	43	7.22
4/27/2021	12:00:00	15.71	43	7.24
4/27/2021	12:15:00	15.74	42.9	7.24
4/27/2021	12:30:00	15.79	43	6.86
4/27/2021	12:45:00	15.86	43.3	6.76
4/27/2021	13:00:00	15.91	43.1	6.75
4/27/2021	13:15:00	15.98	43.1	6.73
4/27/2021	13:30:00	16.03	43	6.71
4/27/2021	13:45:00	16.06	43	6.69
4/27/2021	14:00:00	16.07	43.2	6.69
4/27/2021	14:15:00	16.07	43.3	6.7
4/27/2021	14:30:00	16.11	43	6.72
4/27/2021	14:45:00	16.11	42.9	6.69
4/27/2021	15:00:00	16.12	42.9	6.68
4/27/2021	15:15:00	15.97	42.9	6.65
4/27/2021	15:30:00	15.71	42.8	6.81
4/27/2021	15:45:00	15.59	42.7	6.81
4/27/2021	16:00:00	15.52	42.7	6.82
4/27/2021	16:15:00	15.47	42.9	6.82
4/27/2021	16:30:00	15.45	42.9	6.83
4/27/2021	16:45:00	15.43	43	6.79
4/27/2021	17:00:00	15.37	43	6.74
4/27/2021	17:15:00	15.36	42.9	6.8
4/27/2021	17:30:00	15.31	42.6	6.81
4/27/2021	17:45:00	15.31	42.8	6.8
4/27/2021	18:00:00	15.25	43	6.8
4/27/2021	18:15:00	15.2	43	6.8
4/27/2021	18:30:00	15.14	43	6.78
4/27/2021	18:45:00	15.05	42.9	6.77
4/27/2021	19:00:00	14.99	43	6.82
4/27/2021	19:15:00	14.97	42.9	6.79
4/27/2021	19:30:00	14.92	43	6.76
4/27/2021	19:45:00	14.9	42.9	6.77
4/27/2021	20:00:00	14.86	42.9	6.78
4/27/2021	20:15:00	14.86	43	6.76
4/27/2021	20:30:00	14.85	43	6.77
4/27/2021	20:45:00	14.83	43	6.79
4/27/2021	21:00:00	14.82	42.9	6.77
Date	Time	Temp SpCond		LDO
--------------	----------	-------------	------	------
MMDDYY	HHMMSS	°C µS/cm		mg/l
4/27/2021	21:15:00	14.82	43	6.87
4/27/2021	21:30:00	14.9	43	7.47
4/27/2021	21:45:00	15.35	43.1	7.75
4/27/2021	22:00:00	15.57	43	8.04
4/27/2021	22:15:00	15.68	43	7.95
4/27/2021	22:30:00	15.73	43.1	7.85
4/27/2021	22:45:00	15.76	43.3	7.92
4/27/2021	23:00:00	15.78	43	8.19
4/27/2021	23:15:00	15.72	43.4	8.33
4/27/2021	23:30:00	15.67	43.1	8.42
4/27/2021	23:45:00	15.63	43.1	8.38
4/28/2021	0:00:00	15.64	43.1	8.29
4/28/2021	0:15:00	15.69	43.1	8.2
4/28/2021	0:30:00	15.7	43.1	8.35
4/28/2021	0:45:00	15.67	43	8.32
4/28/2021	1:00:00	15.6	42.9	8.09
4/28/2021	1:15:00	15.45	42.9	7.66
4/28/2021	1:30:00	15.35	42.8	7.49
4/28/2021	1:45:00	15.3	42.9	7.36
4/28/2021	2:00:00	15.29	43	7.33
4/28/2021	2:15:00	15.24	42.6	7.28
4/28/2021	2:30:00	15.26	42.8	7.24
4/28/2021	2:45:00	15.31	43	7.24
4/28/2021	3:00:00	15.35	43	7.28
4/28/2021	3:15:00	15.36	42.9	7.25
4/28/2021	3:30:00	15.32	43	6.99
4/28/2021	3:45:00	15.32	43	7.03
4/28/2021	4:00:00	15.3	42.8	6.87
4/28/2021	4:15:00	15.28	42.9	6.81
4/28/2021	4:30:00	15.25	43	6.7
4/28/2021	4:45:00	15.23	42.8	6.65
4/28/2021	5:00:00	15.21	42.8	6.66
4/28/2021	5:15:00	15.19	42.9	6.55
4/28/2021	5:30:00	15.24	42.9	7.13
4/28/2021	5:45:00	15.29	43	7.58
4/28/2021	6:00:00	15.32	43	7.76
4/28/2021	6:15:00	15.35	43	7.86
4/28/2021	6:30:00	15.38	42.9	7.91
4/28/2021	6:45:00	15.39	43.1	7.91
4/28/2021	7:00:00	15.42	43	7.92
4/28/2021	7:15:00	15.45	42.9	7.98
4/28/2021	7:30:00	15.49	43	7.98
4/28/2021	7:45:00	15.52	42.8	8
4/28/2021	8:00:00	15.59	42.9	8.06
<u>· · ·</u>		11		

Date	Time	Temp	Temp SpCond	
MMDDYY	HHMMSS	°C	μS/cm	mg/l
4/28/2021	8:15:00	15.65	43	8.01
4/28/2021	8:30:00	15.68	43	8.06
4/28/2021	8:45:00	15.72	42.9	8.02
4/28/2021	9:00:00	15.74	43	8.08
4/28/2021	9:15:00	15.78	43	8.02
4/28/2021	9:30:00	15.85	43	8.03
4/28/2021	9:45:00	15.92	42.9	8.09
4/28/2021	10:15:00	16.28	45.2	8.43
4/28/2021	10:30:00	16.17	48.2	8.18
4/28/2021	10:45:00	16.17	48.2	8.16
4/28/2021	11:00:00	16.2	47.5	8.28
4/28/2021	11:15:00	16.25	46.9	8.34
4/28/2021	11:30:00	16.31	47.1	8.26
4/28/2021	11:45:00	16.37	47.4	8.35
4/28/2021	12:00:00	16.37	48.6	8.14
4/28/2021	12:15:00	16.34	47.4	8.16
4/28/2021	12:30:00	16.33	46.4	8.15
4/28/2021	12:45:00	16.37	45.1	8.25
4/28/2021	13:00:00	16.47	45.8	8.33
4/28/2021	13:15:00	16.58	45.8	8.31
4/28/2021	13:30:00	16.64	45.8	8.14
4/28/2021	13:45:00	16.71	45.3	8.19
4/28/2021	14:00:00	16.75	44.9	8.07
4/28/2021	14:15:00	16.74	44.6	8.14
4/28/2021	14:30:00	16.37	42.8	7.17
4/28/2021	14:45:00	16.18	43.1	6.92
4/28/2021	15:00:00	16.15	43.1	6.84
4/28/2021	15:15:00	15.85	42.6	6.86
4/28/2021	15:30:00	15.6	42.4	6.98
4/28/2021	15:45:00	15.47	42.4	6.92
4/28/2021	16:00:00	15.36	42.4	6.93
4/28/2021	16:15:00	15.36	42.7	6.9
4/28/2021	16:30:00	15.38	42.7	6.93
4/28/2021	16:45:00	15.4	42.7	6.85
4/28/2021	17:00:00	15.35	42.5	6.8
4/28/2021	17:15:00	15.32	42.7	6.84
4/28/2021	17:30:00	15.31	42.7	6.92
4/28/2021	17:45:00	15.29	42.7	6.93
4/28/2021	18:00:00	15.25	42.8	6.97
4/28/2021	18:15:00	15.2	42.5	6.91
4/28/2021	18:30:00	15.17	42.7	6.91
4/28/2021	18:45:00	15.13	42.5	6.93
4/28/2021	19:00:00	15.04	42.4	6.89
4/28/2021	19:15:00	15	42.5	6.93
		45		

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
4/28/2021	19:30:00	15	42.5	6.92
4/28/2021	19:45:00	14.98	42.5	6.88
4/28/2021	20:00:00	14.98	42.4	6.84
4/28/2021	20:15:00	14.94	42.4	6.9
4/28/2021	20:30:00	14.92	42.4	6.92
4/28/2021	20:45:00	14.89	42.4	6.92
4/28/2021	21:00:00	14.89	42.4	6.96
4/28/2021	21:15:00	14.89	42.5	7
4/28/2021	21:30:00	14.97	42.5	7.56
4/28/2021	21:45:00	15.42	42.8	8.18
4/28/2021	22:00:00	15.58	42.8	8.35
4/28/2021	22:15:00	15.72	43.2	8.24
4/28/2021	22:30:00	15.78	42.8	8.14
4/28/2021	22:45:00	15.82	42.8	8.05
4/28/2021	23:00:00	15.8	42.8	8.06
4/28/2021	23:15:00	15.83	42.8	8.16
4/28/2021	23:30:00	15.83	42.8	8.13
4/28/2021	23:45:00	15.79	42.7	8.41
	Max	16.75	48.6	8.43
	Min	14.71	42.2	6.55

Stevens Creek Operations Data (Provided By DESC & USACE)

4/27/2021

Thurmond discharge

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.3	159.1	12897	8939
2:00	0	186.1	159	12823	8973
3:00	0	185.8	159	12435	8743
4:00	0	185.6	158.9	12488	8836
5:00	0	185.2	158.8	12298	8780
6:00	0	185	158.8	12203	8747
7:00	2680	184.7	158.8	11978	8645
8:00	2930	184.6	158.8	11904	8493
9:00	3077	184.5	158.8	11814	8576
10:00	9010	184.3	158.8	11645	8493
11:00	9340	184.3	158.8	11825	8609
12:00	9420	184.4	158.8	11895	8656
13:00	9327	184.4	158.8	11858	8700
14:00	10200	184.5	158.8	11984	8673
15:00	10120	184.6	158.8	12120	8682
16:00	10554	184.7	158.8	12147	8802
17:00	27030	184.8	158.9	12094	8707
18:00	27390	185.3	158.8	12447	8823
19:00	27120	185.5	158.9	12717	8966
20:00	27120	186.3	159	13031	9040
21:00	27210	186.8	159.2	13235	9090
22:00	26940	187.1	159.3	13345	9112
23:00	883	187.4	159.5	13545	9220
24:00:00	0	187.2	159.5	13425	9169
daily avg.	10015	185	159	25409	8811
Total Generation		298153]	
Projected discharg	<u>e</u>	11021			

10015

Stevens Creek Operations Data (Provided By DESC & USACE)

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.9	159.3	13245	9133
2:00	0	186.6	159.2	12976	9251
3:00	0	186.2	159	12856	8904
4:00	0	186	159	12740	8915
5:00	294	185.7	158.9	12624	8864
6:00	7100	185.5	158.9	12502	8834
7:00	7100	185.2	158.9	12319	8790
8:00	7100	185.2	158.9	12295	8780
9:00	7100	185.2	158.9	12271	8767
10:00	7100	185.2	158.9	12305	8771
11:00	7020	185.2	158.9	12323	8778
12:00	7100	185.1	158.8	12291	8785
13:00	7020	185.1	158.9	12295	8750
14:00	7535	185.1	158.8	12288	8774
15:00	13695	185.1	158.8	12268	8752
16:00	26580	185	158.8	12280	8772
17:00	27480	185.2	158.8	12330	8834
18:00	27210	185.6	158.9	12590	8888
19:00	27930	186.2	158.9	12918	9011
20:00	27210	184.2	159	13146	9077
21:00	26580	187	159.3	13277	9081
22:00	441	187.9	159.4	13481	9138
23:00	0	187.6	159.6	13285	8972
24:00:00	0	187.3	159.5	13170	9006
daily avg.	10066	186	159	12670	8901
Total Generation		304075]	
Projected discharge	2	11021			
Thurmond discharg	<u>te</u>	10066			

4/28/2021

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station:02197000 (Savannah River at Augusta)PCode:FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
4/27/2021 0:00	12100
4/27/2021 1:00	12500
4/27/2021 2:00	13100
4/27/2021 3:00	13200
4/27/2021 4:00	12700
4/27/2021 5:00	12200
4/27/2021 6:00	11600
4/27/2021 7:00	11200
4/27/2021 8:00	10900
4/27/2021 9:00	10600
4/27/2021 10:00	10400
4/27/2021 11:00	10100
4/27/2021 12:00	9980
4/27/2021 13:00	9910
4/27/2021 14:00	9840
4/27/2021 15:00	9650
4/27/2021 16:00	9590
4/27/2021 17:00	9510
4/27/2021 18:00	9110
4/27/2021 10:00	9020
4/27/2021 19:00	8860
4/27/2021 20:00	8780
4/27/2021 21:00	8690
4/27/2021 22:00	8530
4/27/2021 23:00	8470
4/28/2021 0:00	8650
4/28/2021 1:00	11100
4/28/2021 2:00	1100
4/28/2021 3:00	11600
4/28/2021 4.00	11600
4/28/2021 5.00	11200
4/28/2021 0.00	11300
4/28/2021 7.00	10600
4/28/2021 8.00	10000
4/28/2021 9:00	10400
4/28/2021 10:00	10100
4/28/2021 11:00	9920
4/28/2021 12:00	9890
4/28/2021 13:00	9660
4/28/2021 14:00	9/10
4/28/2021 15:00	9440
4/28/2021 16:00	9400
4/28/2021 17:00	9370
4/28/2021 18:00	9350
4/28/2021 19:00	9250
4/28/2021 20:00	9300
4/28/2021 21:00	9250
4/28/2021 22:00	9240
4/28/2021 23:00	9110

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary May 2021

	Ten	nperat	<u>ure</u>	<u>Dissolvec</u>	Oxyge	<u>en</u> (mg/L)
		(°C)				
Location						
Thurmond Forebay (Site 8)						
(5/18/21)	12.49	_	22.24	2.5	_	9.4
Thurmond Tailrace (Site 7)						
(5/11/21 - 5/12/21)		_			_	
Stevens Creek Res. (Site 6)	14.74	_	14.77	8.0	_	8.0
(5/11/21 - 5/12/21)						
(0// 0///						
Stavans Craak Ros (Sita 1)	1/1 21	_	1/ 96	7 /	_	7 9
([(11/21 - [(12/21)])])	14.01		14.00	7.4		7.0
(5/11/21 - 5/12/21)						
	45.00		45.00			
Stevens Creek Res. (Site 2)	15.02	_	15.03	1.1	_	7.8
(5/11/21 - 5/12/21)						
Stevens Creek Tailrace (Site 3)	15.37	—	15.65	8.1	—	8.3
(5/11/21 - 5/12/21)						
Stevens Creek (Site 5)	20.69	_	21.25	5.0	_	5.4
(5/11/21 - 5/12/21)						
Stevens Creek (Site 4)	18.28	_	20.89	5.4	_	7.1
(5/11/21 - 5/12/21)	23.20		_0.00	5.1		
(3/ + +/ 2 + 3/ + 2/ 2 +)						

USGS note: Heavy lightening caused sampling to end early.

No data collected on 5/12 for sites 2, 4 & 6

Date: 05/11/2021 Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:56	surface	6.4	20.7	95	5.3	59
		1M	6.4	20.7	95	5.3	60
		2M	6.5	20.7	95	5.3	60
		3M	6.5	20.7	95	5.4	60
		4M	6.5	20.7	95	5.4	60
		5M	6.6	20.7	95	5.4	60
3	10:18	1M	6.2	15.7	43	8.3	83
4	8:46	surface	6.5	20.9	85	5.4	61
		1M	6.5	20.6	83	5.5	61
		2M	6.5	19.8	71	6.3	69
		3M	6.6	19.1	61	7.0	76
		4M	6.6	18.7	60	7.1	76
		5M	6.6	18.3	60	6.8	73
2	9:05	surface	6.5	15.0	43	7.8	78
		1M	6.4	15.0	43	7.8	77
		2M	6.4	15.0	43	7.8	77
		3M	6.4	15.0	43	7.8	77
		4M	6.3	15.0	43	7.7	77
1	9:24	surface	6.4	14.8	42	7.8	77
		1M	6.4	14.8	42	7.7	76
		2M	6.4	14.8	42	7.7	76
		3M	6.4	14.8	42	7.7	76
1A	9:36	surface	6.3	14.8	42	8.0	79
		1M	6.3	14.8	42	8.0	79
		2M	6.3	14.7	42	8.0	79
		3M	6.3	14.7	42	8.0	79

Date: 05/12/2021 Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)	-	(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	8:09	surface	6.6	21.3	96	5.1	58
		1M	6.6	21.3	96	5.1	57
		2M	6.6	21.2	96	5.0	57
		3M	6.6	21.2	96	5.0	57
		4M	6.6	21.2	96	5.1	57
3	8:45	1M	6.3	15.4	43	8.1	81
4		surface					
		1M					
		2M					
		3M					
2		surface					
		1M					
		2M					
		3M					
		4M					
1	9:16	surface	6.3	14.9	42	7.5	74
		1M	6.3	14.9	42	7.4	74
		2M	6.3	14.9	42	7.4	73
		3M	6.3	14.9	42	7.4	73
1A		surface					
		1M					
		2M					
		3M					

JST Forebay Water Quality Data (Provided By USACE-ERDC)

May 18, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
44553	22.24	9.15	43.7	0.2
44612	21.54	9.27	43.7	2
44651	20.98	9.35	43.7	4
44747	20.64	8.3	44	6
44837	19.7	7.11	43.7	8
44923	17.61	5.72	43.3	10
45017	16.22	5.04	42.6	12
45117	15.7	4.96	41.7	14
45212	15.3	4.94	41	16
45312	14.77	4.92	40.5	18
45338	14.68	4.93	40.7	20
45454	14.45	4.93	40.7	22
45527	14.35	5	41	24
45605	14.11	4.98	40.5	26
45654	13.71	5.11	41.2	28
45734	13.55	5.17	41.6	30
45806	13.43	5.25	42.1	32
45832	13.12	5.28	42.1	34
45924	12.89	4.99	41.5	36
50011	12.78	4.77	41	38
50055	12.72	4.65	41	40
50145	12.61	4.54	41.2	42
50234	12.49	4.24	41.5	44
50323	12.49	4.12	41.6	46
50410	12.5	2.54	91.7	46.2
Max:	22.24	9.35	91.7	46.2
Min:	12.49	2.54	40.5	0.2

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
5/11/2021	0:00:00	17.86	42.7	6.56
5/11/2021	0:15:00	17.92	42.7	6.43
5/11/2021	0:30:00	17.96	42.8	6.49
5/11/2021	0:45:00	18.01	42.6	6.5
5/11/2021	1:00:00	18.04	42.8	6.28
5/11/2021	1:15:00	18.06	42.7	6.27
5/11/2021	1:30:00	18.06	42.8	6.36
5/11/2021	1:45:00	18.06	42.8	6.37
5/11/2021	2:00:00	18.06	42.8	6.14
5/11/2021	2:15:00	18.06	42.8	6.07
5/11/2021	2:30:00	18.08	42.8	6.09
5/11/2021	2:45:00	18.09	42.8	5.92
5/11/2021	3:00:00	18.1	42.8	6.02
5/11/2021	3:15:00	18.1	42.7	5.95
5/11/2021	3:30:00	18.08	43	5.69
5/11/2021	3:45:00	18.08	43.2	5.49
5/11/2021	4:00:00	18.12	43	5.2
5/11/2021	4:15:00	18.13	43	5.35
5/11/2021	4:30:00	18.14	42.7	5.34
5/11/2021	4:45:00	18.16	43	5.31
5/11/2021	5:00:00	18.16	42.8	5.16
5/11/2021	5:15:00	18.07	42.8	5.16
5/11/2021	5:30:00	17.84	42.7	5.16
5/11/2021	5:45:00	17.72	42.7	5.39
5/11/2021	6:00:00	17.46	42.3	5.45
5/11/2021	6:15:00	17.26	42.4	5.45
5/11/2021	6:30:00	17.17	42.4	5.45
5/11/2021	6:45:00	17.17	42.5	5.42
5/11/2021	7:00:00	17.21	42.2	5.27
5/11/2021	7:15:00	17.26	42.5	5.07
5/11/2021	7:30:00	17.3	42.5	4.84
5/11/2021	7:45:00	17.34	42.6	4.79
5/11/2021	8:00:00	17.34	42.6	5.11
5/11/2021	8:15:00	17.33	42.4	5.59
5/11/2021	8:30:00	17.31	42.3	5.88
5/11/2021	8:45:00	17.25	42.4	6.03
5/11/2021	9:00:00	17.18	42.1	6.06
5/11/2021	9:15:00	17.13	42	6.02
5/11/2021	9:30:00	17.05	42	6.1
5/11/2021	9:45:00	17.03	42	6.01
5/11/2021	10:00:00	16.98	41.9	5.99

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
5/11/2021	10:15:00	16.94	41.8	6.07
5/11/2021	10:30:00	16.94	41.8	6.04
5/11/2021	10:45:00	16.96	42	6.07
5/11/2021	11:00:00	16.98	42.1	6.06
5/11/2021	11:15:00	17.01	42.2	6.05
5/11/2021	11:30:00	16.97	42.1	6.02
5/11/2021	11:45:00	16.94	42.2	5.99
5/11/2021	12:00:00	16.94	42.1	6
5/11/2021	12:15:00	16.97	42	6.01
5/11/2021	12:30:00	17.02	42.1	5.97
5/11/2021	12:45:00	17.03	42.4	5.97
5/11/2021	13:00:00	17.07	42.2	6.03
5/11/2021	13:15:00	17.16	42.2	5.99
5/11/2021	13:30:00	17.19	42.2	5.9
5/11/2021	13:45:00	17.22	42.4	5.87
5/11/2021	14:00:00	17.21	42.1	5.84
5/11/2021	14:15:00	17.21	42.3	5.87
5/11/2021	14:30:00	17.17	42.2	5.86
5/11/2021	14:45:00	17.03	42.4	5.75
5/11/2021	15:00:00	17	42.4	5.67
5/11/2021	15:15:00	16.96	42.4	5.67
5/11/2021	15:30:00	16.9	42.5	5.99
5/11/2021	15:45:00	16.83	42.2	5.81
5/11/2021	16:00:00	16.8	42.5	5.7
5/11/2021	16:15:00	16.75	42.3	5.64
5/11/2021	16:30:00	16.67	42.2	5.79
5/11/2021	16:45:00	16.64	42.6	5.78
5/11/2021	17:00:00	16.63	42.3	5.86
5/11/2021	17:15:00	16.59	42.3	5.82
5/11/2021	17:30:00	16.57	42.5	5.7
5/11/2021	17:45:00	16.57	42.3	5.7
5/11/2021	18:00:00	16.58	42.6	5.63
5/11/2021	18:15:00	16.62	42.7	5.63
5/11/2021	18:30:00	16.66	42.5	5.6
5/11/2021	18:45:00	16.62	42.3	5.57
5/11/2021	19:00:00	16.61	42.6	5.64
5/11/2021	19:15:00	16.57	42.3	5.52
5/11/2021	19:30:00	16.54	42.2	5.54
5/11/2021	19:45:00	16.54	42.3	5.54
5/11/2021	20:00:00	16.54	42.5	5.52
5/11/2021	20:15:00	16.52	42.5	5.5
5/11/2021	20:30:00	16.48	42.5	5.47
5/11/2021	20:45:00	16.45	42.5	5.5
5/11/2021	21:00:00	16.42	42.3	5.5
		55		

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
5/11/2021	21:15:00	16.41	42.3	5.49
5/11/2021	21:30:00	16.65	42.5	5.56
5/11/2021	21:45:00	17.21	42.5	5.65
5/11/2021	22:00:00	17.44	42.5	6.04
5/11/2021	22:15:00	17.62	42.5	5.95
5/11/2021	22:30:00	17.72	42.5	5.93
5/11/2021	22:45:00	17.86	42.4	6.32
5/11/2021	23:00:00	17.97	42.6	6.5
5/11/2021	23:15:00	18.07	42.3	6.62
5/11/2021	23:30:00	18.15	42.6	6.47
5/11/2021	23:45:00	18.21	42.7	6.34
5/12/2021	0:00:00	18.24	42.7	6.26
5/12/2021	0:15:00	18.23	42.7	6.34
5/12/2021	0:30:00	18.25	42.7	6.32
5/12/2021	0:45:00	18.33	42.6	6.23
5/12/2021	1:00:00	18.45	43	5.98
5/12/2021	1:15:00	18.57	42.9	5.87
5/12/2021	1:30:00	18.66	43	5.81
5/12/2021	1:45:00	18.72	43.2	5.69
5/12/2021	2:00:00	18.74	43	5.63
5/12/2021	2:15:00	18.7	43.2	5.59
5/12/2021	2:30:00	18.68	43	5.45
5/12/2021	2:45:00	18.67	43	5.31
5/12/2021	3:00:00	18.65	42.9	5.16
5/12/2021	3:15:00	18.62	42.9	5.17
5/12/2021	3:30:00	18.6	42.9	5.09
5/12/2021	3:45:00	18.57	42.9	5.01
5/12/2021	4:00:00	18.55	42.8	5.07
5/12/2021	4:15:00	18.55	42.9	5.01
5/12/2021	4:30:00	18.55	42.8	4.98
5/12/2021	4:45:00	18.55	42.9	4.95
5/12/2021	5:00:00	18.54	42.9	4.97
5/12/2021	5:15:00	18.49	42.9	4.85
5/12/2021	5:30:00	18.1	42.5	5.03
5/12/2021	5:45:00	17.71	42.3	5.15
5/12/2021	6:00:00	17.51	42.4	5.14
5/12/2021	6:15:00	17.42	42.6	5.13
5/12/2021	6:30:00	17.39	42.4	5.2
5/12/2021	6:45:00	17.36	42.4	5.24
5/12/2021	7:00:00	17.33	42.3	5.23
5/12/2021	7:15:00	17.31	42.5	5.21
5/12/2021	7:30:00	17.31	42.4	5.2
5/12/2021	7:45:00	17.3	42.5	5.15
5/12/2021	8:00:00	17.32	42.4	5.19

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
5/12/2021	8:15:00	17.34	42.8	5.18
5/12/2021	8:30:00	17.34	42.4	5.18
5/12/2021	8:45:00	17.34	42.5	5.18
5/12/2021	9:00:00	17.35	42.3	5.2
5/12/2021	9:15:00	17.39	42.4	5.17
5/12/2021	9:30:00	17.4	42.6	5.15
5/12/2021	9:45:00	17.21	42.4	5.13
5/12/2021	10:00:00	17.05	42.4	5.11
5/12/2021	10:15:00	16.96	42.2	5.1
5/12/2021	10:30:00	16.91	42.5	5.07
5/12/2021	10:45:00	16.89	42.4	4.95
5/12/2021	11:00:00	16.89	42.6	4.88
5/12/2021	11:15:00	16.9	42.9	4.82
5/12/2021	11:30:00	16.9	42.6	5.07
5/12/2021	11:45:00	16.8	42	5.67
5/12/2021	12:00:00	16.67	42	5.89
5/12/2021	12:15:00	16.53	41.8	5.92
5/12/2021	12:30:00	16.35	41.9	6.04
5/12/2021	12:45:00	16.28	41.9	6.05
5/12/2021	13:00:00	16.27	42.1	6.05
5/12/2021	13:15:00	16.24	42.3	6.01
5/12/2021	13:30:00	16.28	42.4	6.01
5/12/2021	13:45:00	16.29	42.4	6.01
5/12/2021	14:00:00	16.28	42.2	5.91
5/12/2021	14:15:00	16.24	42.2	5.96
5/12/2021	14:30:00	16.11	42.2	5.98
5/12/2021	14:45:00	15.98	42.2	5.94
5/12/2021	15:00:00	15.84	42	5.91
5/12/2021	15:15:00	15.77	42.3	5.84
5/12/2021	15:30:00	15.71	42	5.84
5/12/2021	15:45:00	15.63	42.3	5.74
5/12/2021	16:00:00	15.55	42.2	5.72
5/12/2021	16:15:00	15.5	42	5.75
5/12/2021	16:30:00	15.46	42.3	5.73
5/12/2021	16:45:00	15.45	42.2	5.71
5/12/2021	17:00:00	15.42	42.2	5.65
5/12/2021	17:15:00	15.42	42.3	5.61
5/12/2021	17:30:00	15.44	42.5	5.65
5/12/2021	17:45:00	15.45	42.4	5.57
5/12/2021	18:00:00	15.46	42.4	5.56
5/12/2021	18:15:00	15.47	42.3	5.58
5/12/2021	18:30:00	15.48	42	5.62
5/12/2021	18:45:00	15.5	42.4	5.65
5/12/2021	19:00:00	15.53	42.3	5.63

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
5/12/2021	19:15:00	15.57	42.2	5.55
5/12/2021	19:30:00	15.56	42.2	5.74
5/12/2021	19:45:00	15.53	42	5.7
5/12/2021	20:00:00	15.53	42.3	5.73
5/12/2021	20:15:00	15.55	42.2	5.72
5/12/2021	20:30:00	15.55	42	5.75
5/12/2021	20:45:00	15.54	42	5.81
5/12/2021	21:00:00	15.55	42.3	5.7
5/12/2021	21:15:00	15.56	42.2	5.62
5/12/2021	21:30:00	15.61	42.7	5.37
5/12/2021	21:45:00	15.97	42.2	5.3
5/12/2021	22:00:00	16.1	42.4	4.99
5/12/2021	22:15:00	16.08	42.6	5.02
5/12/2021	22:30:00	16.06	42.9	5.08
5/12/2021	22:45:00	16.04	42.8	5.11
5/12/2021	23:00:00	16.09	42.7	5.29
5/12/2021	23:15:00	16.11	43.1	5.24
5/12/2021	23:30:00	16.13	42.9	5.17
5/12/2021	23:45:00	16.14	43.5	5.06
	Max	18.74	43.5	6.62
	Min	15.42	41.8	4.79

Stevens Creek Operations Data (Provided By DESC & USACE)

5/11/2021

Thurmond discharge

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	186.7	159.3	12902	8889
2:00	0	186.5	159.2	12785	8863
3:00	0	186.2	159.1	12686	8835
4:00	0	185.9	159	12595	8836
5:00	0	185.6	159	12460	8773
6:00	737	185.3	159	12492	8738
7:00	11640	185.1	158.9	12156	8655
8:00	11640	185.2	158.9	12156	8668
9:00	11700	185.4	159	12191	8763
10:00	11860	185.5	159	12377	8799
11:00	11700	185.6	159	12385	8736
12:00	11630	185.7	159	12382	8786
13:00	11700	185.8	159	12447	8808
14:00	11995	185.9	159	12507	8808
15:00	17285	185.9	159	12601	8832
16:00	30820	186.2	159.1	12646	8840
17:00	22320	186.6	159.2	12704	8956
18:00	15990	186.8	159.3	12980	8933
19:00	15060	186.9	159.4	13034	8958
20:00	15190	187	159.4	13030	8813
21:00	14970	187.1	159.5	12931	8826
22:00	13380	187.1	159.5	12943	8836
23:00	0	187	159.4	12925	8835
24:00:00	0	186	159.4	12763	8808
daily avg.	9984	186	159	12628	8816
Total Generation		303078]	
Projected discharg	<u>e</u>	11219			

9984

Stevens Creek Operations Data (Provided By DESC & USACE)

5/12/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.3	159.2	12670	8798
2:00	0	186	159.1	12545	8760
3:00	0	185.8	159	12405	8731
4:00	0	185.5	159	12241	8647
5:00	737	185.2	158.9	11860	8462
6:00	11640	184.9	158.9	11938	8498
7:00	11570	184.7	158.9	11764	8494
8:00	11640	184.9	158.9	11881	8524
9:00	11640	185	158.9	11806	8488
10:00	11780	185.2	158.9	12268	8776
11:00	11630	185.3	158.9	12275	8760
12:00	11780	185.5	158.9	12317	8743
13:00	11860	185.6	158.9	12404	8751
14:00	12530	185.7	159	12438	8771
15:00	28500	185.8	159	12545	8781
16:00	22050	186	159.1	12602	8822
17:00	22050	186.2	159.1	12729	8847
18:00	22150	186.5	159.2	12915	8937
19:00	21810	186.8	159.3	12962	8886
20:00	12504	187	159.4	13201	8868
21:00	11620	187.2	159.5	13121	8882
22:00	147	187.2	159.5	13089	8880
23:00	0	187.1	159.5	13041	8870
24:00:00	0	186.8	159.4	12921	8896
daily avg.	10318	186	159	12497	8745
Total Generation		299938]	
Projected discharg	<u>e</u>	11219			
Thurmond discharg	ge	10318			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
5/11/2021 0:00	12300
5/11/2021 1:00	13100
5/11/2021 2:00	14300
5/11/2021 3:00	14600
5/11/2021 4:00	14700
5/11/2021 5:00	13200
5/11/2021 6:00	12400
5/11/2021 7:00	12300
5/11/2021 8:00	12400
5/11/2021 9:00	11500
5/11/2021 10:00	11000
5/11/2021 11:00	10600
5/11/2021 12:00	10500
5/11/2021 13:00	10200
5/11/2021 14:00	10300
5/11/2021 15:00	10400
5/11/2021 16:00	10300
5/11/2021 17:00	10400
5/11/2021 18:00	10200
5/11/2021 19:00	10200
5/11/2021 20:00	10600
5/11/2021 21:00	11100
5/11/2021 22:00	11200
5/11/2021 23:00	11200
5/12/2021 0:00	11600
5/12/2021 1:00	11700
5/12/2021 2:00	11700
5/12/2021 3:00	11700
5/12/2021 4:00	11900
5/12/2021 5:00	11800
5/12/2021 6:00	11900
5/12/2021 7:00	11900
5/12/2021 8:00	11800
5/12/2021 9:00	11400
5/12/2021 10:00	11300
5/12/2021 11:00	11000
5/12/2021 12:00	10400
5/12/2021 13:00	10300
5/12/2021 14:00	10200
5/12/2021 15:00	9940
5/12/2021 16:00	9820
5/12/2021 17:00	9710
5/12/2021 18:00	9680
5/12/2021 19:00	9720
5/12/2021 20:00	9680
5/12/2021 21:00	9680
5/12/2021 22:00	9640
5/12/2021 23:00	10300

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary June 2021

	Tem	nperatu (°C)	re	<u>Dissolve</u>	d Oxyge	<u>en</u> (mg/L)
Location						
Thurmond Forebay (Site 8)						
(6/10/21)	13.25	_	27.65	2.3	_	9.1
Thurmond Tailrace (Site 7)						
(6/8/21 - 6/9/21)		—			—	
Stevens Creek Res. (Site 6)	15.74	—	18.36	6.1	—	6.8
(6/8/21 - 6/9/21)						
Stevens Creek Res. (Site 1)	15.65	_	18.37	5.5	_	6.8
(6/8/21 - 6/9/21)						
Stevens Creek Res. (Site 2)	16.44	_	16.68	6.6	_	6.7
(6/8/21 - 6/9/21)						
Stevens Creek Tailrace (Site 3)	16.56	_	18.27	7.3	—	8.0
(6/8/21 - 6/9/21)						
Stevens Creek (Site 5)	23.59	_	25.23	5.2	—	6.0
(6/8/21 - 6/9/21)						
Stevens Creek (Site 4)	24.36	_	26.93	4.6	_	5.7
(6/8/21 - 6/9/21)						

USGS note: Heavy lightening resulted in not finishing afternoon run on 6/8.

No data collected on 6/8 for sites 2, 4 & 6

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary June 2021 (cont'd.)

	<u>Ten</u>	<u>nperat</u> (°C)	ure	Dissolved (Dxyge	<u>n</u> (mg/L)
Location						
Thurmond Forebay (Site 8)						
(6/23/21)	13.67	_	27.39	1.83	_	8.3
Thurmond Tailrace (Site 7)						
(6/23/21 - 6/24/21)		_			_	
Stevens Creek Res. (Site 6)	16.71	_	17.21	5.5	_	5.9
(6/23/21 - 6/24/21)						
Stevens Creek Res. (Site 1)	16.89	_	18.58	5.7	_	6.3
(6/23/21 - 6/24/21)						
Stevens Creek Res. (Site 2)	17.02	_	18.01	6.2	_	7.2
(6/23/21 - 6/24/21)	_//0_			0.2		
(0/20/21 0/24/21)						
Stevens Creek Tailrace (Site 3)	17 64	_	19 73	6.9	_	79
(6/23/21 - 6/24/21)	17.04		15.75	0.5		7.5
(0/23/21 - 0/24/21)						
Stavans Craak (Site 5)	24 22	_	25 76	57	_	5 0
(6/22/21 - 6/24/21)	24.52		23.70	5.7		5.5
(0/23/21-0/24/21)						
Stovens Crook (Site 1)	10 55		24.01	٨		6.6
(6/22/21 - 6/24/21)	10.00	_	24.31	4.0	_	0.0
(0/23/21-0/24/21)						

USGS note: 6/23 water levels too low to sample site 6

6/24 water levels too low to sample sites 2, 4 & 6

Date: 6/8/2021 AM Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:28	surface	6.6	25.2	100	5.7	69
		1M	6.6	25.2	101	5.7	69
		2M	6.6	25.2	101	5.6	69
		3M	6.6	25.2	100	5.6	68
		4M	6.6	25.2	100	5.6	68
3	7:12	1M	6.3	16.6	43	7.6	78
4	9:16	surface	6.5	24.6	89	4.6	56
		1M	6.6	24.7	89	4.6	56
		2M	6.6	24.6	88	4.6	56
		3M	6.6	24.5	87	4.6	55
		4M	6.6	24.4	85	4.6	55
		5M	6.5	24.4	85	4.6	55
2	9:03	surface	6.3	16.6	43	6.7	69
		1M	6.3	16.6	43	6.7	69
		2M	6.2	16.6	43	6.7	69
		3M	6.2	16.6	43	6.7	69
		4M	6.2	16.6	43	6.7	69
1	8:28	surface	6.2	17.5	47	6.3	66
		1M	6.2	17.2	46	6.3	65
		2M	6.2	15.7	42	6.7	68
		3M	6.1	15.7	42	6.8	68
1A	8:17	surface	6.1	16.2	42	6.8	69
		1M	6.1	15.8	42	6.8	68
		2M	6.1	15.7	42	6.1	68

Date: 6/8/2021 PM Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	2:26	surface	6.9	24.9	102	6.0	73
		1M	6.8	24.8	102	6.0	72
		2M	6.8	24.8	101	6.0	72
		3M	6.8	24.7	100	6.0	72
		4M	6.8	24.6	100	6.0	72
3	1:46	1M	6.4	17.7	44	8.0	84
4		surface					
		1M					
		2M					
		3M					
		4M					
		5M					
2		surface					
		1M					
		2M					
		3M					
		4M					
1	2:04	surface	6.2	16.5	43	6.7	69
		1M	6.2	16.5	44	6.7	68
		2M	6.2	16.5	44	6.7	68
		3M	6.1	16.5	44	6.7	68
1A		surface					
		1M					
		2M					
		3M					

*Heavy lighting caused techs to not finish afternoon run.

Date: 6/9/2021 AM Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site							
No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:30	surface	6.5	23.6	65	5.3	62
		1M	6.5	23.6	65	5.2	62
		2M	6.5	23.6	65	5.2	62
		3M	6.5	23.6	65	5.2	61
		4M	6.5	23.6	65	5.2	61
3	9:28	1M	6.5	17.7	46	7.3	77
4	7:43	surface	6.8	25.4	103	5.1	62
		1M	6.8	25.4	103	5.0	61
		2M	6.8	25.4	103	5.0	60
		3M	6.8	25.4	103	4.9	60
		4M	6.8	25.4	102	4.7	57
		5M	6.8	25.4	101	4.6	56
2	7:29	surface	6.3	16.7	43	6.6	68
		1M	6.3	16.5	43	6.6	68
		2M	6.2	16.5	43	6.6	68
		3M	6.2	16.4	43	6.6	67
1	8:16	surface	6.3	18.4	51	5.5	59
		1M	6.3	16.4	44	6.4	66
		2M	6.3	15.8	43	6.6	67
		3M					
1A	8:31	surface	6.4	18.4	51	6.5	69
		1M	6.3	16.5	44	6.6	67
		2M	6.3	16.2	43	6.6	67
		3M	6.3	16.2	44	6.6	67

Date: 6/9/2021 PM Field Team: REH/NDM Field Meter Model/Number: YSI EXO3 / 18H110944

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	11:55	surface	6.6	24.1	66	5.3	63
		1M	6.6	24.1	66	5.3	63
		2M	6.5	24.0	66	5.2	62
		3M	6.5	23.9	66	5.2	62
		4M					
3	12:31	1M	6.4	18.3	45	7.6	81
4	2:31	surface	6.8	26.9	97	5.7	72
		1M	6.8	26.0	95	5.4	66
		2M	6.8	25.5	94	5.3	64
		3M	6.8	25.1	93	5.0	61
		4M	6.8	24.8	85	5.1	70
		5M					
2	7:29	surface	6.3	16.7	43	6.6	68
		1M	6.3	16.5	43	6.6	68
		2M	6.2	16.5	43	6.6	68
		3M	6.2	16.4	43	6.6	67
1	2:05	surface	6.4	18.3	46	6.8	72
		1M	6.4	18.2	46	6.8	72
		2M	6.3	18.2	46	6.7	72
		3M					
1A	1:54	surface	6.3	17.1	44	6.7	70
		1M	6.3	17.1	44	6.7	69
		2M	6.3	17.1	44	6.7	69
		3M	6.3	17.1	44	6.7	69

Date: 6/23/2021 AM Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H11946

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	8:05	0	6.6	24.3	83	5.7	69
		1	6.6	24.3	83	5.7	68
		2	6.6	24.3	83	5.7	68
		3	6.6	24.3	83	5.7	68
		4	6.6	24.3	83	5.7	68
3	9:37		6.3	17.6	44	7.2	75
4	7:09	0	6.4	24.4	83	5.0	60
		1	6.4	24.3	83	5.0	60
		2	6.4	24.3	82	5.0	60
		3	6.4	24.2	82	5.0	59
		4	6.4	24.2	82	4.9	58
		5	6.4	24.3	82	4.9	59
		6	6.4	24.3	82	4.9	59
2	7:23	0	5.8	17.1	43	6.2	65
		1	5.8	17.1	43	6.2	65
		2	5.8	17.0	43	6.2	65
		3	5.7	17.0	43	6.2	64
		4	5.8	17.0	43	6.2	64
1	10:12	0	6.0	17.4	45	6.3	66
		1	5.9	17.4	45	6.3	65
		2	5.9	17.4	45	6.2	66
		3	5.9	17.4	45	6.2	65

Water level was dropping during data collection periods on 6/23 & 6/24 and technicians could not get to all the sites for every run.

Date: 6/23/2021 PM Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H11946

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:15	0	6.8	25.1	85	5.9	71
		1	6.8	24.7	85	5.9	70
		2	6.8	24.5	85	5.8	70
		3	6.8	24.5	85	5.7	69
		4	6.8	24.5	85	5.7	68
3	15:47		6.5	18.5	44	7.9	84
4	14:47	0	6.5	22.5	68	5.8	67
		1	6.5	19.6	52	6.4	70
		2	6.4	19.3	50	6.5	71
		3	6.3	18.8	48	6.6	71
		4	6.3	18.7	48	6.5	70
2	14:58	0	6.3	18.0	44	7.2	77
		1	6.2	18.0	44	7.1	75
		2	6.2	18.0	44	7.1	75
		3	6.2	17.9	44	7.1	75
		4	6.2	18.0	44	7.1	75
1	13:42	0	6.1	17.0	42	5.8	60
		1	6.1	17.0	42	5.8	59
		2	6.1	17.0	42	5.7	59
		3	6.1	17.0	42	5.7	59
		4	6.1	17.0	42	5.7	59
1-a	13:30	0	6.1	16.7	42	5.6	57
		1	6.1	16.7	42	5.5	57
		2	6.1	16.7	42	5.5	57
		3	6.1	16.7	42	5.5	57

Date: 6/24/2021 AM Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H11946

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:33	0	6.8	24.7	87	5.9	71
		1	6.8	24.7	87	5.9	70
		2	6.8	24.7	87	5.8	70
		3	6.8	24.7	87	5.8	70
		4	6.8	24.7	87	5.8	69
3	6:54		6.3	18.1	45	6.9	73
4	8:22	0	6.5	24.9	80	4.7	56
		1	6.5	24.9	80	4.6	56
		2	6.5	24.9	80	4.6	55
		3	6.5	24.8	80	4.6	56
		4	6.5	24.9	80	4.6	55
		5	6.6	24.8	80	4.6	56
2	8:38	0	6.2	17.9	43	6.4	67
		1	6.1	17.9	43	6.3	67
		2	6.1	17.9	43	6.3	66
		3	6.0	17.9	43	6.3	66
		4	6.0	17.9	43	6.2	66
1	8:57	0	6.1	17.7	45	6.1	64
		1	6.1	17.3	43	6.0	62
		2	6.0	16.9	43	6.0	62
		3					
1-A	9:07	0	6.0	17.2	44	5.9	62
		1	6.0	16.8	43	5.7	59
		2	6.0	16.8	43	5.7	59

Date: 6/24/2021 PM Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18H11946

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:15	0	6.8	25.7	86	5.8	71
		1	6.8	25.8	86	5.8	71
		2	6.8	25.3	85	5.7	70
		3	6.8	25.3	85	5.7	70
3	13:17		6.5	19.7	47	7.7	84
1	13:49	0	6.2	18.6	44	6.2	67
		1	6.2	18.6	44	6.2	66
		2	6.2	18.6	44	6.2	66
		3	6.1	18.6	44	6.1	66

JST Forebay Water Quality Data (Provided By USACE-ERDC)

June 10, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
75756	27.65	8.68	46.9	0.2
75828	27.47	8.7	46.9	2
75852	25.94	9.11	46.7	4
75953	23.36	8.55	46.5	6
80053	20.94	6.05	45.9	7
80153	19.76	4.66	45.5	8
80230	19.23	4.07	45.5	9
80309	18.63	3.67	44.8	10
80350	18.18	3.5	44.2	11
80420	17.73	3.41	43.9	12
80449	16.92	3.35	43	14
80517	16.46	3.33	42	16
80546	16.04	3.5	40.8	18
80619	15.58	3.65	40.2	20
80645	15.36	3.79	39.7	22
80717	15.15	3.77	40.4	24
80753	14.92	4.03	39.1	26
80822	14.69	4.06	40	28
80849	14.59	4.03	40.3	30
80934	14.35	3.8	43.6	32
81010	14.13	3.89	42.6	34
81037	13.94	3.74	43.4	36
81102	13.69	3.62	42.7	38
81153	13.56	3.06	42	40
81230	13.38	2.75	42.1	42
81319	13.26	2.29	42.3	44
81340	13.25	2.26	42.5	45.2
Max:	27.65	9.11	46.9	45.2
Min:	13.25	2.26	39.1	0.2

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/8/2021	0:00:00	17.31	40.7	6.2
6/8/2021	0:15:00	17.32	40.5	6.05
6/8/2021	0:30:00	17.3	40.2	5.84
6/8/2021	0:45:00	17.35	40.2	5.64
6/8/2021	1:00:00	17.29	40.2	5.32
6/8/2021	1:15:00	17.28	40	5.22
6/8/2021	1:30:00	17.27	40.1	5.02
6/8/2021	1:45:00	17.26	39.8	4.93
6/8/2021	2:00:00	17.24	39.8	4.87
6/8/2021	2:15:00	17.22	39.8	4.85
6/8/2021	2:30:00	17.2	39.8	4.8
6/8/2021	2:45:00	17.19	39.7	4.74
6/8/2021	3:00:00	17.2	39.6	4.64
6/8/2021	3:15:00	17.21	39.7	4.64
6/8/2021	3:30:00	17.26	39.7	4.4
6/8/2021	3:45:00	17.17	39.6	4.49
6/8/2021	4:00:00	17.18	39.4	4.53
6/8/2021	4:15:00	17.2	39.7	4.55
6/8/2021	4:30:00	17.2	39.8	4.52
6/8/2021	4:45:00	17.22	39.7	4.44
6/8/2021	5:00:00	17.2	39.8	4.49
6/8/2021	5:15:00	17.22	39.4	4.45
6/8/2021	5:30:00	17.22	39.6	4.49
6/8/2021	5:45:00	17.24	39.6	4.49
6/8/2021	6:00:00	17.25	39.8	4.31
6/8/2021	6:15:00	17.21	39.7	4.34
6/8/2021	6:30:00	17.27	39.7	4.3
6/8/2021	6:45:00	17.27	39.8	4.35
6/8/2021	7:00:00	17.3	39.6	4.36
6/8/2021	7:15:00	17.25	39.7	4.33
6/8/2021	7:30:00	17.33	39.8	4.28
6/8/2021	7:45:00	17.28	39.6	4.22
6/8/2021	8:00:00	17.33	39.6	4.36
6/8/2021	8:15:00	17.4	39.6	4.37
6/8/2021	8:30:00	17.41	39.7	4.36
6/8/2021	8:45:00	17.43	39.6	4.31
6/8/2021	9:00:00	17.52	39.7	4.44
6/8/2021	9:15:00	17.52	39.7	4.44
6/8/2021	9:30:00	17.57	39.5	4.44
6/8/2021	9:45:00	17.62	39.7	4.38
6/8/2021	10:00:00	17.71	39.6	4.51

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/8/2021	10:15:00	17.75	39.6	4.33
6/8/2021	10:30:00	17.78	39.6	4.44
6/8/2021	10:45:00	17.83	39.5	4.49
6/8/2021	11:00:00	17.82	39.6	4.49
6/8/2021	11:15:00	17.78	39.6	4.53
6/8/2021	11:30:00	17.83	39.5	4.57
6/8/2021	11:45:00	17.74	39.5	4.75
6/8/2021	12:00:00	17.8	39.8	4.67
6/8/2021	12:15:00	17.76	40.4	4.62
6/8/2021	12:30:00	17.67	40.9	5.5
6/8/2021	12:45:00	17.54	40.9	5.69
6/8/2021	13:00:00	17.52	41	5.69
6/8/2021	13:15:00	17.19	41	5.61
6/8/2021	13:30:00	17.11	40.8	6.41
6/8/2021	13:45:00	17.11	41	6.28
6/8/2021	14:00:00	17.15	41	6.46
6/8/2021	14:15:00	17.17	41.1	6.29
6/8/2021	14:30:00	17.22	41.2	6.06
6/8/2021	14:45:00	17.25	41.2	6.01
6/8/2021	15:00:00	17.19	41.4	6.08
6/8/2021	15:15:00	17.19	41.4	6.1
6/8/2021	15:30:00	17.05	41.3	6.08
6/8/2021	15:45:00	17.05	41.5	6.02
6/8/2021	16:00:00	17.08	41.3	6.05
6/8/2021	16:15:00	16.97	41.2	6.03
6/8/2021	16:30:00	17.06	41.1	5.95
6/8/2021	16:45:00	17.04	41.3	5.91
6/8/2021	17:00:00	17.06	41	5.84
6/8/2021	17:15:00	17.02	41	5.87
6/8/2021	17:30:00	17.03	41	5.83
6/8/2021	17:45:00	17.15	40.7	6.09
6/8/2021	18:00:00	17.16	40.7	6.07
6/8/2021	18:15:00	17.14	41	6.03
6/8/2021	18:30:00	17.09	40.8	6.01
6/8/2021	18:45:00	16.98	40.8	5.98
6/8/2021	19:00:00	16.92	40.8	5.99
6/8/2021	19:15:00	16.92	40.8	6.09
6/8/2021	19:30:00	16.9	41	6.5
6/8/2021	19:45:00	16.92	41	6.66
6/8/2021	20:00:00	16.91	41	6.68
6/8/2021	20:15:00	16.96	41	6.56
6/8/2021	20:30:00	17.36	40.7	6.75
6/8/2021	20:45:00	17.6	40.9	6.91
6/8/2021	21:00:00	17.79	40.8	6.6
		74		

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/8/2021	21:15:00	17.84	41	6.45
6/8/2021	21:30:00	17.84	40.8	7.09
6/8/2021	21:45:00	17.87	41	6.78
6/8/2021	22:00:00	17.92	40.8	6.88
6/8/2021	22:15:00	17.95	40.8	6.78
6/8/2021	22:30:00	17.95	40.9	6.82
6/8/2021	22:45:00	17.97	40.9	6.8
6/8/2021	23:00:00	17.96	40.8	6.84
6/8/2021	23:15:00	17.91	40.8	6.66
6/8/2021	23:30:00	17.93	40.8	6.65
6/8/2021	23:45:00	17.93	40.5	6.43
6/9/2021	0:00:00	17.84	40.8	6.3
6/9/2021	0:15:00	17.77	40.4	5.88
6/9/2021	0:30:00	17.65	40.2	5.55
6/9/2021	0:45:00	17.6	40.1	5.44
6/9/2021	1:00:00	17.64	40.1	5.43
6/9/2021	1:15:00	17.59	40	5.25
6/9/2021	1:30:00	17.55	40.2	4.96
6/9/2021	1:45:00	17.68	40.1	5.17
6/9/2021	2:00:00	17.71	40.3	5.27
6/9/2021	2:15:00	17.69	40.6	5.15
6/9/2021	2:30:00	17.61	40.2	4.92
6/9/2021	2:45:00	17.59	40.2	4.83
6/9/2021	3:00:00	17.56	40.2	4.76
6/9/2021	3:15:00	17.57	40.1	4.77
6/9/2021	3:30:00	17.58	40	4.7
6/9/2021	3:45:00	17.6	40	4.64
6/9/2021	4:00:00	17.57	39.9	4.55
6/9/2021	4:15:00	17.59	40.1	4.55
6/9/2021	4:30:00	17.6	40.1	4.54
6/9/2021	4:45:00	17.59	40	4.47
6/9/2021	5:00:00	17.63	40.2	4.47
6/9/2021	5:15:00	17.63	40	4.42
6/9/2021	5:30:00	17.65	40	4.4
6/9/2021	5:45:00	17.64	39.7	4.53
6/9/2021	6:00:00	17.67	39.9	4.42
6/9/2021	6:15:00	17.69	39.9	4.35
6/9/2021	6:30:00	17.75	40	4.39
6/9/2021	6:45:00	17.77	40	4.26
6/9/2021	7:00:00	17.81	39.9	4.34
6/9/2021	7:15:00	17.72	40	4.39
6/9/2021	7:30:00	17.76	40.1	4.36
6/9/2021	7:45:00	17.8	40	4.39
6/9/2021	8:00:00	17.78	39.8	4.45

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/9/2021	8:15:00	17.87	39.8	4.52
6/9/2021	8:30:00	17.89	39.8	4.46
6/9/2021	8:45:00	17.93	39.8	4.56
6/9/2021	9:00:00	17.98	39.9	4.5
6/9/2021	9:15:00	18.01	39.6	4.58
6/9/2021	9:30:00	18.09	39.7	4.45
6/9/2021	9:45:00	18.15	39.7	4.51
6/9/2021	10:00:00	18.21	39.9	4.58
6/9/2021	10:15:00	18.33	39.8	4.6
6/9/2021	10:30:00	18.38	39.8	4.59
6/9/2021	10:45:00	18.49	40	4.52
6/9/2021	11:00:00	18.63	40.1	4.47
6/9/2021	11:15:00	18.78	40.1	4.48
6/9/2021	11:30:00	18.9	40.3	4.44
6/9/2021	11:45:00	19.02	40.3	4.4
6/9/2021	12:00:00	19.14	40.4	4.45
6/9/2021	12:15:00	19.24	40.3	4.33
6/9/2021	12:30:00	19.44	40.5	5.7
6/9/2021	12:45:00	19.5	40.6	5.48
6/9/2021	13:00:00	19.77	41	4.94
6/9/2021	13:15:00	20.22	41.2	4.35
6/9/2021	13:30:00	20.35	41.2	5.02
6/9/2021	13:45:00	19.79	41.1	5.7
6/9/2021	14:00:00	18.68	41.2	5.34
6/9/2021	14:15:00	18.66	41	5.87
6/9/2021	14:30:00	19	41.3	5.85
6/9/2021	14:45:00	18.73	41.1	5.96
6/9/2021	15:00:00	18.6	41.1	5.78
6/9/2021	15:15:00	18.59	41.4	5.51
6/9/2021	15:30:00	18.5	41.1	5.91
6/9/2021	15:45:00	18.47	41.2	5.68
6/9/2021	16:00:00	18.35	41.2	5.86
6/9/2021	16:15:00	18.13	40.9	6.05
6/9/2021	16:30:00	17.98	41.2	5.98
6/9/2021	16:45:00	17.98	41.2	6.01
6/9/2021	17:00:00	17.92	41.2	6.04
6/9/2021	17:15:00	17.83	41.4	5.91
6/9/2021	17:30:00	17.79	41	5.97
6/9/2021	17:45:00	17.71	41.3	5.97
6/9/2021	18:00:00	17.59	41	5.99
6/9/2021	18:15:00	17.48	41.4	6
6/9/2021	18:30:00	17.5	41.3	5.87
6/9/2021	18:45:00	17.45	41.1	5.83
6/9/2021	19:00:00	17.35	41.1	5.91

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/9/2021	19:15:00	17.32	41	5.94
6/9/2021	19:30:00	17.28	41.1	5.89
6/9/2021	19:45:00	17.28	41	5.93
6/9/2021	20:00:00	17.25	41.2	5.89
6/9/2021	20:15:00	17.24	41.2	5.77
6/9/2021	20:30:00	17.41	41	5.69
6/9/2021	20:45:00	17.62	41.6	5.33
6/9/2021	21:00:00	17.74	41.8	5.33
6/9/2021	21:15:00	17.82	41.3	5.04
6/9/2021	21:30:00	18.2	41.4	4.99
6/9/2021	21:45:00	18.71	41.3	5.11
6/9/2021	22:00:00	19.01	41.3	5.2
6/9/2021	22:15:00	19.23	41.6	5.04
6/9/2021	22:30:00	19.36	41.5	4.75
6/9/2021	22:45:00	19.44	41.4	4.94
6/9/2021	23:00:00	19.6	41.6	4.26
6/9/2021	23:15:00	19.71	41.4	4.11
6/9/2021	23:30:00	19.87	41.3	3.86
6/9/2021	23:45:00	19.99	41.4	4.05
	Max	20.35	41.8	7.09
	Min	16.9	39.4	3.86

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/23/2021	0:10:00	16.45	41.3	5.87
6/23/2021	0:25:00	16.46	41.4	5.92
6/23/2021	0:40:00	16.37	41.2	5.26
6/23/2021	0:55:00	16.35	41.2	5.16
6/23/2021	1:10:00	16.29	41.3	4.85
6/23/2021	1:25:00	16.28	41.3	4.81
6/23/2021	1:40:00	16.28	41.3	4.79
6/23/2021	1:55:00	16.29	41.2	4.76
6/23/2021	2:10:00	16.27	41	4.67
6/23/2021	2:25:00	16.21	41.2	4.53
6/23/2021	2:40:00	16.26	41.2	4.6
6/23/2021	2:55:00	16.26	41.4	4.55
6/23/2021	3:10:00	16.3	41.6	4.32
6/23/2021	3:25:00	16.27	41.3	4.4
6/23/2021	3:40:00	16.22	41.3	4.29
6/23/2021	3:55:00	16.19	41.3	4.19
6/23/2021	4:10:00	16.21	41.6	4.17
6/23/2021	4:25:00	16.23	41.4	4.14
6/23/2021	4:40:00	16.21	41.4	4.11
6/23/2021	4:55:00	16.22	41.6	4.06
6/23/2021	5:10:00	16.14	41.3	4.12
6/23/2021	5:25:00	16.21	41.7	3.99
6/23/2021	5:40:00	16.2	41.4	3.98
6/23/2021	5:55:00	16.23	41.7	3.91
6/23/2021	6:10:00	16.13	41.3	4.03
6/23/2021	6:25:00	16.25	41.7	3.85
6/23/2021	6:40:00	16.21	41.6	3.91
6/23/2021	6:55:00	16.23	41.9	3.9
6/23/2021	7:10:00	16.15	41.3	3.99
6/23/2021	7:25:00	16.3	41.9	3.87
6/23/2021	7:40:00	16.17	41.3	4
6/23/2021	7:55:00	16.23	41.3	3.98
6/23/2021	8:10:00	16.61	41.7	4.36
6/23/2021	8:25:00	16.49	41.4	4.31
6/23/2021	8:40:00	16.48	41.4	4.27
6/23/2021	8:55:00	16.53	41.4	4.26
6/23/2021	9:10:00	16.55	41.4	4.21
6/23/2021	9:25:00	16.58	41.3	4.4
6/23/2021	9:40:00	16.54	41.6	4.43
6/23/2021	9:55:00	16.55	41.7	4.32
6/23/2021	10:10:00	16.59	41.7	4.29
6/23/2021	10:25:00	16.57	41.8	4.33

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/23/2021	10:40:00	16.59	41.7	4.37
6/23/2021	10:55:00	16.58	41.6	4.29
6/23/2021	11:10:00	16.6	41.7	4.34
6/23/2021	11:25:00	16.63	41.7	4.29
6/23/2021	11:40:00	16.69	41.8	4.31
6/23/2021	11:55:00	16.63	41.7	4.26
6/23/2021	12:10:00	16.69	41.7	4.33
6/23/2021	12:25:00	16.69	41.8	4.32
6/23/2021	12:40:00	16.69	41.8	4.34
6/23/2021	12:55:00	16.72	41.7	4.32
6/23/2021	13:10:00	16.71	41.7	4.33
6/23/2021	13:25:00	16.73	41.7	4.29
6/23/2021	13:40:00	16.72	41.6	4.29
6/23/2021	13:55:00	16.71	41.8	4.26
6/23/2021	14:10:00	16.74	41.8	4.33
6/23/2021	14:25:00	16.72	41.8	4.33
6/23/2021	14:40:00	16.69	41.8	4.32
6/23/2021	14:55:00	16.68	41.8	4.32
6/23/2021	15:10:00	16.75	41.6	5.62
6/23/2021	15:25:00	16.79	41.7	5.32
6/23/2021	15:40:00	16.76	41.8	5.36
6/23/2021	15:55:00	16.8	41.7	5.33
6/23/2021	16:10:00	16.83	41.7	5.33
6/23/2021	16:25:00	16.8	41.7	5.31
6/23/2021	16:40:00	16.79	42	5.35
6/23/2021	16:55:00	16.8	42	5.34
6/23/2021	17:10:00	16.79	42	5.67
6/23/2021	17:25:00	16.74	41.7	4.07
6/23/2021	17:40:00	16.78	41.7	3.9
6/23/2021	17:55:00	16.78	41.8	3.76
6/23/2021	18:10:00	16.8	41.7	5.1
6/23/2021	18:25:00	16.91	41.6	6.06
6/23/2021	18:40:00	17.13	41.6	6.02
6/23/2021	18:55:00	17.09	41.5	6.01
6/23/2021	19:10:00	17.09	41.7	6.09
6/23/2021	19:25:00	17.1	41.7	6.03
6/23/2021	19:40:00	17.08	41.7	6.05
6/23/2021	19:55:00	16.98	41.9	6.15
6/23/2021	20:10:00	16.84	42	5.94
6/23/2021	20:25:00	16.8	41.6	5.85
6/23/2021	20:40:00	16.88	41.8	5.88
6/23/2021	20:55:00	16.81	41.6	5.8
6/23/2021	21:10:00	16.7	41.6	5.52
6/23/2021	21:25:00	16.68	41.6	5.37
		79		
Date	Time	Temp	SpCond	LDO
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MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/23/2021	21:40:00	16.64	41.6	5.18
6/23/2021	21:55:00	16.75	41.6	5.38
6/23/2021	22:10:00	16.74	41.7	5.27
6/23/2021	22:25:00	16.53	41.4	4.74
6/23/2021	22:40:00	16.56	41.4	4.75
6/23/2021	22:55:00	16.63	41.6	4.96
6/23/2021	23:10:00	16.57	41.4	4.69
6/23/2021	23:25:00	16.53	41.3	4.47
6/23/2021	23:40:00	16.55	41.4	4.5
6/23/2021	23:55:00	16.56	41.4	4.47
6/24/2021	0:10:00	16.55	41.4	4.37
6/24/2021	0:25:00	16.56	41.3	4.49
6/24/2021	0:40:00	16.52	41.3	4.27
6/24/2021	0:55:00	16.55	41.4	4.22
6/24/2021	1:10:00	16.45	41.3	4.02
6/24/2021	1:25:00	16.5	41.4	4.06
6/24/2021	1:40:00	16.45	41.3	3.94
6/24/2021	1:55:00	16.54	41.7	4.04
6/24/2021	2:10:00	16.53	41.7	3.86
6/24/2021	2:25:00	16.49	41.4	3.86
6/24/2021	2:40:00	16.53	41.6	3.82
6/24/2021	2:55:00	16.36	41.2	3.85
6/24/2021	3:10:00	16.44	41.4	3.76
6/24/2021	3:25:00	16.41	41.3	3.75
6/24/2021	3:40:00	16.38	41.4	3.74
6/24/2021	3:55:00	16.3	41.3	3.78
6/24/2021	4:10:00	16.4	41.3	3.74
6/24/2021	4:25:00	16.3	41.3	3.72
6/24/2021	4:40:00	16.36	41.3	3.68
6/24/2021	4:55:00	16.27	41	3.71
6/24/2021	5:10:00	16.33	41.6	3.59
6/24/2021	5:25:00	16.33	41.6	3.62
6/24/2021	5:40:00	16.29	41.3	3.63
6/24/2021	5:55:00	16.35	41.4	3.7
6/24/2021	6:10:00	16.29	41.3	3.63
6/24/2021	6:25:00	16.23	41.2	3.65
6/24/2021	6:40:00	16.32	41.4	3.64
6/24/2021	6:55:00	16.29	41.7	3.61
6/24/2021	7:10:00	16.34	41.7	3.61
6/24/2021	7:25:00	16.37	41.7	3.62
6/24/2021	7:40:00	16.43	41.8	3.68
6/24/2021	7:55:00	16.38	41.4	3.7
6/24/2021	8:10:00	16.43	41.7	3.63
6/24/2021	8:25:00	16.42	41.8	3.64

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/24/2021	8:40:00	16.42	41.7	3.75
6/24/2021	8:55:00	16.54	41.8	3.66
6/24/2021	9:10:00	16.58	42.1	3.75
6/24/2021	9:25:00	16.37	41.4	3.89
6/24/2021	9:40:00	16.42	41.4	3.79
6/24/2021	9:55:00	16.5	41.4	3.85
6/24/2021	10:10:00	16.44	41.6	3.97
6/24/2021	10:25:00	16.53	41.4	3.97
6/24/2021	10:40:00	16.53	41.3	4.03
6/24/2021	10:55:00	16.52	41.1	4.13
6/24/2021	11:10:00	16.58	40.9	4.21
6/24/2021	11:25:00	16.63	40.9	4.32
6/24/2021	11:40:00	16.65	40.9	4.35
6/24/2021	11:55:00	16.69	40.7	4.38
6/24/2021	12:10:00	16.81	41.7	4.53
6/24/2021	12:25:00	16.7	41.6	6.35
6/24/2021	12:40:00	16.7	41.5	6.72
6/24/2021	12:55:00	16.69	41.4	6.74
6/24/2021	13:10:00	16.98	41.9	5.64
6/24/2021	13:25:00	16.8	41.6	5.62
6/24/2021	13:40:00	16.8	41.7	5.58
6/24/2021	13:55:00	16.82	41.6	5.38
6/24/2021	14:10:00	16.93	41.6	5.87
6/24/2021	14:25:00	16.82	41.6	5.92
6/24/2021	14:40:00	16.72	41.6	5.89
6/24/2021	14:55:00	16.71	41.7	5.8
6/24/2021	15:10:00	16.69	41.7	5.7
6/24/2021	15:25:00	16.66	41.6	5.68
6/24/2021	15:40:00	16.66	41.7	5.68
6/24/2021	15:55:00	16.75	41.7	5.54
6/24/2021	16:10:00	16.73	41.5	5.57
6/24/2021	16:25:00	16.73	41.7	5.48
6/24/2021	16:40:00	16.76	41.5	5.39
6/24/2021	16:55:00	16.74	41.8	5.34
6/24/2021	17:10:00	16.78	41.8	5.48
6/24/2021	17:25:00	16.73	41.7	5.56
6/24/2021	17:40:00	16.74	41.6	5.56
6/24/2021	17:55:00	16.74	41.7	5.5
6/24/2021	18:10:00	16.78	41.7	5.11
6/24/2021	18:25:00	16.72	41.7	5.13
6/24/2021	18:40:00	16.72	41.8	5.04
6/24/2021	18:55:00	16.76	41.5	4.84
6/24/2021	19:10:00	16.77	41.5	5.59
6/24/2021	19:25:00	16.79	41.5	6.34

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
6/24/2021	19:40:00	16.89	41.7	5.88
6/24/2021	19:55:00	16.96	41.8	5.72
6/24/2021	20:10:00	16.99	41.6	5.63
6/24/2021	20:25:00	16.98	41.7	5.64
6/24/2021	20:40:00	16.79	41.3	6.48
6/24/2021	20:55:00	16.77	41.6	6.53
6/24/2021	21:10:00	16.78	41.3	6.47
6/24/2021	21:25:00	16.85	41.6	6.04
6/24/2021	21:40:00	16.79	41.6	6.29
6/24/2021	21:55:00	16.67	41.4	6.57
6/24/2021	22:10:00	16.62	41.4	6.02
6/24/2021	22:25:00	16.54	41.2	5.51
6/24/2021	22:40:00	16.49	41.2	5.31
6/24/2021	22:55:00	16.48	41.2	5.26
6/24/2021	23:10:00	16.49	41.3	5.24
6/24/2021	23:25:00	16.5	41.3	5.09
6/24/2021	23:40:00	16.47	41.2	5.01
6/24/2021	23:55:00	16.45	41.3	4.71
	Max	17.13	42.1	6.74
	Min	16.13	40.7	3.59

6/8/2021	
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					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.2	159.1	10477	7185
2:00	0	185.9	158.9	10472	7312
3:00	0	185.7	159	10502	7317
4:00	0	185.5	158.9	10201	7104
5:00	0	185.2	158.7	10048	7111
6:00	0	185.2	158.4	6820	4743
7:00	0	185	158.3	7002	4858
8:00	0	184.8	158.2	6702	4735
9:00	0	184.7	158.2	6882	4866
10:00	0	184.6	158.2	6850	4962
11:00	0	184.5	158.2	6613	4725
12:00	0	184.3	158.2	6602	4738
13:00	0	184.2	158.2	6540	4742
14:00	1327	184.7	158.2	6574	4765
15:00	22760	184.8	158.4	6622	4702
16:00	21410	185.3	158.5	7100	4833
17:00	24170	186	158.8	7483	4973
18:00	24197	186.4	158	9530	6031
19:00	23364	186.8	159.2	9734	6476
20:00	21750	187.1	159.5	12453	8407
21:00	13867	187.2	159.6	12429	8432
22:00	11550	187.1	159.7	12405	8416
23:00	441	186.8	159.5	12125	8238
24:00:00	0	186.5	159.4	12130	8575
daily avg.	6868	186	159	8929	6177
Total Generation		214296]	
Projected discharg	<u>e</u>	7727			
Thurmond dischar	ge	6868			

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.2	159.2	12077	8378
2:00	0	185.9	159.1	11934	8346
3:00	0	185.7	159.1	11871	8319
4:00	0	185.4	159	11716	8318
5:00	0	185.2	159	11601	8291
6:00	0	185	158.8	10147	7211
7:00	0	184.8	158.7	10136	7196
8:00	0	184.6	158.5	8496	6058
9:00	0	184.4	158.4	8688	6255
10:00	0	184.3	158.4	8259	5916
11:00	0	184.1	158.4	8228	5996
12:00	0	183.9	158.4	8134	5906
13:00	0	183.9	158.3	8002	5819
14:00	6140	183.6	158.4	7947	5862
15:00	9630	183.8	158.3	7892	5796
16:00	27450	184	158.4	8009	5826
17:00	26940	184.6	158.4	8372	5945
18:00	27030	185.2	158.6	9677	6777
19:00	26600	185.8	158.7	10031	6881
20:00	23927	186.3	158.8	10318	7020
21:00	17867	186.8	159.1	10546	7104
22:00	3074	187	159.3	10509	7038
23:00	0	186.9	159.3	10403	6939
24:00:00	0	186.6	159.1	10285	6909
daily avg.	7027	185	159	9720	6838
Total Generation		233278]	
Projected discharg	<u>e</u>	7853			
Thurmond discharg	<u>3e</u>	7027			

6/9/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	185.8	159.2	12823	9031
2:00	0	185.6	159.2	12675	8974
3:00	0	185.3	159	12679	8920
4:00	0	185	159.1	12480	8965
5:00	0	184.7	159	12389	8929
6:00	0	184.5	159	11925	8922
7:00	0	184.2	159	11844	8623
8:00	0	183.9	159	11610	8376
9:00	0	183.6	158.9	11407	8483
10:00	1032	183.3	158.9	11164	8359
11:00	18840	183.6	159	11375	8437
12:00	18760	184	159	11649	8535
13:00	18720	184.4	159	11951	8649
14:00	18960	184.7	159.1	12019	8639
15:00	18145	185	159.2	12160	8718
16:00	18640	185.2	159.3	12770	8731
17:00	18145	185.5	159.4	12464	8800
18:00	23240	185.7	159.5	12339	8710
19:00	23090	185.9	159.6	12480	8746
20:00	7847	185.8	159.7	12404	8710
21:00	147	185.3	159.6	12390	8724
22:00	0	185.2	159.4	12151	8657
23:00	0	184.8	159.3	11981	8597
24:00:00	0	184.7	158.7	7811	5510
daily avg.	7732	185	159	11956	8573
Total Generation		286940]	
Projected discharge	2	8870			
Thurmond discharg	<u>e</u>	7732			

6/23/2021

6/24/2021

	Thursday Discharge	11 doubter	T - 11	Constitut	Estimated
Hour	Inurmond Discharges	Headwater	Tailrace	Generation	Iotal CFS
1:00	0	184.4	158.6	7728	5537
2:00	0	184.3	158.4	7006	5097
3:00	0	184	158.4	6393	5001
4:00	0	183.9	158.1	5432	4067
5:00	0	183.8	158.1	5341	4032
6:00	0	183.6	158	5952	4441
7:00	0	183.5	158.1	6604	5004
8:00	0	183.3	158.2	6674	5033
9:00	0	183.1	158.1	6554	5013
10:00	0	182.9	158.1	6429	4962
11:00	0	182.7	158.1	6354	4935
12:00	294	182.6	157.9	4960	4010
13:00	6357	182.5	157.9	5305	4217
14:00	23150	182.3	157.9	5215	4214
15:00	25630	182.2	158.4	8689	6715
16:00	25880	182.8	158.5	8951	6774
17:00	26040	183.5	158.6	9408	6968
18:00	23960	184.1	159	11816	8573
19:00	22887	184.6	159	11913	8630
20:00	143	185.2	159.2	12167	8670
21:00	0	185.5	159.4	12257	8657
22:00	0	185.4	159.4	12111	8558
23:00	0	185.4	158.8	6308	4377
24:00:00	0	185.2	158.7	6048	4121
daily avg.	6431	184	158	7734	5734
Total Generation		185615]	
Projected discharge	<u>e</u>	7304			
Thurmond discharg	<u>30</u>	6431			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

_

Date-Time	Flow (cfs)
6/8/2021 0:00	9200
6/8/2021 1:00	10500
6/8/2021 2:00	10900
6/8/2021 3:00	11300
6/8/2021 4:00	11800
6/8/2021 5:00	11900
6/8/2021 6:00	10400
6/8/2021 7:00	10100
6/8/2021 8:00	9760
6/8/2021 9:00	9420
6/8/2021 10:00	9220
6/8/2021 11:00	8820
6/8/2021 12:00	8510
6/8/2021 13:00	8080
6/8/2021 14:00	7740
6/8/2021 14:00	7/80
6/8/2021 15:00	7400
6/8/2021 10:00	7130
6/8/2021 17:00	6040
6/8/2021 10:00	6340
6/8/2021 19:00	6740
6/8/2021 20:00	6710
6/8/2021 21:00	6730
6/8/2021 22:00	7880
6/8/2021 23:00	8640
6/9/2021 0:00	10400
6/9/2021 1:00	11500
6/9/2021 2:00	12000
6/9/2021 3:00	12400
6/9/2021 4:00	11900
6/9/2021 5:00	11700
6/9/2021 6:00	11500
6/9/2021 7:00	10900
6/9/2021 8:00	10400
6/9/2021 9:00	10100
6/9/2021 10:00	9420
6/9/2021 11:00	8780
6/9/2021 12:00	8390
6/9/2021 13:00	8060
6/9/2021 14:00	7770
6/9/2021 15:00	7470
6/9/2021 16:00	7380
6/9/2021 17:00	7240
6/9/2021 18:00	7070
6/9/2021 19:00	6950
6/9/2021 20:00	6980
6/9/2021 21:00	6770
6/9/2021 22:00	6740
6/9/2021 23:00	6670
6/23/2021 0:00	8770
6/23/2021 1:00	9520

Date-Time	Flow (cfs)
6/23/2021 2:00	10200
6/23/2021 3:00	10200
6/23/2021 4:00	10400
6/23/2021 5:00	10700
6/23/2021 6:00	9800
6/23/2021 7:00	9600
6/23/2021 8:00	9420
6/23/2021 9:00	9330
6/23/2021 10:00	9290
6/23/2021 11:00	9090
6/23/2021 12:00	8990
6/23/2021 13:00	8980
6/23/2021 14:00	9080
6/23/2021 15:00	8470
6/23/2021 16:00	8570
6/23/2021 17:00	8750
6/23/2021 18:00	9140
6/23/2021 10:00	9410
6/23/2021 20:00	9680
6/23/2021 20:00	9860
6/23/2021 21:00	10100
6/22/2021 22:00	10100
6/24/2021 23:00	11700
6/24/2021 0.00	12000
6/24/2021 1:00	112000
6/24/2021 2:00	10700
6/24/2021 3:00	10700
6/24/2021 4.00	0550
6/24/2021 5.00	9550
6/24/2021 0.00	9520
6/24/2021 7:00	8970
6/24/2021 8:00	0320
6/24/2021 9:00	7070
0/24/2021 10:00	/310
0/24/2021 11:00	0930
6/24/2021 12:00	6600
6/24/2021 13:00	6380
6/24/2021 14:00	6200
6/24/2021 15:00	6010
6/24/2021 16:00	5860
6/24/2021 17:00	5480
6/24/2021 18:00	5190
6/24/2021 19:00	4960
6/24/2021 20:00	4810
6/24/2021 21:00	4690
6/24/2021 22:00	4660
6/24/2021 23:00	6060

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary July 2021

	Tem	peratu (°C)	<u>re</u>	Dissolve	ed Oxyge	<u>en</u> (mg/L)
Location						
Thurmond Forebay (Site 8)						
(7/12/21)	14.43	_	28.30	1.5	_	8.3
Thurmond Tailrace (Site 7)						
(7/12/21 - 7/13/21)		_			_	
Stevens Creek Res. (Site 6)	17.46	_	18.47	5.1	_	6.0
(7/12/21 - 7/13/21)						
Stevens Creek Res. (Site 1)	17.46	_	19.48	5.2	_	6.3
(7/12/21 - 7/13/21)						
(,,, ,, ,,,,,						
Stevens Creek Res (Site 2)	18 13	_	19 77	5 3	_	67
(7/12/21 - 7/13/21)	10.10		10.77	5.5		0.7
(//12/21 //13/21)						
Stavans Craak Tailrace (Site 2)	19 19	_	28.24	6.2	_	77
	10.10		20.24	0.2		7.7
(//12/21 - //15/21)						
Stavans (rook (Sita E)	20.21		20.09	10		0 0
(7/12/21 - 7/12/21)	20.21	_	29.90	4.5	_	0.0
(//12/21 - //13/21)						
Stavana Craak (Sita 4)	20.07			F 7		0.0
Sievens Creek (Sile 4)	20.87	_	27.50	5.7	_	8.0
(//12/21 - //13/21)						

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary July 2021 (cont'd.)

	Terr	nperatu (°C)	<u>re</u>	<u>Disso</u>	olved Ox	ygen
Location_		(0)			(,9,)	
Thurmond Forebay (Site 8)						
(7/19/21)	14.69	—	29.18	1.0	_	8.31
Thurmond Tailrace (Site 7)*						
(7/21/21 - 7/22/21)		—			—	
Stevens Creek Res. (Site 6)	18.25	—	21.05	4.5	—	5.7
(7/21/21 - 7/22/21)						
Stevens Creek Res. (Site 1)	18.05	—	21.40	4.3	—	5.1
(7/21/21 - 7/22/21)						
Stevens Creek Res. (Site 2)	18.88	—	20.53	4.6	—	5.4
(7/21/21 - 7/22/21)						
Stevens Creek Tailrace (Site 3)	18.88	_	20.71	5.3	_	6.2
(7/21/21 - 7/22/21)						
Stevens Creek (Site 5)	24.15	—	25.26	5.3	—	5.9
(7/21/21 - 7/22/21)						
Stevens Creek (Site 4)	24.18	_	25.99	4.3	_	5.2
(7/21/21 - 7/22/21)						

Date: 7/12/2021 Field Team: EGM/KYA Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:24	surface	7.2	28.2	110	5.6	71
		1m	7.1	28.2	111	5.6	71
		2m	7.1	28.2	110	5.5	71
		3m	7.1	28.2	111	5.5	70
		4m	7.1	28.2	111	5.4	69
3	7:15	surface	6.5	28.2	45	6.9	72
4	7:56	surface	6.9	24.7	66	6.2	75
		1m	6.9	24.6	65	6.2	74
		2m	6.8	24.4	64	6.1	73
		3m	6.8	24.4	64	6.0	71
		4m	6.8	20.9	50	6.0	67
2	8:17	surface	6.6	18.3	45	5.6	59
		1m	6.5	18.3	45	5.5	59
		2m	6.5	18.2	45	5.5	58
		3m	6.5	18.2	45	5.5	58
		4m	6.5	18.2	45	5.4	58
1	8:35	surface	6.5	18.2	45	5.2	55
		1m	6.5	17.7	44	5.2	55
		2m	6.4	17.5	44	5.2	55
		3m	6.4	17.5	44	5.2	54
1A	8:45	surface	6.5	17.9	45	5.3	55
		1m	6.5	17.7	44	5.2	54
		2m	6.4	17.6	44	5.1	54
		3m	6.4	17.6	44	5.1	54

Date: 7/12/2021 Field Team: EGM/KYA Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	16:00	surface	7.3	29.3	111	7.7	101
		1m	7.4	29.2	111	7.6	100
		2m	7.4	29.2	111	7.7	100
		3m	7.3	30.0	111	7.3	95
		4m	7.3	29.0	111	7.3	94
3	15:15	surface	6.6	19.9	45	7.7	84
4	13:40	surface	7.1	27.5	72	7.4	94
		1m	7.1	27.2	72	7.4	93
		2m	7.1	26.1	71	6.9	84
		4m	6.7	21.1	50	6.2	70
		5m	6.7	21.0	50	6.2	69
2	14:03	surface	6.7	19.8	44	6.7	74
		1m	6.7	19.8	45	6.7	74
		2m	6.6	19.8	45	6.7	74
		3m	6.6	19.8	45	6.7	74
		4m	6.6	19.8	45	6.7	74
1	14:21	surface	6.6	19.4	45	5.6	61
		1m	6.5	19.4	45	5.5	60
		2m	6.5	19.3	45	5.5	60
		3m	6.5	19.5	45	5.5	60
1A	14:35	surface	6.5	18.5	44	5.6	60
		1m	6.4	18.5	44	5.5	59
		2m	6.3	18.5	44	5.5	58
		3m	6.3	18.5	44	5.5	58
		4m	6.2	18.5	44	5.5	58

Date: 7/13/2021 AM Field Team: EGM/KYA Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	5:42	surface	7.1	28.2	112	5.0	64
		1m	7.1	28.2	112	5.0	64
		2m	7.1	28.2	112	5.0	64
		3m	7.1	28.2	112	5.0	64
		4m	7.1	28.2	112	4.9	63
3	6:14	surface	6.4	18.2	45	6.2	65
4	6:42	surface	6.9	24.2	63	6.3	76
		1m	6.8	24.2	63	6.4	76
		2m	6.8	24.1	63	6.3	75
		3m	6.8	24.0	62	6.3	75
		4m	6.8	23.9	62	6.3	75
		5m	6.8	23.8	62	6.3	74
2	13:12	suface	6.5	18.2	45	5.4	57
		1m	6.5	18.2	45	5.4	57
		2m	6.5	18.2	45	5.3	57
		3m	6.4	18.1	45	5.3	56
		4m	6.5	18.1	45	5.3	56
1	3:36	surface	6.5	17.6	44	5.6	59
		1m	6.4	17.5	44	5.6	58
		2m	6.4	17.5	44	5.5	58
		3m	6.3	17.5	44	5.6	58
1A	7:34	surface	6.5	17.5	44	5.4	57
		1m	6.4	17.5	44	5.4	56
		2m	6.3	17.5	44	5.4	56
		2.5m	6.3	17.5	44	5.4	56

Date: 7/12/2021 Field Team: EGM/KYA Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	13:38	surface	7.6	29.1	112	8.8	115
		1m	7.3	28.5	112	6.7	86
		2m	7.2	28.3	113	5.6	72
		3m	7.2	28.2	113	5.4	69
		4m	7.2	28.2	113	5.1	65
3	14:16	surface	7.6	19.7	45	7.6	83
4	14:21	surface	7.2	26.1	71	8.0	99
		1m	7.1	25.6	68	8.0	98
		2M	6.9	24.1	61	6.7	80
		3m	6.9	22.8	56	6.4	74
		4m	6.8	22.1	53	6.1	70
		5m	6.7	21.5	52	5.7	65
2	15:08	surface	6.6	19.1	45	6.3	68
		1m	6.6	19.1	45	6.3	68
		2m	6.6	19.0	45	6.4	68
		3m	6.6	19.0	45	6.2	67
		4m	6.5	19.0	45	6.2	66
1	15:28	surface	6.5	18.3	44	6.3	67
		1m	6.5	18.3	44	6.3	67
		2m	6.5	18.3	44	6.3	67
		3m	6.5	18.3	44	6.3	67
		4m	6.5	18.3	44	6.3	67
1A	15:44	surface	6.5	17.6	44	6.0	63
		1m	6.5	17.6	44	6.0	63
		2m	6.4	17.6	44	6.0	63
		3m	6.4	17.7	44	5.9	62
		4m	6.4	17.7	44	5.9	62

Date: 7/21/2021 Field Team: DFS/WTB Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	5:46	surface	7.3	24.2	67	5.3	64
		1	7.0	24.2	68	5.3	63
		2	6.9	24.2	68	5.3	63
		3	6.9	24.2	68	5.3	63
		4	6.9	24.2	68	5.3	62
		5	6.9	24.2	67	5.3	63
3	6:23	surface	6.9	19.1	47	5.3	58
4	6:45	surface	6.9	24.3	56	4.4	52
		1	6.0	24.3	57	4.3	52
		2	4.9	24.3	58	4.3	52
		3	5.6	24.3	57	4.3	52
		4	7.0	24.3	57	4.3	51
2	6:57	surface	6.9	18.9	45	4.9	53
		1	6.7	18.9	45	4.9	52
		2	6.6	18.9	45	4.9	52
		3	6.6	18.9	45	4.8	52
		4	6.6	18.9	45	4.8	52
		5	6.5	18.9	45	4.8	52
1	7:17	surface	6.9	21.0	52	4.3	48
		1	6.8	19.0	47	4.5	49
		2	6.7	18.2	46	4.8	51
		3	6.6	18.1	46	4.8	51
		4	6.6	18.1	47	4.8	51
		5	6.6	18.1	47	4.8	51
1A	7:25	surface	7.1	21.1	54	5.2	58
		1	6.9	19.3	49	4.9	53
		2	6.7	18.4	46	4.9	52
		3	6.6	18.3	45	4.8	52

Date: 7/21/2021 Field Team: DFS/WTB Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:53	surface	6.8	24.2	58	5.9	70
		1	6.8	24.2	58	5.8	69
		2	6.8	24.2	58	5.8	69
		3	6.8	24.2	58	5.8	69
		4	6.8	24.2	58	5.8	69
		5	6.8	24.2	58	5.8	69
3	15:32	surface	6.8	20.7	47	5.8	65
4	13:51	surface	6.8	24.5	57	4.9	59
		1	6.8	24.5	57	4.9	58
		2	6.8	24.5	57	4.9	58
		3	6.8	24.5	57	4.8	58
		4	6.8	24.5	57	4.8	58
2	13:40	surface	6.9	20.1	46	5.1	57
		1	6.7	20.0	45	5.1	56
		2	6.6	20.0	45	5.1	56
		3	6.6	20.0	45	5.0	55
		4	6.6	20.0	45	5.0	55
		5	6.5	20.0	45	5.0	55
1	13:15	surface	6.8	21.4	55	4.8	55
		1	6.7	20.5	53	5.0	56
		2	6.6	20.1	52	5.0	55
		3	6.6	20.2	52	5.0	55
		4	6.6	20.2	52	5.0	55
		5	6.6	20.1	52	4.9	55
1A	13:00	surface	6.7	18.7	47	4.6	49
		1	6.6	18.7	46	4.6	49
		2	6.6	18.7	46	4.6	49
		3	6.6	18.7	46	4.5	49

Date: 7/22/2021 Field Team: DFS/WTB Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:45	Surface	6.8	24.3	57	5.9	70
		1	6.8	24.3	57	5.8	70
		2	6.8	24.3	57	5.8	69
		3	6.8	24.3	57	5.8	69
		4	6.8	24.3	57	5.8	69
		5	6.8	24.3	57	5.8	69
3	6:18	Surface	6.6	18.9	46	5.4	58
4	7:18	Surface	6.8	24.2	58	5.2	62
		1	6.8	24.2	58	5.2	62
		2	6.8	24.2	58	5.1	61
		3	6.8	24.2	58	5.1	61
		4	6.8	24.2	58	5.1	61
2	7:29	Surface	6.6	18.9	46	4.8	51
		1	6.5	18.9	46	4.7	51
		2	6.5	18.9	46	4.7	50
		3	6.5	19.0	46	4.7	50
		4	6.5	18.9	46	4.6	50
1	7:46	Surface	6.5	19.8	51	4.7	52
		1	6.5	19.0	48	4.8	51
		2	6.5	18.5	48	4.9	52
		3	6.5	18.5	48	4.9	52
		4	6.5	18.4	48	4.9	52
1A	7:55	Surface	6.6	19.6	50	5.0	54
		1	6.5	18.8	47	4.9	52
		2	6.5	18.3	46	4.8	51
		3	6.5	18.3	46	4.7	50

Date: 7/22/2021 Field Team: DFS/WTB Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	13:42	Surface	6.8	25.3	54	5.8	70
		1	6.8	25.3	54	5.8	70
		2	6.8	25.3	54	5.8	70
		3	6.8	25.3	54	5.8	70
		4	6.8	25.3	54	5.7	70
3	13:13	Surface	6.7	20.5	47	6.2	69
4	14:16	Surface	6.9	26.0	58	5.1	62
		1	6.8	25.9	58	5.1	62
		2	6.8	25.5	58	5.1	62
		3	6.8	25.4	58	5.0	61
		4	6.8	25.3	58	5.0	61
		5	6.7	25.3	58	5.0	60
2	15:17	Surface	6.8	20.5	49	5.4	60
		1	6.6	20.4	48	5.4	60
		2	6.6	20.4	48	5.4	60
		3	6.6	20.4	48	5.4	60
		4	6.6	20.4	48	5.4	60
		5	6.6	20.4	48	5.4	59
1	15:01	Surface	6.7	19.0	45	5.1	55
		1	6.5	19.0	45	5.1	55
		2	6.5	19.0	45	5.1	55
		3	6.5	19.1	46	5.1	55
		4	6.5	19.1	46	5.1	55
		5	6.5	19.1	45	5.0	55
1A	14:51	Surface	6.7	18.9	45	5.7	62
		1	6.6	18.9	45	5.7	61
		2	6.6	18.9	45	5.7	61
		3	6.5	18.9	45	5.7	61
		4	6.5	18.9	45	5.6	61

JST Forebay Water Quality Data (Provided By USACE-ERDC)

July 12, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
44019	28.22	8.28	46.2	0.2
44058	28.3	8.25	46.1	2
44143	27.8	8.15	45.9	4
44308	27.39	7.48	45.8	6
44455	24.86	4.76	45.6	7
44553	22.9	2.55	44.9	8
44713	20.58	1.84	43.6	9
44753	20.13	1.48	43.3	10
44853	19.86	1.96	42.2	11
44933	19.55	1.81	42.5	12
45032	19.09	1.8	42.2	13
45143	18.7	2.11	41.9	14
45230	18.43	2.06	41.7	15
45316	18.03	2.3	41.6	16
45450	17.62	1.64	41.8	18
45527	17.27	1.88	41.3	20
45616	16.91	1.73	41.5	22
45713	16.55	1.66	41.6	24
45827	16.17	1.64	41.9	26
45913	15.83	1.64	42.6	28
45956	15.55	1.66	42.9	30
50028	15.34	1.65	42.8	32
50104	15.19	1.68	42.2	34
50146	14.93	1.71	41.8	36
50225	14.79	1.73	41.3	38
50253	14.64	1.69	40.9	40
50344	14.48	1.6	40.5	42
50444	14.43	1.53	40.7	43.2
Max:	28.3	8.28	46.2	43.2
Min:	14.43	1.48	40.5	0.2

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/12/2021	0:10:00	18.58	43.2	4.5
7/12/2021	0:25:00	18.5	43.1	4.26
7/12/2021	0:40:00	18.46	43.1	4
7/12/2021	0:55:00	18.46	43.3	3.96
7/12/2021	1:10:00	18.47	43.1	3.88
7/12/2021	1:25:00	18.45	43.4	3.55
7/12/2021	1:40:00	18.38	43.3	3.44
7/12/2021	1:55:00	18.43	43.4	3.45
7/12/2021	2:10:00	18.45	43.5	3.41
7/12/2021	2:25:00	18.41	43.4	3.24
7/12/2021	2:40:00	18.36	43.1	3.08
7/12/2021	2:55:00	18.32	43	3.05
7/12/2021	3:10:00	18.37	43.3	3.12
7/12/2021	3:25:00	18.32	43.1	3.06
7/12/2021	3:40:00	18.36	43.4	3.03
7/12/2021	3:55:00	18.26	43.1	2.82
7/12/2021	4:10:00	18.33	43.4	2.92
7/12/2021	4:25:00	18.31	43.2	2.83
7/12/2021	4:40:00	18.33	43.3	2.84
7/12/2021	4:55:00	18.3	43.1	2.79
7/12/2021	5:10:00	18.29	43.2	2.76
7/12/2021	5:25:00	18.26	43.1	2.72
7/12/2021	5:40:00	18.31	43.3	2.71
7/12/2021	5:55:00	18.34	43.4	2.69
7/12/2021	6:10:00	18.35	43.5	2.67
7/12/2021	6:25:00	18.39	43.1	2.71
7/12/2021	6:40:00	18.42	43.5	2.71
7/12/2021	6:55:00	18.42	43.5	2.68
7/12/2021	7:10:00	18.36	43.6	2.66
7/12/2021	7:25:00	18.38	43.1	2.67
7/12/2021	7:40:00	18.48	43.3	2.71
7/12/2021	7:55:00	18.51	43.1	2.75
7/12/2021	8:10:00	18.4	43	2.82
7/12/2021	8:25:00	18.47	43	3.56
7/12/2021	8:40:00	18.73	42.9	3.55
7/12/2021	8:55:00	18.84	43.1	3.49
7/12/2021	9:10:00	18.9	42.9	3.49
7/12/2021	9:25:00	18.66	42.9	3.42
7/12/2021	9:40:00	18.76	42.9	3.41
7/12/2021	9:55:00	18.83	42.9	3.5
7/12/2021	10:10:00	18.85	42.9	3.19

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/12/2021	10:25:00	18.9	43.1	3.26
7/12/2021	10:40:00	18.9	43.1	3.34
7/12/2021	10:55:00	18.95	43.1	3.29
7/12/2021	11:10:00	19.01	43	3.33
7/12/2021	11:25:00	19.11	43.2	3.31
7/12/2021	11:40:00	19.19	43.2	3.37
7/12/2021	11:55:00	19.27	42.9	3.53
7/12/2021	12:10:00	19.62	43.3	3.66
7/12/2021	12:25:00	19.35	43.1	5.42
7/12/2021	12:40:00	19.27	43.1	5.53
7/12/2021	12:55:00	19.29	43.1	5.73
7/12/2021	13:10:00	19.3	43	5.66
7/12/2021	13:25:00	19.13	43	4.99
7/12/2021	13:40:00	19.07	43	4.93
7/12/2021	13:55:00	19.09	43.2	4.87
7/12/2021	14:10:00	19.16	43.1	4.76
7/12/2021	14:25:00	19.12	43.1	4.71
7/12/2021	14:40:00	19.1	42.8	4.63
7/12/2021	14:55:00	18.97	42.8	4.87
7/12/2021	15:10:00	18.83	43.1	4.73
7/12/2021	15:25:00	18.76	42.9	4.96
7/12/2021	15:40:00	18.74	43	5.06
7/12/2021	15:55:00	18.74	43.3	5.17
7/12/2021	16:10:00	18.73	43	5.07
7/12/2021	16:25:00	18.62	43.2	4.6
7/12/2021	16:40:00	18.5	43.1	4.56
7/12/2021	16:55:00	18.4	43.4	4.54
7/12/2021	17:10:00	18.39	43	4.52
7/12/2021	17:25:00	18.37	43.5	4.78
7/12/2021	17:40:00	18.41	42.9	4.69
7/12/2021	17:55:00	18.39	43.1	4.66
7/12/2021	18:10:00	18.4	43	4.65
7/12/2021	18:25:00	18.44	43	5.52
7/12/2021	18:40:00	18.44	43.1	5.63
7/12/2021	18:55:00	18.44	43	5.75
7/12/2021	19:10:00	18.37	42.7	5.68
7/12/2021	19:25:00	18.42	43.1	4.78
7/12/2021	19:40:00	18.73	43	4.69
7/12/2021	19:55:00	18.73	42.9	4.59
7/12/2021	20:10:00	18.68	43	4.74
7/12/2021	20:25:00	18.72	43	5.53
7/12/2021	20:40:00	18.73	42.9	5.58
7/12/2021	20:55:00	18.71	43	5.58
7/12/2021	21:10:00	18.69	42.9	5.65

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/12/2021	21:25:00	18.67	43	5.64
7/12/2021	21:40:00	18.68	42.9	5.67
7/12/2021	21:55:00	18.67	42.8	5.65
7/12/2021	22:10:00	18.65	42.9	5.67
7/12/2021	22:25:00	18.61	42.9	5.68
7/12/2021	22:40:00	18.59	43	5.68
7/12/2021	22:55:00	18.66	43	5.71
7/12/2021	23:10:00	18.71	42.8	5.74
7/12/2021	23:25:00	18.68	42.9	5.74
7/12/2021	23:40:00	18.66	42.9	5.71
7/12/2021	23:55:00	18.69	42.8	5.7
7/13/2021	0:10:00	18.74	42.9	5.7
7/13/2021	0:25:00	18.79	43.1	6.7
7/13/2021	0:40:00	18.83	42.9	6.33
7/13/2021	0:55:00	18.82	43.1	6.09
7/13/2021	1:10:00	18.88	42.8	5.79
7/13/2021	1:25:00	18.83	43.1	5.59
7/13/2021	1:40:00	18.84	43.1	5.48
7/13/2021	1:55:00	18.85	42.8	5.44
7/13/2021	2:10:00	18.84	43.1	5.45
7/13/2021	2:25:00	18.88	43.2	5.49
7/13/2021	2:40:00	18.77	43	5.3
7/13/2021	2:55:00	18.76	43	5.18
7/13/2021	3:10:00	18.75	43	5.2
7/13/2021	3:25:00	18.78	43	5.21
7/13/2021	3:40:00	18.76	43.3	5.03
7/13/2021	3:55:00	18.71	42.9	4.83
7/13/2021	4:10:00	18.71	43.2	4.75
7/13/2021	4:25:00	18.66	43	4.42
7/13/2021	4:40:00	18.66	43	4.3
7/13/2021	4:55:00	18.61	42.9	4.05
7/13/2021	5:10:00	18.62	43.2	4.01
7/13/2021	5:25:00	18.61	43.2	3.86
7/13/2021	5:40:00	18.59	43	3.66
7/13/2021	5:55:00	18.63	43.2	3.61
7/13/2021	6:10:00	18.62	43.2	3.48
7/13/2021	6:25:00	18.65	43.3	3.42
7/13/2021	6:40:00	18.62	43.2	3.32
7/13/2021	6:55:00	18.61	43	3.24
7/13/2021	7:10:00	18.62	43.2	3.16
7/13/2021	7:25:00	18.59	43	3.09
7/13/2021	7:40:00	18.62	43	3.06
7/13/2021	7:55:00	18.65	43.2	3.06
7/13/2021	8:10:00	18.71	43	3.03

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/13/2021	8:25:00	18.69	43.2	3.06
7/13/2021	8:40:00	18.75	43.3	3.06
7/13/2021	8:55:00	18.73	42.8	3.05
7/13/2021	9:10:00	18.75	43.2	3.02
7/13/2021	9:25:00	18.84	43.1	2.99
7/13/2021	9:40:00	18.87	43.1	2.97
7/13/2021	9:55:00	18.92	42.9	2.96
7/13/2021	10:10:00	18.98	43.1	3
7/13/2021	10:25:00	19.05	43	3
7/13/2021	10:40:00	19.1	43.2	2.94
7/13/2021	10:55:00	19.16	42.8	2.9
7/13/2021	11:10:00	19.73	43.2	2.88
7/13/2021	11:25:00	19.66	43.2	2.77
7/13/2021	11:40:00	20.04	43.2	2.86
7/13/2021	11:55:00	20.21	43.1	2.84
7/13/2021	12:10:00	20.54	43.3	2.87
7/13/2021	12:25:00	20.45	43.3	3.41
7/13/2021	12:40:00	20.21	43.1	4.09
7/13/2021	12:55:00	20.17	43.1	4.55
7/13/2021	13:10:00	20.18	43.1	4.63
7/13/2021	13:25:00	20.13	43	5.15
7/13/2021	13:40:00	20.08	43.1	5.15
7/13/2021	13:55:00	20.05	43.1	5.23
7/13/2021	14:10:00	19.51	43	5.21
7/13/2021	14:25:00	19.18	42.9	4.9
7/13/2021	14:40:00	19.11	43.1	4.72
7/13/2021	14:55:00	18.95	42.9	4.65
7/13/2021	15:10:00	18.91	43.2	4.62
7/13/2021	15:25:00	18.82	42.9	4.54
7/13/2021	15:40:00	18.81	42.9	4.51
7/13/2021	15:55:00	18.77	42.9	4.5
7/13/2021	16:10:00	18.71	43.3	4.49
7/13/2021	16:25:00	18.74	42.9	4.46
7/13/2021	16:40:00	18.72	43.2	4.4
7/13/2021	16:55:00	18.62	43.2	4.43
7/13/2021	17:10:00	18.57	43.2	4.42
7/13/2021	17:25:00	18.57	43	4.82
7/13/2021	17:40:00	18.53	43.3	4.82
7/13/2021	17:55:00	18.48	43.1	4.86
7/13/2021	18:10:00	18.46	43.1	4.84
7/13/2021	18:25:00	18.35	43	4.74
7/13/2021	18:40:00	18.36	43	4.57
7/13/2021	18:55:00	18.35	42.9	4.63
7/13/2021	19:10:00	18.33	43	4.79

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/13/2021	19:25:00	18.41	42.9	5.37
7/13/2021	19:40:00	18.47	42.8	5.56
7/13/2021	19:55:00	18.65	43	5.59
7/13/2021	20:10:00	18.74	42.9	5.58
7/13/2021	20:25:00	18.7	43	5.55
7/13/2021	20:40:00	18.7	42.9	5.56
7/13/2021	20:55:00	18.7	42.8	5.59
7/13/2021	21:10:00	18.7	42.9	5.6
7/13/2021	21:25:00	18.78	42.9	5.92
7/13/2021	21:40:00	18.83	42.9	5.98
7/13/2021	21:55:00	18.87	43.1	5.67
7/13/2021	22:10:00	18.9	43.2	5.61
7/13/2021	22:25:00	18.91	42.9	5.55
7/13/2021	22:40:00	18.88	42.9	5.43
7/13/2021	22:55:00	18.84	43.1	5.34
7/13/2021	23:10:00	18.75	43	5.23
7/13/2021	23:25:00	18.68	42.9	4.98
7/13/2021	23:40:00	18.7	42.9	5.03
7/13/2021	23:55:00	18.75	42.9	5.18
	Max	20.54	43.6	6.7
	Min	18.26	42.7	2.66

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/21/2021	0:10:00	19.02	44	3.58
7/21/2021	0:25:00	19.01	44	3.47
7/21/2021	0:40:00	19	44.2	3.35
7/21/2021	0:55:00	19.02	44	3.3
7/21/2021	1:10:00	19.01	44	3.25
7/21/2021	1:25:00	18.97	44.1	3.07
7/21/2021	1:40:00	18.97	44.2	3
7/21/2021	1:55:00	18.98	44	2.97
7/21/2021	2:10:00	18.97	44.4	2.92
7/21/2021	2:25:00	19.02	44.1	3.06
7/21/2021	2:40:00	19.04	44.1	3.04
7/21/2021	2:55:00	19.11	44	3.13
7/21/2021	3:10:00	19.13	44.1	3.07
7/21/2021	3:25:00	19.14	44	2.9
7/21/2021	3:40:00	19.12	44	2.8
7/21/2021	3:55:00	19.13	43.9	2.83
7/21/2021	4:10:00	19.16	44	2.9
7/21/2021	4:25:00	19.14	44.1	2.8
7/21/2021	4:40:00	19.16	43.9	2.7
7/21/2021	4:55:00	19.14	44	2.66
7/21/2021	5:10:00	19.2	44.1	2.75
7/21/2021	5:25:00	19.15	44	2.61
7/21/2021	5:40:00	19.18	44.1	2.74
7/21/2021	5:55:00	19.14	44.3	2.64
7/21/2021	6:10:00	19.18	44	2.6
7/21/2021	6:25:00	19.18	44.3	2.58
7/21/2021	6:40:00	19.12	44.4	2.52
7/21/2021	6:55:00	19.18	44.3	2.64
7/21/2021	7:10:00	19.18	44.4	2.58
7/21/2021	7:25:00	19.27	44	2.69
7/21/2021	7:40:00	19.24	44	2.56
7/21/2021	7:55:00	19.27	44.1	2.52
7/21/2021	8:10:00	19.26	44.3	2.48
7/21/2021	8:25:00	19.35	43.9	2.58
7/21/2021	8:40:00	19.33	44.3	2.5
7/21/2021	8:55:00	19.4	44.4	2.55
7/21/2021	9:30:00	19.31	44.3	2.61
7/21/2021	9:45:00	19.38	44.2	2.63
7/21/2021	10:00:00	19.31	44.4	2.64
7/21/2021	10:15:00	19.33	44.7	2.65
7/21/2021	10:30:00	19.35	44.8	2.7
, ,				

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/21/2021	10:45:00	19.36	44.5	2.72
7/21/2021	11:00:00	19.38	44.3	2.73
7/21/2021	11:15:00	19.46	44.7	2.78
7/21/2021	11:30:00	19.71	44.3	2.95
7/21/2021	11:45:00	19.6	44.7	2.88
7/21/2021	12:00:00	19.53	44.1	2.79
7/21/2021	12:15:00	19.62	44.1	2.87
7/21/2021	12:30:00	19.5	44	2.41
7/21/2021	12:45:00	19.46	44	2.41
7/21/2021	13:00:00	19.45	44	2.37
7/21/2021	13:15:00	19.37	43.9	3.01
7/21/2021	13:30:00	19.36	44.2	3.07
7/21/2021	13:45:00	19.02	44.2	3.71
7/21/2021	14:00:00	19.06	43.9	3.67
7/21/2021	14:15:00	19.07	44	3.55
7/21/2021	14:30:00	18.95	43.7	3.48
7/21/2021	14:45:00	18.98	44.1	3.51
7/21/2021	15:00:00	18.97	43.8	3.43
7/21/2021	15:15:00	18.96	43.8	3.37
7/21/2021	15:30:00	18.98	44	3.37
7/21/2021	15:45:00	18.94	44	3.45
7/21/2021	16:00:00	18.9	43.7	3.36
7/21/2021	16:15:00	18.9	44	3.4
7/21/2021	16:30:00	18.85	43.8	3.34
7/21/2021	16:45:00	18.77	44.1	3.31
7/21/2021	17:00:00	18.78	43.8	3.39
7/21/2021	17:15:00	18.75	43.7	3.56
7/21/2021	17:30:00	18.73	43.8	3.71
7/21/2021	17:45:00	18.73	43.8	3.69
7/21/2021	18:00:00	18.74	43.7	3.65
7/21/2021	18:15:00	18.71	43.8	3.79
7/21/2021	18:30:00	18.73	43.7	4.13
7/21/2021	18:45:00	18.77	43.7	4.18
7/21/2021	19:00:00	18.76	43.8	3.21
7/21/2021	19:15:00	18.8	44.1	3.76
7/21/2021	19:30:00	18.79	43.6	4.89
7/21/2021	19:45:00	18.84	43.7	5.11
7/21/2021	20:00:00	18.84	44.1	5.15
7/21/2021	20:15:00	18.79	43.8	5.21
7/21/2021	20:30:00	18.79	43.7	5.2
7/21/2021	20:45:00	19.07	44	5.2
7/21/2021	21:00:00	19.11	43.7	5.16
7/21/2021	21:15:00	19.09	43.9	5.18
7/21/2021	21:30:00	19.05	44.1	5.16

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/21/2021	21:45:00	19.06	44.1	5.12
7/21/2021	22:00:00	19.03	43.9	5.13
7/21/2021	22:15:00	19.05	43.7	5.37
7/21/2021	22:30:00	19.17	43.9	5.97
7/21/2021	22:45:00	19.25	43.9	5.69
7/21/2021	23:00:00	19.28	43.9	5.55
7/21/2021	23:15:00	19.32	43.8	5.09
7/21/2021	23:30:00	19.33	43.6	5.03
7/21/2021	23:45:00	19.25	44	4.93
7/22/2021	0:00:00	19.26	43.9	4.89
7/22/2021	0:15:00	19.23	43.9	4.87
7/22/2021	0:30:00	19.21	44	4.79
7/22/2021	0:45:00	19.16	44	4.62
7/22/2021	1:00:00	19.09	44.2	4.46
7/22/2021	1:15:00	19.06	44.4	4.21
7/22/2021	1:30:00	19.04	44.4	4.05
7/22/2021	1:45:00	19.04	44.4	4.05
7/22/2021	2:00:00	19.04	44.2	4.02
7/22/2021	2:15:00	19.03	44.1	3.91
7/22/2021	2:30:00	19.04	44.5	3.86
7/22/2021	2:45:00	19.03	44.2	3.76
7/22/2021	3:00:00	18.98	44.2	3.6
7/22/2021	3:15:00	19	44.4	3.59
7/22/2021	3:30:00	19.03	44.2	3.64
7/22/2021	3:45:00	19.04	44.1	3.6
7/22/2021	4:00:00	19.03	44	2.99
7/22/2021	4:15:00	19.03	44.4	2.97
7/22/2021	4:30:00	19.01	44.2	2.94
7/22/2021	4:45:00	18.97	44.1	2.86
7/22/2021	5:00:00	18.92	44.1	2.73
7/22/2021	5:15:00	18.99	44.2	3.05
7/22/2021	5:30:00	18.94	44	2.79
7/22/2021	5:45:00	19.03	44.4	2.98
7/22/2021	6:00:00	18.99	44.5	2.82
7/22/2021	6:15:00	18.98	44.5	2.75
7/22/2021	6:30:00	19.03	44.2	2.98
7/22/2021	6:45:00	18.94	44.5	2.63
7/22/2021	7:00:00	19.04	44.4	2.73
7/22/2021	7:15:00	18.93	44.1	2.55
7/22/2021	7:30:00	19.06	44.4	2.71
7/22/2021	7:45:00	18.95	44.4	2.53
7/22/2021	8:00:00	19.1	44.6	2.63
7/22/2021	8:15:00	19.06	44.5	2.54
7/22/2021	8:30:00	19.03	44.4	2.53

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/22/2021	8:45:00	19.08	44.6	2.56
7/22/2021	9:00:00	19.19	44.8	2.58
7/22/2021	9:15:00	19.28	44.5	2.57
7/22/2021	9:30:00	19.19	44.3	2.52
7/22/2021	9:45:00	19.38	44.7	2.88
7/22/2021	10:00:00	19.45	44.6	3.16
7/22/2021	10:15:00	19.53	44.7	3.08
7/22/2021	10:30:00	19.54	44.6	2.74
7/22/2021	10:45:00	19.61	44.6	2.62
7/22/2021	11:00:00	19.63	44.6	2.67
7/22/2021	11:15:00	19.87	44.1	2.7
7/22/2021	11:30:00	19.76	43.8	2.29
7/22/2021	11:45:00	19.75	43.7	2.26
7/22/2021	12:00:00	19.77	43.8	2.29
7/22/2021	12:15:00	19.78	43.8	2.66
7/22/2021	12:30:00	19.78	43.8	2.49
7/22/2021	12:45:00	19.77	43.7	2.21
7/22/2021	13:00:00	19.82	43.8	2.17
7/22/2021	13:15:00	19.71	43.8	3.14
7/22/2021	13:30:00	19.39	43.8	3.51
7/22/2021	13:45:00	19.14	43.6	3.44
7/22/2021	14:00:00	19.15	43.9	3.47
7/22/2021	14:15:00	19.09	43.7	3.42
7/22/2021	14:30:00	19.03	43.5	3.32
7/22/2021	14:45:00	19.01	43.3	3.33
7/22/2021	15:00:00	19.01	43.6	3.38
7/22/2021	15:15:00	19.01	43.5	3.34
7/22/2021	15:30:00	18.99	43.6	3.34
7/22/2021	15:45:00	18.97	43.6	3.31
7/22/2021	16:00:00	18.96	43.7	3.33
7/22/2021	16:15:00	18.96	43.3	3.32
7/22/2021	16:30:00	18.95	43.6	3.31
7/22/2021	16:45:00	18.91	43.5	3.3
7/22/2021	17:00:00	18.93	43.6	3.2
7/22/2021	17:15:00	18.92	43.7	3.28
7/22/2021	17:30:00	19.01	43.6	2.95
7/22/2021	17:45:00	19.06	43.6	2.92
7/22/2021	18:00:00	19.05	43.5	2.94
7/22/2021	18:15:00	19.06	43.5	2.86
7/22/2021	18:30:00	19.12	43.6	2.63
7/22/2021	18:45:00	19.1	43.7	2.48
7/22/2021	19:00:00	19.04	43.9	2.48
7/22/2021	19:15:00	19.15	43.9	2.52
7/22/2021	19:30:00	19.34	43.6	2.59

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
7/22/2021	19:45:00	19.29	43.8	2.52
7/22/2021	20:00:00	19.26	43.6	2.51
7/22/2021	20:15:00	19.26	43.6	2.66
7/22/2021	20:30:00	19.28	43.8	2.97
7/22/2021	20:45:00	19.29	43.8	3.03
7/22/2021	21:00:00	19.29	43.8	3.06
7/22/2021	21:15:00	19.3	43.8	3.02
7/22/2021	21:30:00	19.28	43.9	3.04
7/22/2021	21:45:00	19.3	43.9	3.01
7/22/2021	22:00:00	19.27	43.8	3.04
7/22/2021	22:15:00	19.31	43.8	3.92
7/22/2021	22:30:00	19.44	43.8	4.77
7/22/2021	22:45:00	19.47	43.7	4.95
7/22/2021	23:00:00	19.46	43.7	4.85
7/22/2021	23:15:00	19.47	43.5	4.86
7/22/2021	23:30:00	19.49	43.9	4.78
7/22/2021	23:45:00	19.5	43.7	4.78
	Max	19.87	44.8	5.97
	Min	18.71	43.3	2.17

7/12/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated
1:00	0	184.9	159	10342	7348
2:00	0	184.7	158.6	6988	4955
3:00	0	184.6	158.4	6714	4887
4:00	0	184.4	158.4	7330	5301
5:00	0	184.2	158.4	6693	5010
6:00	0	184	158.3	6835	5025
7:00	0	183.8	158.3	7060	5222
8:00	0	183.6	158.3	6877	5071
9:00	0	183.4	158.2	6270	4735
10:00	0	183.2	158.1	5934	4162
11:00	0	183.2	158	5303	4168
12:00	590	183	158	5300	4100
13:00	8554	182.8	158	5232	4120
14:00	17600	182.7	158	5123	4102
15:00	19685	182.7	158.4	8136	6150
16:00	21590	183.1	157.7	9100	6741
17:00	23540	183.6	157.7	9381	6986
18:00	17467	183.9	158.9	10853	8316
19:00	10917	184.5	159	11644	8436
20:00	9100	184.9	159.1	11921	8568
21:00	7400	185.2	159.2	12084	8593
22:00	7470	185.2	159.2	12077	8610
23:00	7400	185.2	159.2	12092	8633
24:00:00	7320	185.2	159.2	12104	8650
daily avg.	6610	184	158	8391	6162
Total Generation		201393]	
Projected discharge	2	7389			
Thurmond discharg	<u>e</u>	6610			

7/13/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CFS
1:00	0	185.1	159.2	12069	8601
2:00	0	185	159.2	12085	8600
3:00	0	184.7	159.1	11859	8542
4:00	0	184.3	159.1	11567	8440
5:00	0	184	159.1	11510	8512
6:00	0	183.7	1559	11102	8383
7:00	0	183.5	159	10396	7751
8:00	0	183.4	158.9	6531	4953
9:00	0	183.2	158.4	5804	3518
10:00	0	183.1	158.1	4404	3475
11:00	0	183	157.9	4297	3320
12:00	0	182.9	157.9	4088	3302
13:00	0	182.7	157.7	3975	3058
14:00	12832	182.6	157.7	3629	4756
15:00	21097	183	157.9	6443	7520
16:00	26680	183.3	157.7	10038	8516
17:00	27030	183.8	159	11604	8575
18:00	26860	184.4	159	11811	8733
19:00	25160	185.1	159.1	12221	8839
20:00	12730	185.6	159.2	12495	8839
21:00	3400	185.9	159.3	12599	8838
22:00	3320	185.9	159.3	12564	8783
23:00	0	185.7	159.3	12401	8735
24:00:00	0	185.4	159.2	12271	8686
daily avg.	6630	184	217	9490	7136
Total Generation		227763]	
Projected discharge	2	7416			
Thurmond discharg	e	6630			

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	186.2	159.5	11870	8204
2:00	0	186	159.4	11910	8291
3:00	0	185.8	159.3	11771	8241
4:00	0	185.6	159.3	11609	8161
5:00	0	186.4	159.2	11506	8140
6:00	0	185.2	159.2	11291	8048
7:00	0	185	159.1	11405	8042
8:00	0	184.9	159.1	11540	8251
9:00	0	184.8	159.1	11327	8177
10:00	0	184.6	159.1	11241	8217
11:00	0	184.5	159.1	11260	8097
12:00	0	184.3	159.1	11309	8192
13:00	442	184.2	159.1	11212	8266
14:00	7785	184.1	159.1	11171	8244
15:00	22050	184.3	159.1	11407	8100
16:00	26640	185	159.1	11890	8206
17:00	26780	185.6	159.1	12445	8374
18:00	26860	186.3	159.3	12702	8623
19:00	25600	186.7	159.5	12644	8644
20:00	11880	187.1	159.7	12674	8606
21:00	2380	187.2	159.9	12504	8576
22:00	2860	187	159.8	12285	8426
23:00	2690	186.8	159.7	12285	8134
24:00:00	0	186.6	159.6	12312	8501
daily avg.	6499	186	159	11815	8282
Total Generation		283570]	
Projected discharge	2	7223			
Thurmond discharg	<u>e</u>	6499			

7/21/2021

7/22/2021

					Estimated Total
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	CFS
1:00	0	186.3	159.4	12104	8408
2:00	0	186	159.4	12018	8371
3:00	0	185.8	159.3	11941	8343
4:00	0	185.6	159.2	11781	8313
5:00	0	1853	159.2	11541	8209
6:00	0	185.1	159.2	11250	7995
7:00	0	184.9	159.1	11122	8001
8:00	0	184.6	159.1	10865	7818
9:00	0	184.4	159	10483	7597
10:00	0	184.2	159	10027	7275
11:00	0	184	158.9	9374	6811
12:00	147	183.6	159.1	10794	7953
13:00	3865	183.3	159	10835	8145
14:00	9484	183.3	159	11023	8151
15:00	26670	183.3	159.1	10808	8115
16:00	26670	183.8	159.1	1176	8252
17:00	26520	184.4	159.1	11565	8410
18:00	26420	185.1	159.2	12076	8544
19:00	15607	185.7	159.2	12368	8729
20:00	7547	186.1	159.3	12575	8816
21:00	5940	186.1	159.3	12638	8817
22:00	2930	186.1	159.3	12571	8778
23:00	2750	185.9	159.3	12508	8717
24:00:00	0	185.7	159.3	12508	8728
daily avg.	6440	254	159	11081	8221
Total Generation		265951]	
Projected discharge		6917			
Thurmond discharge	2	6440			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)		
7/12/2021 0:00	7090		
7/12/2021 1:00	7470		
7/12/2021 2:00	7790		
7/12/2021 3:00	7820		
7/12/2021 4:00	7860		
7/12/2021 5:00	7990		
7/12/2021 6:00	7930		
7/12/2021 7:00	7430		
7/12/2021 8:00	6980		
7/12/2021 9:00	5900		
7/12/2021 10:00	5530		
7/12/2021 11:00	5260		
7/12/2021 12:00	4990		
7/12/2021 12:00	4780		
7/12/2021 13:00	4620		
7/12/2021 14:00	4020		
7/12/2021 15:00	4490		
7/12/2021 10:00	4300		
7/12/2021 17:00	4310		
7/12/2021 18:00	4310		
7/12/2021 19:00	4520		
7/12/2021 20:00	5060		
//12/2021 21:00	5570		
7/12/2021 22:00	5800		
7/12/2021 23:00	5920		
7/13/2021 0:00	6080		
7/13/2021 1:00	6270		
7/13/2021 2:00	6380		
7/13/2021 3:00	6680		
7/13/2021 4:00	6770		
7/13/2021 5:00	6810		
7/13/2021 6:00	6890		
7/13/2021 7:00	7220		
7/13/2021 8:00	7610		
7/13/2021 9:00	8920		
7/13/2021 10:00	9250		
7/13/2021 11:00	8850		
7/13/2021 12:00	8220		
7/13/2021 13:00	7390		
7/13/2021 14:00	6930		
7/13/2021 15:00	6540		
7/13/2021 16:00	6200		
7/13/2021 17:00	5990		
7/13/2021 18:00	5830		
7/13/2021 19:00	5680		
7/13/2021 20:00	5580		
7/13/2021 21:00	5830		
7/13/2021 22:00	6070		
·, + -,			

Date-Time	Flow (cfs)
7/13/2021 23:00	6350
7/21/2021 0:00	10400
7/21/2021 1:00	11400
7/21/2021 2:00	12300
7/21/2021 3:00	12600
7/21/2021 4:00	12400
7/21/2021 5:00	11900
7/21/2021 6:00	11000
7/21/2021 7:00	10500
7/21/2021 8:00	10200
7/21/2021 9:00	10100
7/21/2021 3:00	10100
7/21/2021 10:00	9830
7/21/2021 11:00	9800
7/21/2021 12:00	9000
7/21/2021 13:00	JOZU 0190
7/21/2021 14:00	9480
7/21/2021 15:00	9240
7/21/2021 16:00	9190
7/21/2021 17:00	9060
7/21/2021 18:00	8930
//21/2021 19:00	8940
7/21/2021 20:00	8820
7/21/2021 21:00	8790
7/21/2021 22:00	8900
7/21/2021 23:00	10000
7/22/2021 0:00	10800
7/22/2021 1:00	11600
7/22/2021 2:00	12100
7/22/2021 3:00	12400
7/22/2021 4:00	12000
7/22/2021 5:00	11900
7/22/2021 6:00	11400
7/22/2021 7:00	10400
7/22/2021 8:00	9940
7/22/2021 9:00	9650
7/22/2021 10:00	9410
7/22/2021 11:00	9170
7/22/2021 12:00	9010
7/22/2021 13:00	8840
7/22/2021 14:00	8720
7/22/2021 15:00	8450
7/22/2021 16:00	8460
7/22/2021 17:00	8210
7/22/2021 18:00	8200
7/22/2021 19:00	8130
7/22/2021 20:00	8060
7/22/2021 21:00	8170
7/22/2021 21:00	8070
7/22/2021 22:00	81/0
1/22/2021 23.00	0140
Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary August 2021

	<u>Temperature</u> (°C)			Dissolved	Dissolved Oxygen (mg/L)			
Location								
Thurmond Forebay (Site 8)								
(8/02/21)	15.04	_	31.15	0.0	_	8.0		
Thurmond Tailrace (Site 7)*								
(8/02/21 - 8/03/21)		_			_			
Stevens Creek Res. (Site 6)	18.65	_	19.67	4.4	_	5.6		
(8/02/21 - 8/03/21)								
Stevens Creek Res. (Site 1)	18.87	_	19.74	4.8	_	5.7		
(8/02/21 - 8/03/21)								
Stevens Creek Res. (Site 2)	19.57	_	20.67	4.9	_	5.7		
(8/02/21 - 8/03/21)								
Stevens Creek Tailrace (Site 3)	19.86	_	20.84	5.9	_	6.8		
(8/02/21 - 8/03/21)								
(0,0-, 0,00,,								
Stevens Creek (Site 5)	30 31	_	31 55	29	_	4 2		
(8/02/21 - 8/03/21)	00.01		01.00	2.0				
(0,02,21 0,00,21)								
Stevens Creek (Site 4)	21 17	_	29.06	<u>م</u> 2	_	74		
(8/02/21 - 8/03/21)	21.17		20.00	ч.у		7.4		
(8/02/21 - 8/03/21)								

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary August 2021 (cont'd.)

	Temperature			Dissolved Oxygen (mg/L)		
Location		(°C)				
Location						
(a (a (a))						
(8/13/21)	15.25	_	30.24	0.0	_	8.6
Thurmond Tailrace (Site 7)						
(8/18/21 - 8/19/21)		_			_	
Stevens Creek Res. (Site 6)	19.94	_	22.55	4.0	—	4.8
(8/18/21 - 8/19/21)						
Stevens Creek Res (Site 1)	19 73	_	21 70	3.8	_	5.0
(8/18/21 - 8/19/21)	15175		21.70	5.0		5.0
(0,10,21 0,13,21)						
Stovens Crook Pos (Site 2)	10.05		21.02	4.2		5.2
Stevens creek kes. (Site 2)	19.95	—	21.92	4.5	_	5.2
(8/18/21 - 8/19/21)						
Stevens Creek Tailrace (Site 3)	20.39	_	22.37	4.8	_	5.8
(8/18/21 - 8/19/21)						
Stevens Creek (Site 5)	25.71	—	27.81	3.8	_	5.2
(8/18/21 - 8/19/21)						
Stevens Creek (Site 4)	25.10	_	27.20	3.8	_	5.6
(8/18/21 - 8/19/21)						

Date: 8/2/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:38	0	6.7	30.5	89	3.3	44
		1	6.7	30.5	89	3.2	43
		2	6.7	30.5	89	3.2	43
		3	6.7	30.5	89	3.2	43
3	8:29		6.4	19.9	46	6.0	66
4	9:40	0	6.5	26.5	60	5.0	63
		1	6.5	26.3	59	5.1	64
		2	6.6	26.2	59	5.1	63
		3	6.6	26.1	59	5.0	62
		4	6.5	25.9	58	4.9	61
		5	6.5	22.6	49	5.4	63
		6	6.4	21.4	46	5.5	62
		7	6.4	21.2	46	5.3	60
2	9:54	0	6.4	20.0	45	5.0	55
		1	6.4	20.0	45	5.0	55
		2	6.4	19.9	45	5.0	54
		3	6.3	19.9	45	5.0	54
1	10:14	0	6.3	19.7	46	4.8	52
		1	6.2	19.3	45	4.8	52
		2	6.3	19.1	45	4.8	52
		3	6.3	19.1	45	4.8	52
		4	6.3	19.1	45	4.8	51
1-A	10:28	0	6.3	19.7	45	4.5	49
		1	6.3	19.1	45	4.4	48
		2	6.3	19.0	45	4.4	47

Date: 8/2/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:30	0	6.8	31.6	90	4.2	57
		1	6.7	31.3	90	4.0	55
		2	6.7	31.2	90	3.9	53
		3	6.7	30.9	90	3.7	50
3	16:45		6.4	20.8	47	6.2	70
4	15:30	0	6.7	29.1	60	7.4	97
		1	6.6	27.0	57	6.5	82
		2	6.6	26.4	56	6.1	74
		3	6.4	23.5	51	5.2	61
		4	6.4	22.8	50	5.2	60
2	16:30	0	6.4	20.7	46	5.6	63
		1	6.4	20.7	46	5.6	62
		2	6.4	20.7	46	5.6	63
		3	6.4	20.7	46	5.6	63
1	16:13	0	6.3	19.1	44	5.7	61
		1	6.3	19.1	44	5.7	61
		2	6.3	19.1	44	5.6	61
		3	6.3	19.1	44	5.6	61
1-A	16:01	0	6.3	18.7	44	4.9	52
		1	6.3	18.7	44	4.8	52
		2	6.3	18.7	44	4.9	52
		3	6.2	18.7	44	4.8	52

Date: 8/3/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:58	0	6.7	30.4	90	3.0	40
		1	6.7	30.4	90	2.9	39
		2	6.7	30.4	90	2.9	39
		3	6.7	30.4	90	2.9	38
3	9:49		6.3	19.9	45	5.9	65
4	9:21	0	6.5	25.9	58	5.1	63
		1	6.5	25.7	58	5.1	63
		2	6.5	25.7	58	5.0	62
		3	6.5	25.7	58	5.0	61
		4	6.4	21.6	47	5.4	61
		5	6.4	21.2	46	5.2	58
2	8:13	0	6.3	19.6	45	5.0	54
		1	6.3	19.6	45	5.0	54
		2	6.3	19.6	45	5.0	54
		3	6.3	19.6	45	4.9	54
		4	6.3	19.6	45	4.9	54
1	8:39	0	6.3	19.7	47	4.8	53
		1	6.2	19.0	45	4.8	51
		2	6.2	18.9	45	4.8	51
		3	6.2	18.9	44	4.8	51
		4	6.1	18.9	44	4.8	51
1-A	8:51	0	6.2	19.4	45	5.0	55
		1	6.1	19.0	45	4.8	52
		2	6.1	18.9	45	4.7	51

Date: 8/3/2021 Field Team: Nmatthews / Dhampton Field Meter Model/Number:

18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	16:33	0	6.7	30.3	91	3.1	41
		1	6.7	30.3	91	3.0	40
		2	6.7	30.3	91	3.0	40
		3	6.7	30.3	91	3.0	40
3	14:06		6.5	20.6	46	6.8	76
4	15:26	0	6.6	26.8	59	6.0	75
		1	6.6	25.9	57	5.8	72
		2	6.6	25.2	54	6.2	75
		3	6.6	24.8	53	6.3	76
		4	6.5	24.0	52	6.3	74
		5	6.5	23.6	51	6.2	73
		6	6.5	23.4	50	6.1	72
2	14:26	0	6.3	20.1	45	5.6	62
		1	6.3	20.1	45	5.6	62
		2	6.4	20.1	45	5.6	62
		3	6.4	20.2	45	5.7	63
1	15:03	0	6.3	19.4	44	5.7	61
		1	6.3	19.4	44	5.6	61
		2	6.3	19.4	44	5.6	61
		3	6.3	19.4	44	5.6	61
1-A	14:51	0	6.3	19.3	44	5.5	60
		1	6.3	19.3	44	5.6	61
		2	6.3	19.3	44	5.6	61
		3	6.3	19.3	44	5.6	61

Date: 8/18/2021 Field Team: JDL/DFS Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:08	surface	6.7	25.9	74	4.0	50
		1	6.7	25.9	74	4.9	48
		2	6.7	25.8	73	3.9	47
		3	6.6	25.7	72	4.0	48
		4	6.6	25.8	73	3.8	47
3	9:10	surface	6.5	20.4	47	5.2	58
4	6:48	surface	6.5	25.1	44	5.6	68
		1	6.5	25.1	44	5.6	68
		2	6.5	25.1	44	5.6	68
		3	6.5	25.1	44	5.6	67
		4	6.5	25.1	44	5.6	67
2	7:19	surface	6.5	20.0	47	4.4	49
		1	6.4	20.0	47	4.3	48
		2	6.4	20.0	47	4.3	48
		3	6.3	20.0	47	4.3	48
		4	6.3	20.0	47	4.3	47
		5	6.2	20.0	47	4.3	47
1	8:01	surface	6.3	21.6	52	3.8	43
		1	6.3	21.0	50	3.9	44
		2	6.3	20.1	48	4.1	46
		3	6.3	19.8	47	4.3	46
		4	6.3	19.7	47	4.3	47
1A	7:48	surface	6.5	21.6	54	4.8	55
		1	6.4	20.4	49	4.5	50
		2	6.3	19.9	48	4.3	48
		3	6.4	20.0	48	4.3	48

Date: 8/18/2021 Field Team: JDL/DFS Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:14	surface	6.7	26.8	68	4.3	54
		1	6.6	26.5	68	4.2	52
		2	6.6	26.4	68	4.1	51
		3	6.6	26.3	68	4.1	50
		4	6.6	26.3	68	4.0	50
3	13:01	surface	6.5	21.1	47	5.8	65
4	13:41	surface	6.6	26.0	51	5.4	66
		1	6.6	26.0	51	5.4	66
		2	6.6	25.9	51	5.3	66
		3	6.6	25.9	51	5.3	66
		4	6.6	25.9	51	5.3	66
2	15:12	surface	6.4	21.9	49	4.9	55
		1	6.4	21.9	49	4.9	56
		2	6.4	21.8	49	5.0	57
		3	6.4	21.8	49	4.9	56
		4	6.4	21.8	49	4.9	56
		5	6.4	21.8	49	4.9	56
1	14:56	surface	6.4	20.3	46	5.0	55
		1	6.3	20.3	46	5.0	55
		2	6.3	20.4	46	5.0	55
		3	6.3	20.4	46	5.0	55
		4	6.3	20.5	46	5.0	55
		5	6.3	20.4	46	4.9	55
		6	6.3	20.5	46	4.9	55
1A	14:45	surface	6.3	20.1	45	4.6	51
		1	6.3	20.1	45	4.6	51
		2	6.3	20.1	45	4.6	51
		3	6.3	20.1	45	4.6	50
		4	6.3	20.1	45	4.6	50

Date: 8/19/2021 Field Team: JDL/DFS Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:30	Surface	6.6	26.0	66	5.2	64
		1	6.6	26.0	66	5.2	63
		2	6.6	26.0	66	5.1	63
		3	6.6	26.0	66	5.1	64
		4	6.6	26.0	66	5.1	64
3	5:53	Surface	6.4	20.5	47	4.8	53
4	7:13	Surface	6.5	26.4	53	4.4	54
		1	6.5	26.4	53	4.4	54
		2	6.5	26.3	53	4.4	54
		3	6.5	26.3	53	4.4	54
		4	6.5	26.3	53	4.4	54
		5	6.5	26.3	53	4.4	54
2	7:25	Surface	6.4	20.6	47	4.6	51
		1	6.3	20.5	47	4.5	50
		2	6.3	20.5	47	4.5	50
		3	6.3	20.5	47	4.5	50
		4	6.3	20.5	47	4.4	49
		5	6.3	20.5	47	4.4	49
1	7:58	Surface	6.3	21.7	51	4.3	48
		1	6.3	21.3	49	4.3	49
		2	6.3	21.1	49	4.3	49
		3	6.3	20.8	49	4.4	49
1A	7:49	Surface	6.5	22.6	58	4.8	55
		1	6.4	20.4	48	4.3	48
		2	6.3	20.3	47	4.3	48
		3	6.3	20.3	47	4.3	47

Date: 8/19/2021 Field Team: JDL/DFS Field Meter Model/Number: 18J102052

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:26	Surface	6.8	27.8	87	5.2	66
		1	6.8	26.8	89	5.2	65
		2	6.8	26.8	89	5.2	65
		3	6.8	26.7	89	5.2	64
		4	6.8	26.7	89	5.1	64
3	15:03	Surface	6.5	22.4	49	5.8	67
4	13:51	Surface	6.5	27.2	55	4.1	52
		1	6.5	26.7	55	4.0	50
		2	6.5	26.6	54	3.9	49
		3	6.5	26.6	54	3.9	49
		4	6.5	26.6	54	3.8	48
		5	6.5	26.6	54	3.8	47
2	13:40	Surface	6.5	21.8	47	5.2	59
		1	6.4	21.8	47	5.2	59
		2	6.4	21.8	47	5.2	59
		3	6.4	21.8	47	5.2	59
		4	6.4	21.8	47	5.2	59
		5	6.4	21.8	47	5.2	60
1	13:20	Surface	6.4	21.4	48	4.5	51
		1	6.4	21.4	48	4.5	51
		2	6.4	21.3	48	4.4	50
		3	6.4	21.3	48	4.4	50
		4	6.4	21.3	48	4.4	50
		5	6.4	21.3	48	4.4	49
1A	13:11	Surface	6.3	20.4	46	4.1	45
		1	6.3	20.4	46	4.0	45
		2	6.3	20.4	46	4.0	45
		3	6.3	20.4	46	4.0	45
		4	6.3	20.4	46	4.0	44

JST Forebay Water Quality Data (Provided By USACE-ERDC)

August 13, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
43724	30.24	8.07	48	0.2
43759	30.05	8.49	48.2	2
43830	29.19	8.61	47.8	4
43914	27.59	6.12	46.8	6
44017	25.29	2.82	45.7	8
44124	23.41	1.41	44.6	9
44152	22.61	1.33	44.2	10
44217	22.08	1.43	43.4	11
44322	21.44	1.93	42.9	12
44522	21.3	2.04	42.8	13
44713	20.81	2.13	42.5	14
44752	20.55	2.33	42.6	15
44840	20.44	2.87	42.4	16
44918	20.07	2.99	42.5	17
44937	19.95	3	42.3	18
45009	19.72	2.84	42.4	19
45101	19.55	2.87	42.3	20
45140	19.33	2.68	42.4	21
45220	19.15	2.23	42.7	22
45259	18.93	1.34	43.6	23
45327	18.64	0.68	44.1	24
45354	18.51	0.41	45.3	25
45434	18.32	0.13	46.2	26
45500	18.16	0.11	46	27
45531	17.86	0	47.9	28
45603	17.49	0	49.8	30
45629	17.3	0	51.3	32
45710	16.86	0	49.4	34
45744	16.56	0	47.7	36
45818	16.2	0	45.4	38
45852	15.82	0	45.5	40
45916	15.38	0	46.2	42
50009	15.26	0	47.1	44
50030	15.25	0	47.4	45
Max:	30.24	8.61	51.3	45
Min:	15.25	0	42.3	0.2

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
8/2/2021	0:00:00	22.73	45.6	3.28
8/2/2021	0:15:00	22.78	45.6	2.96
8/2/2021	0:30:00	22.77	45.9	3.01
8/2/2021	0:45:00	22.79	46.4	2.68
8/2/2021	1:00:00	22.81	46.5	2.46
8/2/2021	1:15:00	22.85	46.3	2.39
8/2/2021	1:30:00	22.94	46.6	2.5
8/2/2021	1:45:00	23.06	46.4	2.73
8/2/2021	2:00:00	23.09	46.5	2.63
8/2/2021	2:15:00	23.09	46.8	2.6
8/2/2021	2:30:00	23.06	46.7	2.53
8/2/2021	2:45:00	23.03	46.1	2.88
8/2/2021	3:00:00	22.98	45.8	2.87
8/2/2021	3:15:00	22.95	45.8	3.07
8/2/2021	3:30:00	22.96	45.8	2.99
8/2/2021	3:45:00	22.93	45.4	3.01
8/2/2021	4:00:00	22.81	45.4	2.61
8/2/2021	4:15:00	22.61	45.5	2.83
8/2/2021	4:30:00	22.46	45.4	2.69
8/2/2021	4:45:00	22.31	45.3	2.71
8/2/2021	5:00:00	22.24	45.2	2.68
8/2/2021	5:15:00	22.2	45.1	2.77
8/2/2021	5:30:00	22.16	45.2	2.63
8/2/2021	5:45:00	22.14	45.2	2.7
8/2/2021	6:00:00	22.11	45.1	2.46
8/2/2021	6:15:00	22.06	45.1	2.33
8/2/2021	6:30:00	22.04	45.1	2.33
8/2/2021	6:45:00	22.04	45.2	2.27
8/2/2021	7:00:00	22.02	45.2	2.3
8/2/2021	7:15:00	22	45.3	2.25
8/2/2021	7:30:00	21.98	45.2	2.22
8/2/2021	7:45:00	22	45.3	2.14
8/2/2021	8:00:00	21.99	45.3	2.23
8/2/2021	8:15:00	22.06	45.2	2.07
8/2/2021	8:30:00	22.13	45.2	1.93
8/2/2021	8:45:00	22.19	45.1	1.81
8/2/2021	9:00:00	22.23	45.2	1.87
8/2/2021	9:15:00	22.31	46.4	1.78
8/2/2021	9:30:00	22.4	46.4	1.77
8/2/2021	9:45:00	22.51	47.4	1.66
8/2/2021	10:00:00	22.63	46.8	1.7

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
8/2/2021	10:15:00	22.74	46.8	1.69
8/2/2021	10:30:00	22.88	47.1	1.74
8/2/2021	10:45:00	22.99	46.5	1.79
8/2/2021	11:00:00	23.13	46.8	1.83
8/2/2021	11:15:00	23.24	47.3	1.86
8/2/2021	11:30:00	23.36	47.5	1.81
8/2/2021	11:45:00	23.48	47	1.81
8/2/2021	12:00:00	23.65	47.2	1.84
8/2/2021	12:15:00	23.77	48.3	2.15
8/2/2021	12:30:00	23.9	47.8	2.59
8/2/2021	12:45:00	23.79	45.6	3.09
8/2/2021	13:00:00	23.64	45.5	4.43
8/2/2021	13:15:00	23.56	45.2	4.48
8/2/2021	13:30:00	23.29	45	4.63
8/2/2021	13:45:00	22.04	44.9	4.42
8/2/2021	14:00:00	21.37	44.8	4.36
8/2/2021	14:15:00	21.18	44.6	4.17
8/2/2021	14:30:00	21.05	44.5	4.15
8/2/2021	14:45:00	21.01	44.6	4.05
8/2/2021	15:00:00	20.97	44.4	4.14
8/2/2021	15:15:00	20.87	44.2	4.03
8/2/2021	15:30:00	20.81	44.4	3.99
8/2/2021	15:45:00	20.8	44.4	3.96
8/2/2021	16:00:00	20.71	44.5	3.95
8/2/2021	16:15:00	20.7	44.4	3.93
8/2/2021	16:30:00	20.83	44.7	4
8/2/2021	16:45:00	20.95	44.6	3.98
8/2/2021	17:00:00	21.04	44.8	3.98
8/2/2021	17:15:00	21.39	44.7	3.96
8/2/2021	17:30:00	21.53	44.8	4.49
8/2/2021	17:45:00	21.6	45	4.68
8/2/2021	18:00:00	21.56	44.8	4.67
8/2/2021	18:15:00	21.48	44.9	4.68
8/2/2021	18:30:00	21.45	44.7	4.88
8/2/2021	18:45:00	21.47	44.7	5.14
8/2/2021	19:00:00	21.58	44.7	5.19
8/2/2021	19:15:00	21.76	45.1	5.25
8/2/2021	19:30:00	21.92	45.2	5.08
8/2/2021	19:45:00	22.09	44.9	4.67
8/2/2021	20:00:00	22.22	44.6	4.65
8/2/2021	20:15:00	22.39	45.1	4.29
8/2/2021	20:30:00	22.5	45.3	4.32
8/2/2021	20:45:00	22.47	45.2	4.42
8/2/2021	21:00:00	22.42	44.9	4.49

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
8/2/2021	21:15:00	22.46	44.8	4.44
8/2/2021	21:30:00	22.49	44.8	4.51
8/2/2021	21:45:00	22.63	45.3	4.42
8/2/2021	22:00:00	22.72	46	4.35
8/2/2021	22:15:00	22.82	45.5	4.09
8/2/2021	22:30:00	22.88	45.7	4.01
8/2/2021	22:45:00	22.9	45.7	3.84
8/2/2021	23:00:00	22.96	45.5	3.77
8/2/2021	23:15:00	22.96	45	3.81
8/2/2021	23:30:00	22.9	45	3.89
8/2/2021	23:45:00	22.84	45.5	4.07
8/3/2021	0:00:00	22.76	45.1	4.15
8/3/2021	0:15:00	22.7	45.2	3.84
8/3/2021	0:30:00	22.71	45	3.54
8/3/2021	0:45:00	22.74	45.1	3.31
8/3/2021	1:00:00	22.58	45.4	3.09
8/3/2021	1:15:00	22.3	45.3	2.93
8/3/2021	1:30:00	22.18	45.4	2.81
8/3/2021	1:45:00	22.07	45.2	2.66
8/3/2021	2:00:00	22.02	45.2	2.66
8/3/2021	2:15:00	21.99	45.4	2.59
8/3/2021	2.30.00	21.99	45.3	2 54
8/3/2021	2:45:00	21.55	45.4	2.51
8/3/2021	3:00:00	21.99	45.2	2.47
8/3/2021	3:15:00	21.99	45.6	2.46
8/3/2021	3:30:00	21.98	45.4	2.47
8/3/2021	3:45:00	21.97	45.3	2.45
8/3/2021	4:00:00	21.99	45.4	2.42
8/3/2021	4:15:00	22	45.4	2.41
8/3/2021	4:30:00	22.04	45.4	2.44
8/3/2021	4:45:00	22.03	45.4	2.34
8/3/2021	5:00:00	22.05	45.3	2.29
8/3/2021	5:15:00	22.1	45.2	2.63
8/3/2021	5:30:00	22.12	44.9	2.59
8/3/2021	5:45:00	22.14	45	2.53
8/3/2021	6:00:00	22.12	44.9	2.38
8/3/2021	6:15:00	22.13	45.2	2.32
8/3/2021	6:30:00	22.15	45.1	2.36
8/3/2021	6:45:00	22.17	45.1	2.27
8/3/2021	7:00:00	22.2	45.1	2.22
8/3/2021	7:15:00	22.21	45.1	2.23
8/3/2021	7:30:00	22.21	45.1	2.23
8/3/2021	7.45.00	22.24	45	2.21
8/3/2021	8.00.00	22.24	45 45	2.17
0/5/2021	0.00.00	22.21	-J	2.10

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
8/3/2021	8:15:00	22.3	44.9	2.13
8/3/2021	8:30:00	22.32	45	2.09
8/3/2021	8:45:00	22.34	45.1	2.12
8/3/2021	9:00:00	22.37	45.1	2.14
8/3/2021	9:15:00	22.4	45	2.11
8/3/2021	9:30:00	22.47	45.2	2.07
8/3/2021	9:45:00	22.52	45	2.09
8/3/2021	10:00:00	22.56	45.2	2.12
8/3/2021	10:15:00	22.62	45.1	2.12
8/3/2021	10:30:00	22.67	45.2	2.04
8/3/2021	10:45:00	22.67	45.2	2.02
8/3/2021	11:00:00	22.7	45.1	1.98
8/3/2021	11:15:00	22.8	45.4	1.7
8/3/2021	11:30:00	22.87	45.5	1.71
8/3/2021	11:45:00	22.96	45.5	1.76
8/3/2021	12:00:00	23.03	45.4	1.79
8/3/2021	12:15:00	23.12	45.5	1.75
8/3/2021	12:30:00	22.75	45.6	2.03
8/3/2021	12:45:00	22.55	45.3	2.79
8/3/2021	13:00:00	22.4	45.5	3.22
8/3/2021	13:15:00	22.22	45.6	3.4
8/3/2021	13:30:00	21.87	45.7	2.87
8/3/2021	13:45:00	21.44	45.4	2.96
8/3/2021	14:00:00	20.98	45.5	2.84
8/3/2021	14:15:00	20.9	45.3	2.78
8/3/2021	14:30:00	20.84	45.2	2.78
8/3/2021	14:45:00	20.79	45.4	2.86
8/3/2021	15:00:00	20.8	45.4	2.82
8/3/2021	15:15:00	20.77	45.3	2.82
8/3/2021	15:30:00	20.74	45.5	2.84
8/3/2021	15:45:00	20.66	45.3	2.82
8/3/2021	16:00:00	20.63	45.3	2.87
8/3/2021	16:15:00	20.66	45.1	2.91
8/3/2021	16:30:00	20.63	45.4	2.99
8/3/2021	16:45:00	20.53	45.3	2.96
8/3/2021	17:00:00	20.5	45.4	2.98
8/3/2021	17:15:00	20.57	45.1	2.98
8/3/2021	17:30:00	20.65	45	2.99
8/3/2021	17:45:00	20.79	45	3.03
8/3/2021	18:00:00	20.75	45.2	3.05
8/3/2021	18:15:00	20.68	45.2	3.05
8/3/2021	18:30:00	20.72	45.2	2.77
8/3/2021	18:45:00	20.8	44.8	2.43
8/3/2021	19:00:00	20.82	44.8	2.37

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
8/3/2021	19:15:00	20.8	44.9	2.39
8/3/2021	19:30:00	21.22	45.5	2.35
8/3/2021	19:45:00	21.4	45.2	2.31
8/3/2021	20:00:00	21.43	45.3	2.27
8/3/2021	20:15:00	21.46	45.1	2.25
8/3/2021	20:30:00	21.49	45.1	2.6
8/3/2021	20:45:00	21.59	45.1	3.14
8/3/2021	21:00:00	21.59	45.1	3.29
8/3/2021	21:15:00	21.61	45	3.34
8/3/2021	21:30:00	21.64	45.2	3.21
8/3/2021	21:45:00	21.79	45.4	3.23
8/3/2021	22:00:00	21.87	46.1	3.05
8/3/2021	22:15:00	21.96	45.6	2.87
8/3/2021	22:30:00	22.14	45.2	2.98
8/3/2021	22:45:00	22.36	45.8	3.1
8/3/2021	23:00:00	22.52	45.6	3.03
8/3/2021	23:15:00	22.61	45.7	3.16
8/3/2021	23:30:00	22.5	45.3	3.18
8/3/2021	23:45:00	22.15	45.7	3.17
	Max	23.9	48.3	5.25
	Min	20.5	44.2	1.66

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

DATA FOR 8/18/2021 – 8/19/2021 NOT AVAILABLE DUE TO EQUIPMENT MALFUNCTION

8/2/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	2631	185.2	158.7	9126	6389
2:00	61	185.1	158.7	9294	9519
3:00	61	184.8	158.9	10242	7309
4:00	61	184.6	158.8	9381	6711
5:00	61	184.4	158.7	9858	6604
6:00	61	184.2	158.7	8801	6360
7:00	61	184	158.7	9131	6511
8:00	61	183.7	158.7	8831	6483
9:00	70	183.5	158.7	8538	6348
10:00	70	183.3	158.6	8300	6157
11:00	70	183	158.7	8494	6387
12:00	365	182.7	158.8	8219	6255
13:00	3993	182.4	158.7	7939	6123
14:00	16414	182.3	158.7	7959	6166
15:00	26651	182.7	158.7	8145	6246
16:00	26581	183.1	159.1	10022	7521
17:00	26751	183.3	159.1	10436	7702
18:00	25641	183.5	159.1	10849	7835
19:00	8205	184.5	159.1	11228	8015
20:00	6522	185.1	159.1	11457	8080
21:00	5961	185.5	159.1	11559	8087
22:00	2641	185.6	159.1	11475	8067
23:00	61	185.6	159.1	11343	8000
24:00:00	61	185.4	158.8	9232	6450
daily avg.	6380	184	159	9577	7055
Total Generation		229859]	
Projected discharge	2	6948			
Thurmond discharg	<u>e</u>	6380			

8/3/2021

Thurmond discharge

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185	158.7	9055	6343
2:00	61	184.9	158.7	2902	6346
3:00	61	184.7	158.5	7435	5271
4:00	61	184.6	158.5	7289	5213
5:00	61	184.4	158.4	7254	5302
6:00	61	184.2	158.4	7024	5150
7:00	62	184	158.7	9148	6706
8:00	70	183.7	158.7	9018	6579
9:00	70	183.5	158.7	8825	6509
10:00	70	183.2	158.7	8626	6473
11:00	70	182.9	158.7	8130	6131
12:00	70	182.7	158.7	7946	6077
13:00	946	182.4	158.7	7979	6101
14:00	16637	182.1	158.7	7766	6042
15:00	24252	182.4	158.7	8094	6222
16:00	24322	183.1	158.7	8451	6359
17:00	24617	183.7	159	10565	7811
18:00	26582	184.3	159.1	10977	7942
19:00	14552	184.9	159.1	11438	8149
20:00	6816	185.4	159.2	11745	8301
21:00	6071	185.6	159.2	11881	8353
22:00	4171	185.6	159.2	11863	8339
23:00	61	185.5	159.2	11724	8293
24:00:00	61	185.2	159.2	11723	8325
daily avg.	6242	184	159	9036	6764
Total Generation		216858]	
Projected discharg	<u>e</u>	6957			

6242

8/18/2021

Thurmond discharge

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	11722	186.7	159.5	10405	6944
2:00	209	186.7	159.5	10394	6997
3:00	62	186.5	159.5	10246	6902
4:00	62	186.3	159.3	10094	6889
5:00	62	186.1	159.3	9951	6762
6:00	62	185.9	159.1	9586	6599
7:00	62	185.7	159.1	9642	6644
8:00	62	185.5	159.1	9589	6656
9:00	62	185.4	158.9	8211	5682
10:00	62	185.3	158.9	8339	5733
11:00	62	185.1	159	9103	6369
12:00	208	185	159.8	8776	6176
13:00	4249	184.8	158.9	8538	6027
14:00	26262	184.9	158.9	8852	6255
15:00	27004	185.6	158.6	7929	5457
16:00	27004	186	159.3	11902	8325
17:00	27274	186.5	159.5	12243	8434
18:00	27184	186.9	159.6	12480	8490
19:00	27184	187.3	159.8	12500	8442
20:00	26502	187.6	159.9	12607	8434
21:00	4926	187.7	160.1	12570	8375
22:00	3642	187.6	160.2	12494	8380
23:00	3632	187.4	160.1	12418	8348
24:00:00	3702	187.2	159.9	12179	8265
daily avg.	9219	186	159	10460	7149
Total Generation		251048]	
Projected discharge	2	9725			

9219

8/19/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	3612	186.9	159.8	12033	8148
2:00	62	186.7	159.7	11923	8124
3:00	62	186.4	159.5	11693	8101
4:00	62	186.2	159.4	11595	8015
5:00	62	185.9	159.4	10989	7706
6:00	62	185.7	159.2	10990	7670
7:00	62	185.5	159.2	10835	7581
8:00	62	185.2	159.1	9569	6705
9:00	62	185.1	159	9318	6571
10:00	62	184.9	159	9305	6629
11:00	62	184.7	158.9	9222	6569
12:00	62	184.4	158.9	8013	5685
13:00	13342	184.3	158.9	8413	6084
14:00	21732	184.6	158.8	8533	6060
15:00	23657	184.9	159.1	11491	8171
16:00	27274	185.4	159.3	11777	8326
17:00	28084	186	159.3	12065	8429
18:00	27004	186.5	159.5	12303	8495
19:00	27184	186.9	159.6	12404	8472
20:00	26502	187.3	159.8	12563	9474
21:00	8976	187.5	160	12624	8523
22:00	2682	187.4	160	12567	8508
23:00	62	187.2	159.9	12437	8408
24:00:00	62	186.9	159.7	12155	8279
daily avg.	8786	186	159	11034	7697
Total Generation		264817]	
Projected discharge	2	9594			
Thurmond discharg	<u>e</u>	8786			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

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Date-Time	Flow (cfs)
8/2/2021 0:00	6680
8/2/2021 1:00	6880
8/2/2021 2:00	6780
8/2/2021 3:00	6800
8/2/2021 4:00	6790
8/2/2021 5:00	6870
8/2/2021 6:00	6350
8/2/2021 7:00	6170
8/2/2021 8:00	6050
8/2/2021 9:00	5980
8/2/2021 10:00	5810
8/2/2021 11:00	5690
8/2/2021 12:00	5610
8/2/2021 13:00	5560
8/2/2021 14:00	5530
8/2/2021 15:00	5520
8/2/2021 16:00	5510
8/2/2021 17:00	5490
8/2/2021 18:00	5450
8/2/2021 19:00	5730
8/2/2021 20:00	5850
8/2/2021 21:00	5940
8/2/2021 22:00	6010
8/2/2021 23:00	6100
8/3/2021 0:00	6420
8/3/2021 1:00	6540
8/3/2021 2:00	6750
8/3/2021 3:00	6900
8/3/2021 4:00	6870
8/3/2021 5:00	6640
8/3/2021 6:00	6300
8/3/2021 7:00	5770
8/3/2021 8:00	5530
8/3/2021 9:00	5370
8/3/2021 10:00	5540
8/3/2021 11:00	5530
8/3/2021 12:00	5530
8/3/2021 13:00	5520
8/3/2021 14:00	5520
8/3/2021 15:00	5510
8/3/2021 16:00	5510
8/3/2021 17:00	5560
8/3/2021 18:00	5770
8/3/2021 19:00	5840
8/3/2021 20:00	5830
8/3/2021 21:00	5890
8/3/2021 22:00	5970
8/3/2021 23:00	6050
8/18/2021 0:00	9230
8/18/2021 1:00	9380
,,	

Date-Time	Flow (cfs)
8/18/2021 2:00	9390
8/18/2021 3:00	9330
8/18/2021 4:00	9390
8/18/2021 5:00	9620
8/18/2021 6:00	10100
8/18/2021 7:00	10400
8/18/2021 8:00	10600
8/18/2021 9:00	10600
8/18/2021 10:00	10300
8/18/2021 11:00	9790
8/18/2021 12:00	9470
8/18/2021 13:00	9040
8/18/2021 14:00	8440
8/18/2021 15:00	8120
8/18/2021 16:00	7740
8/18/2021 17:00	7640
8/18/2021 18:00	7260
8/18/2021 19:00	7400
8/18/2021 20:00	7530
8/18/2021 21:00	8360
8/18/2021 22:00	9130
8/18/2021 23:00	10200
8/19/2021 0:00	11100
8/19/2021 1:00	12100
8/19/2021 2:00	12900
8/19/2021 3:00	12900
8/19/2021 4:00	13600
8/19/2021 5:00	13700
8/19/2021 6:00	14000
8/19/2021 7:00	13100
8/19/2021 8:00	12900
8/19/2021 9:00	12600
8/19/2021 10:00	11500
8/19/2021 11:00	10900
8/19/2021 12:00	10300
8/19/2021 13:00	10000
8/19/2021 14:00	9650
8/19/2021 15:00	9490
8/19/2021 16:00	9230
8/19/2021 17:00	9050
8/19/2021 18:00	8870
8/19/2021 19:00	8780
8/19/2021 20:00	8610
8/19/2021 21:00	8540
8/19/2021 22:00	8580
8/19/2021 23:00	8820
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Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary September 2021

	<u>Terr</u>	<u>Temperature</u> (°C)		<u> </u>	<u>Dissolved Oxygen</u> (mg/L)		<u>gen</u>
<u>Location</u>							
Thurmond Forebay (Site 8)							
(9/13/21)	15.97	_	26.79		0.0	_	7.8
Thurmond Tailrace (Site 7)*							
(9/08/21 - 9/09/21)		_				_	
Stevens Creek Res. (Site 6)	21.06	_	21.57		4.0	_	4.8
(9/08/21 - 9/09/21)							
Stevens Creek Dec. (Site 1)	21.00		21 54		4.4		4 5
Stevens Creek Res. (Site 1)	21.00	_	21.54		4.1	_	4.5
(9/08/21 - 9/09/21)							
Stevens Creek Res. (Site 2)	21.24	_	22.04		4.0	_	4.7
(9/08/21 - 9/09/21)							
Stevens Creek Tailrace (Site 3)	21.27	_	22.20		5.6	_	6.2
(9/08/21 - 9/09/21)			22.20		5.0		0.2
Stevens Creek (Site 5)	25.30	—	26.37		2.6	—	4.9
(9/08/21 - 9/09/21)							
Stevens Creek (Site 4)	22.16	—	24.74		4.3	_	5.2
(9/08/21 - 9/09/21)							

USGS note: Thunderstorm and heavy downpour curtailed the sampling on 9/8/21 afternoon. Only site 5 & 3 were collected.

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary September 2021 (cont'd.)

	<u>Temperature</u> (°C)		<u>Dissolved Ox</u>	<u>ygen</u> (r	ng/L)	
Location						
Thurmond Forebay (Site 8)						
(09//21)	no data	_		no data	_	
Thurmond Tailrace (Site 7)*						
(9/21/21 - 9/22/21)		_			_	
Stevens Creek Res. (Site 6)	21.78	_	23.20	4.3	_	5.4
(9/21/21 - 9/22/21)						
Stevens Creek Res. (Site 1)	21.69	_	23.09	3.9	_	4.8
(9/21/21 - 9/22/21)						
Stevens Creek Res. (Site 2)	21.65	—	22.71	4.3	—	4.8
(9/21/21 - 9/22/21)						
Stevens Creek Tailrace (Site 3)	21.72	—	23.05	4.8	—	5.8
(9/21/21 - 9/22/21)						
Stevens Creek (Site 5)	24.23	—	26.21	3.9	—	5.0
(9/21/21 - 9/22/21)						
Stevens Creek (Site 4)	23.61	—	26.13	3.4	—	6.4
(9/21/21 - 9/22/21)						

Date: 9/8/2021 Field Team: Nmatthews / Kanderson Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:10	0	7.0	26.4	100	2.7	33
		1	6.9	26.4	100	2.6	33
		2	6.9	26.4	100	2.7	33
		3	6.9	26.4	100	2.7	33
		4	6.9	26.4	100	2.6	32
3	7:55		6.6	21.6	48	5.6	64
4	8:30	0	6.8	24.7	60	4.6	55
		1	6.7	24.7	60	4.6	55
		2	6.8	24.7	60	4.5	54
		3	6.7	24.7	60	4.5	54
		4	6.7	24.6	60	4.4	53
		5	6.7	24.6	59	4.3	52
2	8:51	0	6.6	21.5	48	4.6	52
		1	6.5	21.5	48	4.5	51
		2	6.5	21.5	48	4.5	51
		3	6.5	21.5	48	4.5	51
		4	6.5	21.5	48	4.5	51
1	9:12	0	6.5	21.2	47	4.5	51
		1	6.5	21.0	48	4.5	50
		2	6.5	21.1	48	4.5	50
		3	6.5	21.1	48	4.4	49
		4	6.5	21.0	48	4.4	49
1-A	9:37	0	6.5	21.6	48	4.8	55
		1	6.5	21.2	48	4.7	53
		2	6.5	21.2	48	4.7	53

Date: 9/8/2021 Field Team: Nmatthews / Kanderson Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:38	0	7.1	26.2	98	4.2	52
		1	7.1	26.0	94	4.4	54
		2	7.1	25.6	79	4.7	57
		3	7.0	25.4	73	4.9	59
		4	7.0	25.3	71	4.9	59
3	15:09		6.7	22.1	47	5.9	68

NOTES: Heavy downpours from a long line of thunderstorms and constant lightning. Tried to wait it out, but the line of storms was on us and around us with lightning. Did not want to get on boat with lightning in the area.

Date: 9/9/2021 Field Team: Nmatthews / Kanderson Field Meter Model/Number: 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	7:20	0	6.9	25.4	86	3.5	43
		1	6.9	25.4	86	3.5	43
		2	6.9	25.4	86	3.5	42
		3	6.9	25.4	86	3.4	42
		4	6.9	25.4	86	3.4	42
3	8:02		6.5	21.3	49	5.9	66
4	9:30	0	6.8	24.5	59	4.7	56
		1	6.8	24.4	59	4.6	55
		2	6.7	24.3	59	4.6	55
		3	6.7	24.3	58	4.5	54
		4	6.8	24.3	58	4.5	54
		5	6.7	24.1	58	4.3	52
2	9:48	0	6.6	21.3	48	4.1	46
		1	6.6	21.3	48	4.0	45
		2	6.6	21.3	45	4.0	45
		3	6.5	21.2	48	4.0	45
		4	6.5	21.2	48	4.0	45
1	10:12	0	6.5	21.2	48	4.2	48
		1	6.5	21.2	49	4.1	47
		2	6.5	21.1	49	4.2	47
		3	6.4	21.0	49	4.2	47
		4	6.4	21.0	49	4.2	47
1-A	10:27	0	6.5	21.2	48	4.3	48
		1	6.5	21.1	48	4.2	47
		2	6.5	21.1	48	4.2	47

Date: 9/9/2021 Field Team: Nmatthews / Kanderson Field Meter Model/Number: 17F104114

					Sp.		
Site No.	Time	Depth	рН	Temperature	Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	14:21	0	6.9	26.2	88	3.9	48
		1	6.9	26.1	88	3.7	46
		2	6.9	25.9	89	3.7	46
		3	6.9	25.8	89	3.6	45
		4	6.9	25.6	90	3.5	43
3	15:05		6.7	22.2	49	6.2	71
4	16:54	0	6.7	23.1	51	5.2	61
		1	6.6	23.1	51	5.2	60
		2	6.6	22.4	49	4.9	56
		3	6.6	22.2	49	4.8	55
		4	6.6	22.2	49	4.8	55
2	16:40	0	6.6	22.0	49	4.7	54
		1	6.5	22.0	49	4.7	54
		2	6.5	22.0	49	4.7	53
		3	6.5	22.0	49	4.7	54
1	16:22	0	6.4	21.5	48	4.4	49
		1	6.4	21.5	48	4.4	49
		2	6.4	21.5	48	4.2	48
		3	6.5	21.5	48	4.2	47
		4	6.4	21.5	48	4.2	47
1-A	16:12	0	6.5	21.3	48	4.1	46
		1	6.5	21.3	48	4.0	45
		2	6.5	21.3	48	4.0	45
		3	6.5	21.3	48	4.0	45
		4	6.5	21.3	48	4.0	45

Date: 9/21/2021 Field Team: WTB/PMS Field Meter Model/Number: 20J104516

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:19	surface	6.8	24.2	79	4.6	55
		1	6.8	24.2	79	4.5	54
		2	6.8	24.2	79	4.5	54
		3	6.8	24.2	79	4.5	54
		4	6.8	24.2	79	4.5	53
		5	6.8	24.2	79	4.4	53
3	8:58	surface	6.5	21.7	48	4.8	54
4	7:07	surface	6.5	23.8	52	4.0	48
		1	6.5	23.8	52	4.0	47
		2	6.5	23.7	52	4.0	47
		3	6.5	23.7	52	4.0	47
		4	6.5	23.7	52	3.9	46
		5	6.5	23.7	51	3.9	46
		6	6.5	23.6	51	3.8	45
2	7:24	surface	6.5	21.7	47	4.5	51
		1	6.5	21.7	47	4.4	50
		2	6.5	21.7	47	4.4	50
		3	6.5	21.6	47	4.4	49
		4	6.5	21.6	47	4.3	49
		5	6.5	21.6	47	4.3	49
1	7:47	surface	6.5	21.9	50	4.0	45
		1	6.5	21.7	49	4.1	46
		2	6.4	21.7	48	4.1	46
		3	6.4	21.7	48	4.1	46
		4	6.4	21.7	49	4.1	46
		5	6.4	21.7	49	4.0	46
		6	6.4	21.7	49	4.0	46
1A	7:56	surface	6.5	21.8	48	4.3	49
		1	6.5	21.8	48	4.3	49
		2	6.5	21.8	48	4.3	49
		3	6.5	21.8	48	4.3	49

Date: 9/21/2021 Field Team: WTB/PMS Field Meter Model/Number: 20J104516

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	16:58	surface	6.8	25.0	86	4.6	55
		1	6.8	25.0	86	4.5	54
		2	6.8	25.0	86	4.5	54
		3	6.8	25.0	86	4.5	54
		4	6.8	25.0	86	4.4	54
		5	6.8	25.0	87	4.4	54
3	14:09	surface	6.5	22.5	48	5.2	60
4	14:54	surface	6.6	26.1	55	6.4	80
		1	6.6	25.1	58	4.4	53
		2	6.6	25.0	59	4.2	51
		3	6.6	24.8	60	4.0	48
		4	6.6	24.7	60	3.7	44
		5	6.6	24.7	62	3.4	41
2	15:15	surface	6.5	22.5	49	4.7	55
		1	6.5	22.4	49	4.6	54
		2	6.5	22.4	49	4.6	53
		3	6.5	22.4	49	4.5	52
		4	6.5	22.4	49	4.5	52
		5	6.5	22.4	49	4.5	52
1	15:34	surface	6.5	22.7	48	4.6	54
		1	6.5	22.6	48	4.6	53
		2	6.5	22.7	48	4.6	53
		3	6.5	22.7	48	4.5	53
		4	6.5	22.6	48	4.5	52
		5	6.5	22.7	48	4.5	52
1A	15:47	surface	6.4	22.0	46	4.6	53
		1	6.4	22.0	46	4.6	52
		2	6.4	22.0	46	4.5	52
		3	6.4	22.0	46	4.5	51
		4	6.4	22.0	46	4.5	51
		5	6.4	22.0	46	4.4	51

Date: 9/22/2021 Field Team: WTB/PMS Field Meter Model/Number: 20J104516

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:06	Surface	6.8	24.7	84	4.1	49
		1	6.8	24.7	84	4.1	49
		2	6.8	24.7	84	4.0	49
		3	6.8	24.7	84	4.0	48
		4	6.8	24.7	84	4.0	48
		5	6.8	24.7	84	3.9	47
3	8:56	Surface	6.5	22.2	48	5.8	66
4	7:08	Surface	6.6	24.0	53	4.6	55
		1	6.6	24.0	53	4.6	54
		2	6.6	23.9	52	4.4	53
		3	6.6	23.8	52	4.4	52
		4	6.5	23.7	52	4.3	51
		5	6.5	23.7	52	4.4	52
2	7:21	Surface	6.5	22.0	48	4.6	52
		1	6.5	22.0	48	4.5	52
		2	6.5	21.9	48	4.5	51
		3	6.5	21.9	48	4.5	51
		4	6.5	21.9	48	4.5	51
1	7:41	Surface	6.5	23.0	53	3.9	45
		1	6.5	22.5	50	4.2	48
		2	6.5	21.9	48	4.5	52
		3	6.5	21.9	48	4.5	52
		4	6.5	21.9	48	4.5	52
		5	6.5	21.9	48	4.5	52
1A	7:55	Surface	6.6	23.2	51	5.4	64
		1	6.6	22.7	51	4.7	54
		2	6.5	22.4	50	4.6	52
		3	6.5	22.3	50	4.5	52

Date: 9/22/2021 Field Team: WTB/PMS Field Meter Model/Number: 20J104516

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	15:44	Surface	6.9	26.2	87	5.0	62
		1	6.9	25.3	87	4.6	56
		2	6.8	25.0	87	4.4	53
		3	6.8	24.9	87	4.3	52
		4	6.8	24.9	87	4.4	53
		5	6.8	24.9	88	4.3	52
		6	6.8	24.9	87	4.2	50
3	16:25	Surface	6.5	23.1	49	5.2	61
4	15:00	Surface	6.6	25.3	58	4.5	55
		1	6.6	24.9	58	4.3	52
		2	6.6	24.8	58	4.2	50
		3	6.6	24.8	59	4.1	50
		4	6.6	24.7	59	4.0	48
		5	6.5	24.6	60	4.0	48
2	14:49	Surface	6.5	22.7	48	4.8	55
		1	6.5	22.7	48	4.7	55
		2	6.5	22.7	48	4.7	55
		3	6.5	22.7	48	4.7	55
		4	6.5	22.6	48	4.7	54
		5	6.5	22.6	48	4.7	54
1	14:33	Surface	6.5	23.1	50	4.8	55
		1	6.5	23.0	50	4.7	55
		2	6.5	23.0	50	4.7	54
		3	6.5	23.0	50	4.7	54
		4	6.5	23.0	50	4.6	54
		5	6.5	23.0	50	4.6	54
1A	14:21	Surface	6.5	22.3	47	4.4	50
		1	6.5	22.3	47	4.3	49
		2	6.4	22.3	47	4.3	50
		3	6.4	22.3	47	4.3	49
		4	6.4	22.3	47	4.3	49

JST Forebay Water Quality Data (Provided By USACE-ERDC)

September 13, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
60459	26.69	7.76	47.5	0.2
60541	26.78	7.75	47.5	2
60607	26.79	7.68	47.5	4
60636	26.77	7.67	47.3	6
61119	26.6	5.59	47.2	8
61231	24.37	0.16	45	10
61304	23.52	0.08	44.1	11
61352	23.01	0.38	43.6	12
61445	22.6	1	42.9	13
61527	22.36	1.2	42.6	14
61553	22.12	1.24	42.6	15
61613	21.91	1.28	42.3	16
61652	21.75	1.53	42.3	17
61745	21.65	2.3	42	18
61830	21.48	1.98	42.2	19
61908	21.43	1.93	42.4	20
62004	21.28	2.8	42.1	21
62046	21.21	2.2	42.2	22
62115	21.1	2.22	42.2	23
62153	21.03	1.96	42.3	24
62239	20.88	1.28	42.9	25
62349	20.64	0.4	44.5	26
62418	20.52	0.28	44.4	27
62450	20.19	0	47.1	28
62522	19.91	0	49.6	29
62548	19.56	0	57.4	30
62609	19.11	0	56.3	32
62631	18.96	0	58	33
62648	18.57	0	55.3	34
62715	18.26	0	54.2	36
62742	17.82	0	53.7	38
62808	17.36	0	52.3	40
62840	16.68	0	54.2	42
62900	15.97	0	68.5	44
Max:	26.79	7.76	68.5	44
Min:	15.97	0	42	0.2

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/8/2021	0:00:00	21.29	45.1	3.58
9/8/2021	0:15:00	21.29	44.9	3.49
9/8/2021	0:30:00	21.3	45	3.64
9/8/2021	0:45:00	21.3	44.9	3.54
9/8/2021	1:00:00	21.31	45.2	3.24
9/8/2021	1:15:00	21.27	45.1	3.25
9/8/2021	1:30:00	21.27	44.8	3.21
9/8/2021	1:45:00	21.24	44.6	3.08
9/8/2021	2:00:00	21.25	44.8	3.1
9/8/2021	2:15:00	21.25	44.8	3.05
9/8/2021	2:30:00	21.24	44.8	3.08
9/8/2021	2:45:00	21.24	44.6	2.94
9/8/2021	3:00:00	21.21	44.9	2.86
9/8/2021	3:15:00	21.21	44.6	2.9
9/8/2021	3:30:00	21.2	44.7	2.83
9/8/2021	3:45:00	21.21	44.9	2.86
9/8/2021	4:00:00	21.21	44.7	2.82
9/8/2021	4:15:00	21.18	44.9	2.8
9/8/2021	4:30:00	21.18	44.7	2.74
9/8/2021	4:45:00	21.18	44.9	2.73
9/8/2021	5:00:00	21.18	44.5	2.72
9/8/2021	5:15:00	21.18	44.6	2.72
9/8/2021	5:30:00	21.18	45	2.71
9/8/2021	5:45:00	21.16	45	2.65
9/8/2021	6:00:00	21.15	45	2.63
9/8/2021	6:15:00	21.15	45	2.63
9/8/2021	6:30:00	21.16	45	2.63
9/8/2021	6:45:00	21.15	45	2.61
9/8/2021	7:00:00	21.16	45	2.62
9/8/2021	7:15:00	21.17	44.9	2.64
9/8/2021	7:30:00	21.2	44.7	2.56
9/8/2021	7:45:00	21.22	44.7	2.58
9/8/2021	8:00:00	21.23	44.7	2.56
9/8/2021	8:15:00	21.23	44.9	2.54
9/8/2021	8:30:00	21.25	44.9	2.53
9/8/2021	8:45:00	21.23	45.3	2.54
9/8/2021	9:00:00	21.24	44.6	2.55
9/9/2021	14:45:00	21.33	47.6	4.19
9/9/2021	15:00:00	21.38	47	4.18
9/9/2021	15:15:00	21.38	47.1	4.17
9/9/2021	15:30:00	21.42	47.1	4.13

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/9/2021	15:45:00	21.35	47.1	4.16
9/9/2021	16:00:00	21.37	47.2	4.08
9/9/2021	16:15:00	21.38	47.4	4.03
9/9/2021	16:30:00	21.4	47.2	4.02
9/9/2021	16:45:00	21.35	47.2	4.03
9/9/2021	17:00:00	21.33	47.1	4.02
9/9/2021	17:15:00	21.33	47.1	4.03
9/9/2021	17:30:00	21.36	47.1	4.02
9/9/2021	17:45:00	21.36	47.2	4
9/9/2021	18:00:00	21.35	47.4	3.95
9/9/2021	18:15:00	21.31	47.2	4.47
9/9/2021	18:30:00	21.34	46.8	4.03
9/9/2021	18:45:00	21.35	46.3	3.98
9/9/2021	19:00:00	21.34	46.6	3.98
9/9/2021	19:15:00	21.34	46.6	3.13
9/9/2021	19:30:00	21.35	45.9	3.26
9/9/2021	19:45:00	21.36	46.2	3.21
9/9/2021	20:00:00	21.35	46.3	3.18
9/9/2021	20:15:00	21.38	46.2	4.28
9/9/2021	20:30:00	21.45	46.2	4.74
9/9/2021	20:45:00	21.47	46.1	4.56
9/9/2021	21:00:00	21.47	46	4.52
9/9/2021	21:15:00	21.48	46	4.43
9/9/2021	21:30:00	21.48	46	4.38
9/9/2021	21:45:00	21.48	46.1	4.3
9/9/2021	22:00:00	21.43	46.5	4.27
9/9/2021	22:15:00	21.44	46.6	4.13
9/9/2021	22:30:00	21.45	46.5	4.13
9/9/2021	22:45:00	21.45	46.5	4.09
9/9/2021	23:00:00	21.44	46.2	3.9
9/9/2021	23:15:00	21.42	45.6	3.49
9/9/2021	23:30:00	21.42	45.4	3.42
9/9/2021	23:45:00	21.39	44.9	3.22
	Max	21.48	47.6	4.74
	Min	21.15	44.5	2.53
Date	Time	Temp	SpCond	LDO
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MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/21/2021	0:00:00	21.82	46	3.72
9/21/2021	0:15:00	21.84	45.7	3.68
9/21/2021	0:30:00	21.84	45.8	3.64
9/21/2021	0:45:00	21.83	45.7	3.69
9/21/2021	1:00:00	21.82	46	3.62
9/21/2021	1:15:00	21.83	45.5	3.5
9/21/2021	1:30:00	21.83	45.5	3.41
9/21/2021	1:45:00	21.82	45.3	3.31
9/21/2021	2:00:00	21.8	45.3	3.27
9/21/2021	2:15:00	21.81	45.4	3.29
9/21/2021	2:30:00	21.82	45.3	3.17
9/21/2021	2:45:00	21.82	45.3	3.19
9/21/2021	3:00:00	21.82	45	3.12
9/21/2021	3:15:00	21.84	44.9	3.07
9/21/2021	3:30:00	21.84	44.9	3.02
9/21/2021	3:45:00	21.84	45.1	3.01
9/21/2021	4:00:00	21.83	44.9	2.99
9/21/2021	4:15:00	21.82	44.9	3.03
9/21/2021	4:30:00	21.83	45	3.01
9/21/2021	4:45:00	21.84	44.8	3
9/21/2021	5:00:00	21.85	44.8	2.96
9/21/2021	5:15:00	21.85	44.8	2.91
9/21/2021	5:30:00	21.86	44.6	2.88
9/21/2021	5:45:00	21.86	44.8	2.83
9/21/2021	6:00:00	21.86	44.6	2.84
9/21/2021	6:15:00	21.86	44.5	2.81
9/21/2021	6:30:00	21.86	44.4	2.79
9/21/2021	6:45:00	21.86	44.5	2.78
9/21/2021	7:00:00	21.87	44.6	2.78
9/21/2021	7:15:00	21.86	44.6	2.74
9/21/2021	7:30:00	21.87	44.8	2.76
9/21/2021	7:45:00	21.88	44.5	2.72
9/21/2021	8:00:00	21.9	44.6	2.69
9/21/2021	8:15:00	21.92	44.5	2.71
9/21/2021	8:30:00	21.91	44.6	2.69
9/21/2021	8:45:00	21.92	44.5	2.68
9/21/2021	9:00:00	21.91	44.8	2.64
9/21/2021	9:15:00	21.94	44.4	2.66
9/21/2021	9:30:00	21.94	44.5	2.64
9/21/2021	9:45:00	21.95	44.5	2.63
9/21/2021	10:00:00	21.95	44.6	2.62
9/21/2021	10:15:00	21.96	44.7	2.64

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/21/2021	10:30:00	21.97	44.5	2.63
9/21/2021	10:45:00	21.97	44.8	2.63
9/21/2021	11:00:00	21.97	44.9	2.61
9/21/2021	11:15:00	21.98	44.7	2.64
9/21/2021	11:30:00	21.99	44.5	2.66
9/21/2021	11:45:00	22.01	44.7	2.63
9/21/2021	12:00:00	22.03	44.8	2.66
9/21/2021	12:15:00	22.06	45.2	3.15
9/21/2021	12:30:00	21.87	46.6	4.48
9/21/2021	12:45:00	21.83	46.8	4.61
9/21/2021	13:00:00	21.82	47.2	4.66
9/21/2021	13:15:00	21.77	47.6	4.69
9/21/2021	13:30:00	21.77	47.8	4.47
9/21/2021	13:45:00	21.77	47.7	4.4
9/21/2021	14:00:00	21.8	47.8	4.39
9/21/2021	14:15:00	21.9	47.4	4.88
9/21/2021	14:30:00	21.9	47.5	4.63
9/21/2021	14:45:00	21.89	47.4	4.54
9/21/2021	15:00:00	21.89	47.2	4.57
9/21/2021	15:15:00	21.91	47.2	4.56
9/21/2021	15:30:00	21.91	47.2	4.58
9/21/2021	15:45:00	21.89	47.5	4.6
9/21/2021	16:00:00	21.91	47.4	4.59
9/21/2021	16:15:00	21.91	47.2	4.6
9/21/2021	16:30:00	21.95	47.4	4.64
9/21/2021	16:45:00	21.97	47.1	4.61
9/21/2021	17:00:00	21.96	47.1	4.59
9/21/2021	17:15:00	21.94	47.1	4.42
9/21/2021	17:30:00	21.92	47.6	4.32
9/21/2021	17:45:00	21.9	47.5	4.32
9/21/2021	18:00:00	21.92	47.6	4.28
9/21/2021	18:15:00	21.87	47.7	3.98
9/21/2021	18:30:00	21.87	48.1	3.87
9/21/2021	18:45:00	21.87	47.7	3.7
9/21/2021	19:00:00	21.89	47.7	3.65
9/21/2021	19:15:00	21.91	47.6	4.02
9/21/2021	19:30:00	21.82	47.9	3.92
9/21/2021	19:45:00	21.84	47.9	3.88
9/21/2021	20:00:00	21.86	47.7	3.92
9/21/2021	20:15:00	21.87	47.7	4.09
9/21/2021	20:30:00	21.87	47	4.65
9/21/2021	20:45:00	21.87	47.2	4.7
9/21/2021	21:00:00	21.88	47.1	4.72
9/21/2021	21:15:00	21.88	47.1	4.89

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/21/2021	21:30:00	21.9	47.1	4.86
9/21/2021	21:45:00	21.91	47.2	4.91
9/21/2021	22:00:00	21.9	46.8	5.19
9/21/2021	22:15:00	21.9	46.8	5.17
9/21/2021	22:30:00	21.91	47.1	4.7
9/21/2021	22:45:00	21.92	47.2	4.24
9/21/2021	23:00:00	21.92	47.2	4.57
9/21/2021	23:15:00	21.91	47.1	4.57
9/21/2021	23:30:00	21.93	47	4.46
9/21/2021	23:45:00	21.94	46.5	4.13
9/22/2021	0:00:00	21.91	46.5	3.94
9/22/2021	0:15:00	21.91	46.3	3.95
9/22/2021	0:30:00	21.92	46.1	3.77
9/22/2021	0:45:00	21.91	45.8	3.65
9/22/2021	1:00:00	21.9	45.7	3.56
9/22/2021	1:15:00	21.92	45.7	3.36
9/22/2021	1:30:00	21.91	45.3	3.28
9/22/2021	1:45:00	21.88	45.3	3.21
9/22/2021	2:00:00	21.88	45.4	3.18
9/22/2021	2:15:00	21.88	45.7	3.31
9/22/2021	2:30:00	21.89	45.7	3.38
9/22/2021	2:45:00	21.89	45.9	3.34
9/22/2021	3:00:00	21.89	45.7	3.31
9/22/2021	3:15:00	21.88	45.4	3.06
9/22/2021	3:30:00	21.86	45.5	2.98
9/22/2021	3:45:00	21.86	45.3	2.96
9/22/2021	4:00:00	21.86	45.4	2.98
9/22/2021	4:15:00	21.87	45.3	2.87
9/22/2021	4:30:00	21.88	45.7	3.13
9/22/2021	4:45:00	21.87	45.5	3.09
9/22/2021	5:00:00	21.87	45.5	3.06
9/22/2021	5:15:00	21.86	45.3	2.94
9/22/2021	5:30:00	21.85	45.1	2.79
9/22/2021	5:45:00	21.85	45.3	2.79
9/22/2021	6:00:00	21.86	45.3	2.74
9/22/2021	6:15:00	21.86	45	2.72
9/22/2021	6:30:00	21.85	45.1	2.71
9/22/2021	6:45:00	21.86	44.9	2.7
9/22/2021	7:00:00	21.87	45	2.79
9/22/2021	7:15:00	21.88	45.2	2.89
9/22/2021	7:30:00	21.88	45.2	2.83
9/22/2021	7:45:00	21.88	45	2.77
9/22/2021	8:00:00	21.88	45.2	2.83
9/22/2021	8:15:00	21.89	45.2	2.79

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/22/2021	8:30:00	21.92	45.2	2.74
9/22/2021	8:45:00	21.91	44.9	2.73
9/22/2021	9:00:00	21.91	44.9	2.69
9/22/2021	9:15:00	21.92	44.8	2.71
9/22/2021	9:30:00	21.93	44.8	2.7
9/22/2021	9:45:00	22	44.8	2.73
9/22/2021	10:00:00	21.99	44.7	2.7
9/22/2021	10:15:00	22.06	44.8	2.8
9/22/2021	10:30:00	22.07	44.7	2.84
9/22/2021	10:45:00	22.08	44.8	2.82
9/22/2021	11:00:00	22.08	44.5	2.85
9/22/2021	11:15:00	22.08	44.9	2.78
9/22/2021	11:30:00	22.09	44.7	2.82
9/22/2021	11:45:00	22.12	44.9	2.84
9/22/2021	12:00:00	22.15	44.8	2.83
9/22/2021	12:15:00	22.06	46	3.69
9/22/2021	12:30:00	21.89	47.2	3.15
9/22/2021	12:45:00	21.89	47.1	3.1
9/22/2021	13:00:00	21.88	47.3	3.03
9/22/2021	13:15:00	21.87	47.3	4.14
9/22/2021	13:30:00	21.86	47.7	3.85
9/22/2021	13:45:00	21.85	47.7	3.8
9/22/2021	14:00:00	21.86	47.9	3.78
9/22/2021	14:15:00	21.93	47	4.55
9/22/2021	14:30:00	21.97	47.2	3.95
9/22/2021	14:45:00	21.89	47.4	3.84
9/22/2021	15:00:00	21.91	47.4	3.81
9/22/2021	15:15:00	21.99	47.2	4.41
9/22/2021	15:30:00	22.02	47.1	4.74
9/22/2021	15:45:00	22	47.1	4.71
9/22/2021	16:00:00	21.99	47.1	4.72
9/22/2021	16:15:00	22.03	47.1	4.78
9/22/2021	16:30:00	22.08	47.1	4.79
9/22/2021	16:45:00	22.13	47.5	4.79
9/22/2021	17:00:00	22.14	47.5	4.8
9/22/2021	17:15:00	22.15	47.7	4.71
9/22/2021	17:30:00	22.18	47.4	4.76
9/22/2021	17:45:00	22.2	47.6	4.75
9/22/2021	18:00:00	22.18	47.8	4.73
9/22/2021	18:15:00	22.16	47.5	4.22
9/22/2021	18:30:00	22.13	48.3	4.02
9/22/2021	18:45:00	22.18	48.3	3.94
9/22/2021	19:00:00	22.25	48.5	3.99
9/22/2021	19:15:00	22.27	48.4	4.13

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
9/22/2021	19:30:00	22.32	48.2	4.54
9/22/2021	19:45:00	22.36	47.7	4.64
9/22/2021	20:00:00	22.39	48	4.61
9/22/2021	20:15:00	22.37	48	4.72
9/22/2021	20:30:00	22.26	47.2	4.67
9/22/2021	20:45:00	22.22	47.2	4.55
9/22/2021	21:00:00	22.21	47.2	4.56
9/22/2021	21:15:00	22.23	47	4.86
9/22/2021	21:30:00	22.21	46.9	5.04
9/22/2021	21:45:00	22.22	47	5.17
9/22/2021	22:00:00	22.21	46.8	5.16
9/22/2021	22:15:00	22.2	46.9	5.2
9/22/2021	22:30:00	22.21	46.9	5.34
9/22/2021	22:45:00	22.22	46.7	5.33
9/22/2021	23:00:00	22.25	46.9	5.38
9/22/2021	23:15:00	22.28	47.1	5.36
9/22/2021	23:30:00	22.3	46.8	5.44
9/22/2021	23:45:00	22.32	46.9	5.36
	Max	22.39	48.5	5.44
	Min	21.77	44.4	2.61

9/8/	2021
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					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185.1	158.8	9050	6306
2:00	61	184.9	158.8	8861	6230
3:00	61	184.7	158.8	8737	6217
4:00	61	184.5	158.8	8591	6158
5:00	61	184.3	158.8	8539	6077
6:00	61	183.8	158.8	8238	6062
7:00	61	183.7	158.8	8197	5966
8:00	61	183.4	158.8	8088	6007
9:00	61	183.2	158.8	8064	6004
10:00	61	183	158.8	7849	5881
11:00	61	182.6	158.7	7935	5764
12:00	356	182.3	159	8871	6741
13:00	3926	182.3	158.1	8527	6675
14:00	9016	182.5	158.7	7310	5565
15:00	13052	182.8	159.1	9709	7404
16:00	29952	183.4	159.3	9962	7570
17:00	33144	184.3	159.3	10480	7777
18:00	33144	184.2	159.3	10999	8008
19:00	29069	185.2	159.3	11544	8223
20:00	12863	185.8	159.4	11808	8320
21:00	6122	186.3	159.5	11788	8142
22:00	2672	186.4	159.5	11562	7959
23:00	62	186.2	159.5	11135	7649
24:00:00	62	186	159.4	10629	7323
daily avg.	7252	184	159	9436	6835
Total Generation		226473]	
Projected discharg	<u>e</u>	6215			
Thurmond dischar	ge	7252			

9/9/2021

Thurmond discharge

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	61	185.8	159.1	9708	6713
2:00	61	185.6	159.1	9421	6491
3:00	61	185.4	159	9347	5834
4:00	61	185.2	158.9	8139	5627
5:00	61	185.1	158.7	7418	5161
6:00	61	185.1	158.7	7324	5092
7:00	61	184.9	158.7	7087	5013
8:00	61	184.8	158.4	6084	4347
9:00	61	184.5	158.4	5986	4296
10:00	61	184.4	158.4	5914	4324
11:00	61	184.2	158.4	6058	4405
12:00	61	184.1	158.4	5977	4337
13:00	1094	183.9	158.6	6858	5037
14:00	18862	183.7	158.6	6964	5158
15:00	19892	184.1	158.7	7678	5523
16:00	26662	184.6	158.9	8703	6216
17:00	26922	185.2	159	9571	6744
18:00	26924	185.8	159.1	10154	7048
19:00	26342	186.3	159	11008	7544
20:00	4650	186.7	159.3	11322	7684
21:00	2672	186.7	159.5	11502	7852
22:00	62	186.6	159.7	11357	7728
23:00	62	186.2	159.6	10940	7572
24:00:00	62	186	159.5	10892	7438
daily avg.	6456	185	159	8559	5966
Total Generation		205412]	
Projected discharg	<u>e</u>	7164			

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6456

9/21/2021

					Estimated Total
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	CFS
1:00	62	186.3	159.5	11184	7703
2:00	62	186.1	159.4	10696	7378
3:00	62	185.8	159.2	10417	7150
4:00	62	185.7	159.1	9516	6553
5:00	61	185.5	159.1	9384	6498
6:00	61	185.3	159.1	9402	6609
7:00	61	185.1	159.1	9406	6621
8:00	61	184.9	159.1	9397	6663
9:00	61	184.7	159.1	9448	6719
10:00	61	184.5	159	9290	6643
11:00	61	184.3	159.1	9451	6785
12:00	356	184.1	159	9483	6879
13:00	4104	183.8	159.3	9933	7276
14:00	13517	183.6	159.2	10024	7397
15:00	30914	183.5	159.3	10071	7453
16:00	31374	183.7	159.3	10229	7617
17:00	31444	184.2	159.3	10550	7680
18:00	30244	185	159.3	10785	7732
19:00	28534	185.7	159.4	10991	7919
20:00	15472	186.6	159.5	11859	8097
21:00	6782	187	159.7	11778	7957
22:00	62	187.2	159.8	11520	7730
23:00	62	187.2	159.9	10985	7326
24:00:00	62	187	159.7	8816	6239
daily avg.	8067	185	159	10192	7193
Total Generation		244615]	
Projected discharge	1	8825			
Thurmond discharg	<u>e</u>	8067			

9/22/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	62	186.8	159.4	8628	5775
2:00	62	186.6	159.4	8445	5553
3:00	62	186.4	159.2	8262	5538
4:00	62	186.3	159	7532	4091
5:00	62	186.1	158.8	6837	4553
6:00	62	186	158.7	6121	4095
7:00	62	185.9	158.3	4138	2702
8:00	62	185.8	158.2	4507	3035
9:00	62	185.7	158.4	5201	3565
10:00	62	185.6	158.4	5485	3770
11:00	62	185.4	158.8	8167	5595
12:00	62	185.2	159.1	9609	6702
13:00	590	184.9	159.1	9694	6906
14:00	9275	184.7	159.1	10069	7119
15:00	13877	184.9	159.1	10328	7336
16:00	28840	185.2	159.2	10563	7510
17:00	31200	185.6	159.2	10846	7593
18:00	31610	186.3	159.3	11557	7979
19:00	31310	186.8	159.6	11811	8066
20:00	19942	187.2	159.8	11876	7964
21:00	12407	187.5	159.9	11866	7927
22:00	5497	187.5	160	11770	7872
23:00	2790	187.4	160	11678	7805
24:00:00	2710	187.2	159.8	11035	7387
daily avg.	7950	186	159	9001	6102
Total Generation		216025]	
Projected discharg	<u>e</u>	8798			
Thurmond dischar	<u>ze</u>	7950			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
9/8/2021 0:00	5820
9/8/2021 1:00	5790
9/8/2021 2:00	5770
9/8/2021 3:00	5760
9/8/2021 4:00	5750
9/8/2021 5:00	5740
9/8/2021 6:00	5740
9/8/2021 7:00	5730
9/8/2021 8:00	5730
9/8/2021 9:00	5720
9/8/2021 10:00	5720
9/8/2021 11:00	5710
9/8/2021 12:00	5700
9/8/2021 13:00	5690
9/8/2021 14:00	5670
9/8/2021 15:00	5670
9/8/2021 16:00	5690
9/8/2021 17:00	6730
9/8/2021 18:00	7140
9/8/2021 19:00	7370
9/8/2021 20:00	7580
9/8/2021 21:00	7800
9/8/2021 22:00	7880
9/8/2021 22:00	7980
9/9/2021 23:00	7930
9/9/2021 0:00	8010
9/9/2021 2:00	8120
9/9/2021 2:00	8370
9/9/2021 3:00	8260
9/9/2021 5:00	8180
9/9/2021 5:00	8360
9/9/2021 0:00	8460
9/9/2021 9:00	7890
9/9/2021 8:00	7850
9/9/2021 9.00	6080
9/9/2021 10:00 9/9/2021 11:00	6850
9/9/2021 11:00	6740
9/9/2021 12:00	6100
9/9/2021 13:00	6100
9/9/2021 14.00	5000
0/0/2021 15:00	5/60
0/0/2021 10:00	5050
0/0/2021 1/:00	5510
9/9/2021 18:00	5400
9/9/2021 19:00	5300
9/9/2021 20:00	5210
9/9/2021 21:00	5160
9/9/2021 22:00	5130
9/9/2021 23:00	5130
9/21/2021 0:00	10300

Date-Time	Flow (cfs)
9/21/2021 1:00	10400
9/21/2021 2:00	10900
9/21/2021 3:00	11200
9/21/2021 4:00	11200
9/21/2021 5:00	11600
9/21/2021 6:00	10800
9/21/2021 7:00	10500
9/21/2021 8:00	10200
9/21/2021 9:00	9890
9/21/2021 10:00	9940
9/21/2021 11:00	9340
9/21/2021 12:00	9180
9/21/2021 13:00	8940
9/21/2021 14:00	8610
9/21/2021 15:00	8270
9/21/2021 16:00	8120
9/21/2021 17:00	8040
9/21/2021 18:00	7910
9/21/2021 19:00	7820
9/21/2021 20:00	7680
9/21/2021 20:00	7690
9/21/2021 22:00	7720
9/21/2021 22:00	7680
9/22/2021 23:00	8520
9/22/2021 0:00	9070
9/22/2021 2:00	9730
9/22/2021 2:00	10200
9/22/2021 3:00	10300
9/22/2021 4:00	10400
9/22/2021 5:00	10400
9/22/2021 0.00	10100
9/22/2021 7:00	10000
9/22/2021 8:00	0680
9/22/2021 9.00	9080
9/22/2021 10:00	8950
9/22/2021 11:00	8120
9/22/2021 12:00	7660
0/22/2021 13:00	7320
0/22/2021 14.00	7070
0/22/2021 15.00	6890
9/22/2021 10:00	6670
9/22/2021 17:00	6550
9/22/2021 18:00	6470
9/22/2021 19:00	7670
9/22/2021 20:00	7070
9/22/2021 21:00	7800
9/22/2021 22:00	8260
9/22/2021 23:00	8560

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary October 2021

	<u>Ten</u>	nperatu (°C)	<u>re</u>	Dissolved	Dissolved Oxygen (mg/L)		
Location							
Thurmond Forebay (Site 8)							
(10/10/21)	16.26	_	24.86	0.0	_	7.1	
Thurmond Tailrace (Site 7)*							
(10/04/21 - 10/05/21)		—			—		
Stevens Creek Res. (Site 6)	21.87	—	22.25	4.2	—	4.9	
(10/04/21 - 10/05/21)							
Stevens Creek Res. (Site 1)	21.83	—	22.43	4.5	—	4.7	
(10/04/21 - 10/05/21)							
Stevens Creek Res. (Site 2)	22.13	_	22.62	4.4	_	5.1	
(10/04/21 - 10/05/21)							
Stevens Creek Tailrace (Site 3)	22.23	—	22.69	5.7	_	6.2	
(10/04/21 - 10/05/21)							
Stevens Creek (Site 5)	23.48	—	24.18	3.5	_	4.2	
(10/04/21 - 10/05/21)							
Stevens Creek (Site 4)	23.57	—	24.87	4.4	—	5.0	
(10/04/21 - 10/05/21)							

Date: 10/4/2021 Field Team: DRH/KYA Field Meter Model/Number: 17K102282

SOND: 20J104515

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:38	surface	6.7	23.5	93	3.7	44
		1M	6.7	23.5	93	3.7	44
		2M	6.7	23.5	93	3.7	44
		3M	6.7	23.5	93	3.7	43
3	7:10	1M	6.4	22.2	47	5.7	66
4	7:45	surface	6.6	24.2	61	4.9	58
		1M	6.6	24.2	62	4.8	58
		2M	6.6	24.2	61	4.8	58
		3M	6.6	24.2	61	4.8	57
		4M	6.6	24.1	61	4.8	57
		5M	6.6	24.1	60	4.7	55
2	8:12	surface	6.4	22.2	47	4.4	51
		1M	6.4	22.2	47	4.4	51
		2M	6.4	22.2	47	4.4	50
		3M	6.4	22.2	47	4.4	50
		4M	6.4	22.2	47	4.4	50
1	8:36	surface	6.4	21.9	47	4.7	53
		1M	6.4	21.8	47	4.7	53
		2M	6.4	21.8	47	4.7	53
1A	8:48	surface	6.4	21.9	48	4.5	52
		1M	6.4	21.9	48	4.5	51
		2M	6.4	21.9	48	4.5	48

Date: 10/4/2021 Field Team: DRH/KYA Field Meter Model/Number: 17K102282

SOND: 20J104515

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	13:32	surface	6.8	23.6	94	3.8	45
		1M	6.8	23.6	94	3.8	45
		2M	6.8	23.5	94	3.8	45
		3M	6.8	23.5	94	3.8	44
		4M	6.8	23.5	94	3.7	44
3	14:15	1M	6.5	22.7	48	6.1	70
4	2:49	surface	6.6	24.6	66	4.8	57
		1M	6.6	24.9	67	4.6	55
		2M	6.6	24.3	65	4.6	55
		3M	6.5	23.6	56	4.4	52
2	3:06	surface	6.4	22.6	48	4.9	56
		1M	6.4	22.6	48	4.8	56
		2M	6.4	22.6	48	4.8	56
		3M	6.4	22.5	48	4.8	56
1	3:29	surface	6.4	22.4	47	4.7	55
		1M	6.4	22.4	47	4.7	55
		2M	6.4	22.4	47	4.7	54
		3M					
		4M					
1A	15:48	surface	6.4	22.2	47	4.9	56
		1M	6.4	22.2	47	4.8	56
		2M	6.4	22.2	47	4.8	55

Date: 10/5/2021 Field Team: DRH/KYA Field Meter Model/Number: 17K102282 SOND: 20J104515

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	6:38	surface	6.8	23.6	94	3.5	42
		1M	6.8	23.6	94	3.5	42
		2M	6.8	23.6	93	3.5	41
		3M	6.8	23.6	93	3.5	41
		4M	6.8	23.6	93	3.5	41
3	9:12	1M	6.4	22.4	47	6.1	70
4	7:15	surface	6.6	23.9	60	4.9	58
		1M	6.6	23.9	59	4.8	57
		2M	6.6	23.9	59	4.8	57
		3M	6.6	23.9	59	4.8	57
		4M	6.6	23.9	58	4.8	57
		5M	6.6	23.8	58	4.7	55
2	7:55	surface	6.4	22.1	47	4.6	53
		1M	6.4	22.1	47	4.6	53
		2M	6.4	22.1	47	4.6	53
		3M	6.4	22.1	47	4.6	53
		4M	6.4	22.1	47	4.6	53
1	7:54	surface	6.4	22.0	47	4.5	51
		1M	6.4	21.9	47	4.5	51
		2M	6.4	21.9	47	4.5	51
		3M					
		4M					
1A	8:06	surface	6	21.9	48	4.3	49
		1M	6	21.9	48	4.2	48
		2M	6	21.9	48	4.2	48

Date: 10/5/2021 Field Team: DRH/KYA Field Meter Model/Number: 17K102282 SOND: 20J104515

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	13:17	surface	6.8	24.2	94	4.2	48
		1M	6.8	23.8	94	3.9	47
		2M	6.8	23.7	94	3.8	45
		3M	6.8	23.6	94	3.8	45
		4M	6.8	23.6	94	3.7	44
3	14:00	1M	6.5	22.7	47	6.2	71
4	15:14	surface	6.6	24.9	66	5.0	61
		1M	6.6	24.8	66	4.9	58
		2M	6.6	24.6	66	4.7	56
		3M	6.6	24.5	64	4.7	56
		4M	6.6	24.0	61	4.5	54
		5M	6.5	23.6	57	4.4	51
2	14:54	surface	6.4	22.6	47	5.1	59
		1M	6.4	22.6	47	5.1	59
		2M	6.4	22.6	47	5.1	59
		3M	6.4	22.6	47	5.1	59
1	14:21	surface	6.4	22.4	47	4.6	53
		1M	6.4	22.4	47	4.6	53
		2M	6.4	22.4	47	4.6	53
		3M	6.4	22.4	47	4.6	53
		4M	6.4	22.4	47	4.5	52
1A	14:32	surface	6.4	22.2	48	4.5	52
		1M	6.4	22.2	48	4.5	52
		2M	6.4	22.2	48	4.5	52

JST Forebay Water Quality Data (Provided By USACE-ERDC)

October 10, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
122859	24.86	7.04	48.2	0.2
122919	24.75	7.05	47.9	2
122942	24.69	7.08	48	4
123001	24.66	7.08	48.1	6
123028	24.66	7.08	48	8
123053	24.63	7	48	10
123134	24.58	6.8	48	12
123216	24.56	6.76	47.8	14
123256	23.46	0.65	45.5	15
123321	22.9	0.78	44.2	16
123347	22.71	0.88	44.3	17
123422	22.45	1.13	43.9	18
123449	22.29	1.08	43.8	19
123529	22.21	1.73	43.2	20
123556	22.16	1.83	42.8	21
123629	22.02	0.99	43.3	22
123655	21.98	0.78	43.4	23
123719	21.96	0.67	43.3	24
123745	21.86	0.36	43.6	25
123802	21.83	0.25	43.6	26
123817	21.56	0.01	46.6	28
123834	21.17	0	51.1	30
123850	20.96	0	58.2	32
123908	20.35	0	64.8	34
123930	19.9	0	62	36
123949	19.21	0	61.8	38
124009	18.39	0	68.4	40
124026	17.7	0	69.4	42
124051	16.57	0	84.4	44
124104	16.28	0	90.2	46
124114	16.26	0	91.3	46.2
Max:	24.86	7.08	91.3	46.2
Min:	16.26	0	42.8	0.2

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
10/4/2021	0:00:00	22.03	46.2	3.29
10/4/2021	0:15:00	22.03	46.1	3.11
10/4/2021	0:30:00	22.02	46	2.93
10/4/2021	0:45:00	22.02	46	2.72
10/4/2021	1:00:00	22.02	46	2.61
10/4/2021	1:15:00	22.02	45.7	2.58
10/4/2021	1:30:00	22.01	45.7	2.53
10/4/2021	1:45:00	22.01	45.7	2.43
10/4/2021	2:00:00	22	45.8	2.44
10/4/2021	2:15:00	22	45.6	2.34
10/4/2021	2:30:00	21.99	45.7	2.35
10/4/2021	2:45:00	21.99	45.6	2.3
10/4/2021	3:00:00	22	45.3	2.19
10/4/2021	3:15:00	21.99	45.2	2.2
10/4/2021	3:30:00	21.99	45.4	2.15
10/4/2021	3:45:00	21.99	45.3	2.14
10/4/2021	4:00:00	21.99	45.4	2.13
10/4/2021	4:15:00	21.98	45.4	2.14
10/4/2021	4:30:00	21.98	45.4	2.13
10/4/2021	4:45:00	21.98	45.3	2.13
10/4/2021	5:00:00	21.97	45.4	2.27
10/4/2021	5:15:00	21.97	45.4	2.1
10/4/2021	5:30:00	21.97	45	2.1
10/4/2021	5:45:00	21.95	45.3	2.29
10/4/2021	6:00:00	21.96	45.3	2.14
10/4/2021	6:15:00	21.96	45.4	2.12
10/4/2021	6:30:00	21.95	45.4	2.17
10/4/2021	6:45:00	21.96	45.4	2.12
10/4/2021	7:00:00	21.97	45.2	2.07
10/4/2021	7:15:00	21.97	44.9	2.09
10/4/2021	7:30:00	21.99	45.2	2.03
10/4/2021	7:45:00	21.97	45	2.15
10/4/2021	8:00:00	21.98	45.3	2.1
10/4/2021	8:15:00	22.05	44.9	2.94
10/4/2021	8:30:00	22.05	44.9	3.54
10/4/2021	8:45:00	22.1	44.7	4.01
10/4/2021	9:00:00	22.13	44.6	4.11
10/4/2021	9:15:00	22.11	44.7	4.05
10/4/2021	9:30:00	22.25	44.7	3.93
10/4/2021	9:45:00	22.18	44.7	4
10/4/2021	10:00:00	22.32	44.9	4.19
, ,				

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
10/4/2021	10:15:00	22.22	44.8	3.48
10/4/2021	10:30:00	22.22	44.6	3.41
10/4/2021	10:45:00	22.22	44.8	3.42
10/4/2021	11:00:00	22.24	44.8	3.49
10/4/2021	11:15:00	22.27	45.4	2.99
10/4/2021	11:30:00	22.26	46.4	2.95
10/4/2021	11:45:00	22.27	46.9	3.27
10/4/2021	12:00:00	22.29	46.7	3.31
10/4/2021	12:15:00	22.26	46.8	4.83
10/4/2021	12:30:00	22.26	46.7	5.29
10/4/2021	12:45:00	22.26	46.4	5.31
10/4/2021	13:00:00	22.28	46.4	5.28
10/4/2021	13:15:00	22.28	46.9	4.96
10/4/2021	13:30:00	22.27	46.7	4.89
10/4/2021	13:45:00	22.28	46.8	4.9
10/4/2021	14:00:00	22.28	46.9	4.85
10/4/2021	14:15:00	22.28	46.5	5.14
10/4/2021	14:30:00	22.27	46.5	5.13
10/4/2021	14:45:00	22.26	46.5	5.09
10/4/2021	15:00:00	22.24	46.8	5.12
10/4/2021	15:15:00	22.26	47.1	4.36
10/4/2021	15:30:00	22.25	47.2	4.48
10/4/2021	15:45:00	22.29	46.5	4.68
10/4/2021	16:00:00	22.23	47	4.71
10/4/2021	16:15:00	22.21	47.3	4.16
10/4/2021	16:30:00	22.19	47.8	3.85
10/4/2021	16:45:00	22.19	47.8	3.74
10/4/2021	17:00:00	22.15	47.9	3.69
10/4/2021	17:15:00	22.15	48.1	3.82
10/4/2021	17:30:00	22.17	47.9	3.92
10/4/2021	17:45:00	22.14	48.2	3.91
10/4/2021	18:00:00	22.1	48	3.89
10/4/2021	18:15:00	22.17	47.9	4.19
10/4/2021	18:30:00	22.14	47.7	4.55
10/4/2021	18:45:00	22.14	47.2	4.6
10/4/2021	19:00:00	22.12	47.1	4.65
10/4/2021	19:15:00	22.12	47.4	4.28
10/4/2021	19:30:00	22.09	47.4	3.89
10/4/2021	19:45:00	22.11	47.5	3.89
10/4/2021	20:00:00	22.12	47.4	3.87
10/4/2021	20:15:00	22.16	47.4	4.58
10/4/2021	20:30:00	22.17	47.3	3.4
10/4/2021	20:45:00	22.15	47.2	3.16
10/4/2021	21:00:00	22.14	47.3	3.08

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
10/4/2021	21:15:00	22.15	47	3.69
10/4/2021	21:30:00	22.2	47	3.99
10/4/2021	21:45:00	22.2	47	4.05
10/4/2021	22:00:00	22.19	47.3	4.04
10/4/2021	22:15:00	22.18	46.6	4.09
10/4/2021	22:30:00	22.18	47	4.07
10/4/2021	22:45:00	22.17	46.9	4.04
10/4/2021	23:00:00	22.17	46.9	3.96
10/4/2021	23:15:00	22.17	47	3.99
10/4/2021	23:30:00	22.16	46.9	3.97
10/4/2021	23:45:00	22.14	46.9	4.02
10/5/2021	0:00:00	22.14	46.9	3.99
10/5/2021	0:15:00	22.12	46.8	3.54
10/5/2021	0:30:00	22.12	46.5	3.35
10/5/2021	0:45:00	22.1	46.2	3.01
10/5/2021	1:00:00	22.09	46.2	2.95
10/5/2021	1:15:00	22.08	46.1	2.73
10/5/2021	1:30:00	22.07	45.8	2.51
10/5/2021	1:45:00	22.06	46	2.45
10/5/2021	2:00:00	22.05	45.8	2.37
10/5/2021	2:15:00	22.04	45.7	2.37
10/5/2021	2:30:00	22.03	45.7	2.28
10/5/2021	2:45:00	22.03	45.7	2.19
10/5/2021	3:00:00	22.03	45.6	2.14
10/5/2021	3:15:00	22.02	45.7	2.1
10/5/2021	3:30:00	22.02	45.4	2.08
10/5/2021	3:45:00	22.03	45.6	2.04
10/5/2021	4:00:00	22.03	45.4	2
10/5/2021	4:15:00	22.02	45.4	2
10/5/2021	4:30:00	22.02	45.7	2
10/5/2021	4:45:00	22.02	45.4	2.01
10/5/2021	5:00:00	22.01	45.3	2
10/5/2021	5:15:00	22.01	45.3	1.96
10/5/2021	5:30:00	22.01	45.4	1.98
10/5/2021	5:45:00	22	45.4	2.04
10/5/2021	6:00:00	22	45.4	1.97
10/5/2021	6:15:00	22.01	45.2	1.92
10/5/2021	6:30:00	22	45.3	2.09
10/5/2021	6:45:00	21.99	45.2	2.14
10/5/2021	7:00:00	22	45.3	1.97
10/5/2021	7:15:00	22.01	45.3	1.82
10/5/2021	7:30:00	22	45.4	1.96
10/5/2021	7:45:00	22.01	45.6	1.97
10/5/2021	8:00:00	22.01	45.6	1.93

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
10/5/2021	8:15:00	22.02	45.2	2.02
10/5/2021	8:30:00	22.02	45.3	2.01
10/5/2021	8:45:00	22.04	45.1	1.96
10/5/2021	9:00:00	22.06	45.2	1.93
10/5/2021	9:15:00	22.08	45.5	1.88
10/5/2021	9:30:00	22.11	45.3	1.88
10/5/2021	9:45:00	22.11	45.2	1.9
10/5/2021	10:00:00	22.12	45.3	1.91
10/5/2021	10:15:00	22.2	45.1	1.91
10/5/2021	10:30:00	22.19	45.2	1.94
10/5/2021	10:45:00	22.22	45.2	1.94
10/5/2021	11:00:00	22.22	45.2	1.97
10/5/2021	11:15:00	22.25	45.1	1.99
10/5/2021	11:30:00	22.27	45.4	1.99
10/5/2021	11:45:00	22.32	45.4	2.01
10/5/2021	12:00:00	22.31	45.3	2.01
10/5/2021	12:15:00	22.43	45.5	2.81
10/5/2021	12:30:00	22.3	46.3	5.17
10/5/2021	12:45:00	22.32	46.2	5.23
10/5/2021	13:00:00	22.24	46.3	4.85
10/5/2021	13:15:00	22.2	46.5	4.99
10/5/2021	13:30:00	22.16	46.8	4.85
10/5/2021	13:45:00	22.15	46.8	4.83
10/5/2021	14:00:00	22.16	46.8	4.8
10/5/2021	14:15:00	22.11	47	4.04
10/5/2021	14:30:00	22.11	47.1	3.92
10/5/2021	14:45:00	22.12	47.1	3.95
10/5/2021	15:00:00	22.13	47.3	3.94
10/5/2021	15:15:00	22.19	47.4	4.15
10/5/2021	15:30:00	22.19	47.3	4.55
10/5/2021	15:45:00	22.12	47.8	4.35
10/5/2021	16:00:00	22.16	47.7	4.27
10/5/2021	16:15:00	22.14	47.4	4.01
10/5/2021	16:30:00	22.15	47.7	3.81
10/5/2021	16:45:00	22.2	47.9	3.73
10/5/2021	17:00:00	22.18	47.7	3.72
10/5/2021	17:15:00	22.19	47.7	4.11
10/5/2021	17:30:00	22.15	47.2	4.67
10/5/2021	17:45:00	22.15	47.5	4.67
10/5/2021	18:00:00	22.15	47.3	4.67
10/5/2021	18:15:00	22.16	47.7	4.21
10/5/2021	18:30:00	22.15	47.2	4.08
10/5/2021	18:45:00	22.16	47.3	4.05
10/5/2021	19:00:00	22.18	47	4.02

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
10/5/2021	19:15:00	22.12	47.5	3.99
10/5/2021	19:30:00	22.15	47.2	4.42
10/5/2021	19:45:00	22.17	47	4.63
10/5/2021	20:00:00	22.15	47.2	4.52
10/5/2021	20:15:00	22.19	47	4.74
10/5/2021	20:30:00	22.19	46.9	5.49
10/5/2021	20:45:00	22.21	47	4.71
10/5/2021	21:00:00	22.22	47.3	4.35
10/5/2021	21:15:00	22.22	47.4	4.05
10/5/2021	21:30:00	22.21	47.2	4.19
10/5/2021	21:45:00	22.19	47	4.71
10/5/2021	22:00:00	22.19	47.3	4.63
10/5/2021	22:15:00	22.19	47.2	4.66
10/5/2021	22:30:00	22.18	47.2	4.67
10/5/2021	22:45:00	22.18	47	4.67
10/5/2021	23:00:00	22.18	47	4.66
10/5/2021	23:15:00	22.17	47.2	4.7
10/5/2021	23:30:00	22.17	47.2	4.47
10/5/2021	23:45:00	22.17	47	4.46
	Max	22.43	48.2	5.49
	Min	21.95	44.6	1.82

	Thursday Discharge		T - 11	C	Estimated
Hour	Inurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185.2	158.7	7445	5166
2:00	0	185	158.6	/332	5104
3:00	0	184.9	158.6	7184	5124
4:00	0	184.7	158.6	7108	5107
5:00	0	184.5	158.6	6987	5011
6:00	0	184.4	158.6	6800	4895
7:00	0	184.2	158.6	6687	4875
8:00	0	184	158.6	6431	4867
9:00	0	183.8	158.6	6500	4776
10:00	0	183.6	158.6	6320	4137
11:00	0	183.5	158.5	6275	4735
12:00	295	183.3	158.6	6089	4786
13:00	4175	183.1	158.5	6240	4782
14:00	6510	183.1	158.5	6279	4767
15:00	7795	183.2	158.6	6295	4744
16:00	10695	183.4	158.6	6460	4822
17:00	20535	183.6	158.5	8570	4838
18:00	23330	184	158.8	7034	6188
19:00	21750	184.6	158.5	6368	5025
20:00	11364	185.3	158.5	7513	4681
21:00	8760	185.7	158.7	7511	5121
22:00	3307	185.6	158.7	7577	5180
23:00	0	185.8	158.7	7573	5190
24:00:00	0	185.6	158.7	7549	5179
daily avg.	4938	184	159	6922	4963
Total Generation		166127]	
Projected discharge	<u>e</u>	5445			
Thurmond discharg	<u>ge</u>	4938			

10/4/2021

10/5/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185.4	158.6	7342	5099
2:00	0	185.2	158.6	7338	5086
3:00	0	185.1	158.6	7217	5034
4:00	0	184.9	158.6	7066	5088
5:00	0	184.8	158.5	7532	4936
6:00	0	184.6	158.7	7313	5014
7:00	0	184.4	158.7	7272	5244
8:00	0	184.2	158.6	7191	5286
9:00	0	184.1	158.6	7041	5111
10:00	0	183.8	158.6	6904	5165
11:00	0	183.6	158.6	6763	5086
12:00	0	183.4	158.6	6711	5077
13:00	0	183.1	158.6	6655	5034
14:00	3430	183	158.7	6547	5033
15:00	11550	183	158.6	6561	4979
16:00	13512	183.2	158.6	6638	4997
17:00	21740	183.7	158.6	7021	5172
18:00	23510	184.1	158.6	7360	5279
19:00	16420	184.7	158.6	7996	5626
20:00	14430	185.2	158.8	8224	5722
21:00	11980	185.6	159	9946	6903
22:00	0	185.8	159	9965	6860
23:00	0	185.7	158.9	8061	5493
24:00:00	0	185.5	158.7	7797	5370
daily avg.	4857	184	159	7436	5321
Total Generation		178461]	
Projected discharg	<u>e</u>	5391			
Thurmond dischar	ge	4857			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
10/4/2021 0:00	5120
10/4/2021 1:00	5140
10/4/2021 2:00	5170
10/4/2021 3:00	5180
10/4/2021 4:00	5200
10/4/2021 5:00	5210
10/4/2021 6:00	5210
10/4/2021 7:00	5220
10/4/2021 8:00	5220
10/4/2021 9:00	5210
10/4/2021 10:00	5210
10/4/2021 11:00	5200
10/4/2021 12:00	5190
10/4/2021 13:00	5420
10/4/2021 14:00	6540
10/4/2021 15:00	6750
10/4/2021 16:00	6980
10/4/2021 17:00	6760
10/4/2021 18:00	6640
10/4/2021 19:00	6290
10/4/2021 20:00	6130
10/4/2021 21:00	6050
10/4/2021 22:00	5940
10/4/2021 23:00	5600
10/5/2021 0:00	5300
10/5/2021 1:00	5060
10/5/2021 2:00	4880
10/5/2021 3:00	4770
10/5/2021 4:00	4700
10/5/2021 5:00	4660
10/5/2021 6:00	4650
10/5/2021 7:00	4640
10/5/2021 8:00	4640
10/5/2021 9:00	4640
10/5/2021 10:00	4650
10/5/2021 11:00	4670
10/5/2021 12:00	4680
10/5/2021 12:00	4700
10/5/2021 14:00	4710
10/5/2021 15:00	4720
10/5/2021 16:00	4740
10/5/2021 17:00	4750
10/5/2021 18:00	4750
10/5/2021 19:00	4760
10/5/2021 20:00	4770
10/5/2021 20:00	4780
10/5/2021 22:00	4790
10/5/2021 22:00	4810

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary November 2021

	Temperature		<u>e</u>	Dissolved Oxygen (mg/L		mg/L)
		(°C)				
<u>Location</u>						
Thurmond Forebay (Site 8)						
(11/15/21)	17.91	_	18.33	6.2	_	8.5
Thurmond Tailrace (Site 7)*						
(11/08/21 - 11/09/21)		_			_	
Stevens Creek Res. (Site 6)	19.10	_	19.50	8.0	_	8.4
(11/08/21 - 11/09/21)						
(,,,,,,						
Stevens Creek Res (Site 1)	18 90	_	19 30	83	_	86
(11/08/21 - 11/09/21)	10.50		19.90	0.5		0.0
(11/08/21 - 11/09/21)						
Stavans Crack Bas (Site 2)	19 60		10.00	76		01
Stevens Creek Res. (Site 2)	10.00	—	10.00	7.0	—	0.1
(11/08/21 - 11/09/21)						
	40.00		10.01			
Stevens Creek Tailrace (Site 3)	18.80	_	18.94	7.9	—	8.3
(11/08/21 - 11/09/21)						
Stevens Creek (Site 5)	12.20	_	12.40	5.3	_	5.6
(11/08/21 - 11/09/21)						
Stevens Creek (Site 4)	15.87	—	17.50	7.2	_	7.7
(11/08/21 - 11/09/21)						

Date: 11/8/21 Field Team: KAC, DFS Field Meter Model/Number: 18H110932

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	8:30	S	6.1	12.4	107	5.4	51
		1	6.3	12.4	107	5.4	50
		2	6.4	12.4	107	5.3	50
		3	6.4	12.4	107	5.3	50
		4	6.4	12.3	107	5.3	49
3	11:30	S	6.4	18.9	48	7.9	85
4	9:15	S	6.3	16.0	57	7.4	75
		1	6.5	15.9	57	7.4	75
		2	6.5	15.9	59	7.2	73
2	10:35	S	6.3	18.8	48	7.7	82
		1	6.4	18.8	48	7.7	82
		2	6.4	18.8	48	7.6	82
		3	6.5	18.8	48	7.6	82
		4	6.5	18.8	48	7.6	82
		5	6.5	18.8	48	7.6	82
1	10:00	S	6.6	19.2	47	8.6	93
		1	6.6	19.3	47	8.4	91
		2	6.6	19.3	47	8.4	91
		3	6.6	19.3	47	8.4	91
		4	6.6	19.3	47	8.4	91
1A	9:40	S	6.2	19.5	47	8.1	88
		1	6.3	19.5	47	8.1	88
		2	6.4	19.5	47	8.1	88
		3	6.4	19.5	47	8.0	88
		4	6.5	19.5	47	8.0	87

Date: 11/9/21 Field Team: DFS/KAC Field Meter Model/Number: 18H110932

Site No.	Time	Depth	рΗ	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	8:35	S	7.3	12.3	108	5.6	52
		1	7.2	12.2	108	5.5	51
		2	7.1	12.2	108	5.5	51
		3	6.8	12.2	108	5.4	50
		4	6.7	12.2	108	5.4	50
3	11:45	S	7.1	18.8	48	8.3	89
4	9:30	S	7.2	17.5	52	7.7	80
		1	7.1	17.4	53	7.6	79
		2	7.1	17.3	53	7.5	78
		3	7.0	17.3	54	7.5	78
2	10:40	S	7.1	18.6	48	8.1	87
		1	7.0	18.6	48	8.1	87
		2	7.0	18.6	48	8.1	86
		3	6.9	18.6	48	8.1	86
		4	6.9	18.6	48	8.1	86
		5	6.9	18.6	48	8.0	86
1	10:16	S	7.1	19.0	47	8.5	91
		1	7.0	19.1	47	8.4	91
		2	7.0	19.1	47	8.4	90
		3	7.0	19.0	47	8.4	90
		4	6.9	18.9	47	8.4	90
		5	6.9	18.9	47	8.3	90
		6	6.9	19.0	47	8.3	90
1A	10:00	S	7.3	19.1	47	8.4	90
		1	7.2	19.1	47	8.4	90
		2	7.1	19.1	47	8.3	90
		3	7.1	19.1	47	8.3	90
		4	7.1	19.1	47	8.3	90

JST Forebay Water Quality Data (Provided By USACE-ERDC)

November 15, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
53816	18.21	8.48	43.1	0.2
53836	18.32	7.68	45.9	2
53902	18.32	7.69	45.9	4
53921	18.32	7.62	45.9	6
53948	18.33	7.65	45.9	8
54010	18.33	7.62	45.9	10
54025	18.32	7.67	45.8	12
54052	18.33	7.69	45.8	14
54112	18.32	7.62	45.9	16
54131	18.32	7.64	45.9	18
54200	18.32	7.58	45.7	20
54225	18.32	7.56	45.8	22
54248	18.33	7.63	45.7	24
54304	18.31	7.54	45.8	26
54322	18.3	7.4	45.8	28
54356	18.12	6.8	45.4	30
54414	18.06	6.69	45.3	32
54449	18.05	6.58	45.4	34
54508	18.04	6.54	45.3	36
54531	17.95	6.37	44.9	38
54550	17.94	6.26	45	40
54610	17.93	6.26	44.7	42
54629	17.91	6.19	44.9	44
Max:	18.33	8.48	45.9	44
Min:	17.91	6.19	43.1	0.2

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
11/8/2021	23:00:00	19.8	48.1	6.37
11/8/2021	23:15:00	19.77	48.2	6.28
11/8/2021	23:30:00	19.75	48.1	6.34
11/8/2021	23:45:00	19.74	48.1	6.3
11/8/2021	0:00:00	19.74	48.2	6.15
11/8/2021	0:15:00	19.78	48.2	5.93
11/8/2021	0:30:00	19.86	48.1	6.46
11/8/2021	0:45:00	19.84	48.2	6.5
11/8/2021	1:00:00	19.83	47.9	6.62
11/8/2021	1:15:00	19.83	48.2	6.66
11/8/2021	1:30:00	19.82	47.9	6.78
11/8/2021	1:45:00	19.8	48.1	6.76
11/8/2021	2:00:00	19.79	48.2	6.79
11/8/2021	2:15:00	19.78	48.2	6.77
11/8/2021	2:30:00	19.77	48.1	6.82
11/8/2021	2:45:00	19.76	48.1	6.72
11/8/2021	3:00:00	19.75	48.2	6.64
11/8/2021	3:15:00	19.74	47.9	6.69
11/8/2021	3:30:00	19.72	48.1	6.68
11/8/2021	3:45:00	19.72	48.1	6.67
11/8/2021	4:00:00	19.71	48.1	6.71
11/8/2021	4:15:00	19.7	47.9	6.72
11/8/2021	4:30:00	19.69	48	6.66
11/8/2021	4:45:00	19.68	47.9	6.71
11/8/2021	5:00:00	19.68	47.9	6.7
11/8/2021	5:15:00	19.68	47.9	6.97
11/8/2021	5:30:00	19.7	48.1	5.76
11/8/2021	5:45:00	19.68	47.9	5.77
11/8/2021	6:00:00	19.67	47.8	5.73
11/8/2021	6:15:00	19.49	47.9	5.87
11/8/2021	6:30:00	19.55	47.5	5.92
11/8/2021	6:45:00	19.57	47.8	5.96
11/8/2021	7:00:00	19.59	48	5.96
11/8/2021	7:15:00	19.58	47.9	5.99
11/8/2021	7:30:00	19.58	47.9	6.14
11/8/2021	7:45:00	19.63	47.8	6.14
11/8/2021	8:00:00	19.64	47.7	6.15
11/8/2021	8:15:00	19.67	47.9	6.2
11/8/2021	8:30:00	19.7	48.1	6.21
11/8/2021	8:45:00	19.7	48.1	6.21
11/8/2021	9:00:00	19.71	48.1	6.28

Date	Time Temp S		SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
11/8/2021	9:15:00	19.71	48.1	6.24
11/8/2021	9:30:00	19.73	48.2	6.2
11/8/2021	9:45:00	19.73	47.9	6.25
11/8/2021	10:00:00	19.73	48.1	6.28
11/8/2021	10:15:00	19.74	48.1	6.36
11/8/2021	10:30:00	19.75	47.9	6.41
11/8/2021	10:45:00	19.76	47.9	6.37
11/8/2021	11:00:00	19.76	48.2	6.38
11/8/2021	11:15:00	19.76	47.8	6.39
11/8/2021	11:30:00	19.77	47.7	6.37
11/8/2021	11:45:00	19.77	47.9	6.27
11/8/2021	12:00:00	19.77	48.1	6.31
11/8/2021	12:15:00	19.77	48.2	6.29
11/8/2021	12:30:00	19.77	48.1	6.34
11/8/2021	12:45:00	19.77	48.1	6.24
11/8/2021	13:00:00	19.78	48.2	6.28
11/8/2021	13:15:00	19.8	48.3	6.16
11/8/2021	13:30:00	19.8	48.2	6.19
11/8/2021	13:45:00	19.79	48.2	6.25
11/8/2021	14:00:00	19.77	48.2	6.28
11/8/2021	14:15:00	19.77	48.2	6.29
11/8/2021	14:30:00	19.76	48.1	6.27
11/8/2021	14:45:00	19.77	48.1	6.25
11/8/2021	15:00:00	19.77	48.1	6.25
11/8/2021	15:15:00	19.76	48.1	6.29
11/8/2021	15:30:00	19.74	47.9	6.29
11/8/2021	15:45:00	19.73	48.2	6.3
11/8/2021	16:00:00	19.72	48.2	6.31
11/8/2021	16:15:00	19.7	48.3	5.97
11/8/2021	16:30:00	19.68	48.3	5.9
11/8/2021	16:45:00	19.65	48	5.9
11/8/2021	17:00:00	19.63	48.2	5.97
11/8/2021	17:15:00	19.61	48.3	5.65
11/8/2021	17:30:00	19.61	48.2	5.48
11/8/2021	17:45:00	19.61	48.2	5.51
11/8/2021	18:00:00	19.6	48.3	5.59
11/8/2021	18:15:00	19.62	48.3	5.59
11/8/2021	18:30:00	19.54	47.9	5.65
11/8/2021	18:45:00	19.53	47.9	5.69
11/8/2021	19:00:00	19.54	48.2	5.67
11/8/2021	19:15:00	19.49	48.3	5.78
11/8/2021	19:30:00	19.58	47.9	6.05
11/8/2021	19:45:00	19.56	47.9	6.08
11/8/2021	20:00:00	19.55	48	6.04

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
11/8/2021	20:15:00	19.55	47.9	6.01
11/8/2021	20:30:00	19.55	48	6.02
11/8/2021	20:45:00	19.54	47.8	6.04
11/8/2021	21:00:00	19.53	48.1	6.03
11/8/2021	21:15:00	19.53	48.2	6.09
11/8/2021	21:30:00	19.48	48.1	6.64
11/8/2021	21:45:00	19.47	48.1	6.66
11/8/2021	22:00:00	19.46	48.1	6.52
11/8/2021	22:15:00	19.45	48.3	6.6
11/8/2021	22:30:00	19.45	48.3	6.58
11/8/2021	22:45:00	19.45	48	6.74
11/9/2021	23:00:00	19.44	47.9	6.74
11/9/2021	23:15:00	19.44	48.4	6.72
11/9/2021	23:30:00	19.42	48.1	6.88
11/9/2021	23:45:00	19.39	48	6.61
11/9/2021	0:00:00	19.37	48.3	6.54
11/9/2021	0:15:00	19.35	48.2	6.48
11/9/2021	0:30:00	19.34	48	6.47
11/9/2021	0:45:00	19.33	48.2	6.51
11/9/2021	1:00:00	19.3	48.4	6.5
11/9/2021	1:15:00	19.28	48.4	6.43
11/9/2021	1:30:00	19.27	48.2	6.41
11/9/2021	1:45:00	19.24	48.5	6.37
11/9/2021	2:00:00	19.27	48.4	6.23
11/9/2021	2:15:00	19.3	48.4	6
11/9/2021	2:30:00	19.29	48.5	5.93
11/9/2021	2:45:00	19.28	48.1	5.84
11/9/2021	3:00:00	19.31	48.2	5.64
11/9/2021	3:15:00	19.3	48.4	5.66
11/9/2021	3:30:00	19.3	48.2	5.64
11/9/2021	3:45:00	19.28	48.4	5.53
11/9/2021	4:00:00	19.28	48.4	5.56
11/9/2021	4:15:00	19.28	48.4	5.48
11/9/2021	4:30:00	19.3	48.4	6.33
11/9/2021	4:45:00	19.29	48.4	6.53
11/9/2021	5:00:00	19.28	48.4	6.6
11/9/2021	5:15:00	19.29	48.5	6.84
11/9/2021	5:30:00	19.21	48.4	6.1
11/9/2021	5:45:00	19.2	48.1	6.01
11/9/2021	6:00:00	19.21	48	6.07
11/9/2021	6:15:00	19.24	48	6.18
11/9/2021	6:30:00	19.24	47.8	6.2
11/9/2021	6:45:00	19.25	48.1	6.2
11/9/2021	7:00:00	19.26	47.3	6.26

Date	Time Temp SpCor		SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
11/9/2021	7:15:00	19.27	48.1	6.2
11/9/2021	7:30:00	19.29	48.4	6.12
11/9/2021	7:45:00	19.31	48	6.27
11/9/2021	8:00:00	19.31	48.1	6.29
11/9/2021	8:15:00	19.31	47.9	6.47
11/9/2021	8:30:00	19.35	48	7.02
11/9/2021	8:45:00	19.34	47.9	7.12
11/9/2021	9:00:00	19.35	47.9	7.22
11/9/2021	9:15:00	19.37	47.7	7.09
11/9/2021	9:30:00	19.36	48.2	7.65
11/9/2021	9:45:00	19.35	48	7.7
11/9/2021	10:00:00	19.36	48	7.64
11/9/2021	10:15:00	19.37	47.9	7.58
11/9/2021	10:30:00	19.38	48	7.54
11/9/2021	10:45:00	19.39	48.1	7.63
11/9/2021	11:00:00	19.4	48.1	7.53
11/9/2021	11:15:00	19.4	48	7.63
11/9/2021	11:30:00	19.41	48.1	7.61
11/9/2021	11:45:00	19.42	47.9	7.6
11/9/2021	12:00:00	19.43	47.9	7.6
11/9/2021	12:15:00	19.43	48.3	7.63
11/9/2021	12:30:00	19.44	48	7.68
11/9/2021	12:45:00	19.45	48.1	7.62
11/9/2021	13:00:00	19.46	48.1	7.65
11/9/2021	13:15:00	19.46	48	7.72
11/9/2021	13:30:00	19.48	47.8	7.61
11/9/2021	13:45:00	19.47	48	7.69
11/9/2021	14:00:00	19.47	48	7.66
11/9/2021	14:15:00	19.46	48.1	7.68
11/9/2021	14:30:00	19.45	48.1	7.72
11/9/2021	14:45:00	19.45	48.1	7.73
11/9/2021	15:00:00	19.45	48.3	7.69
11/9/2021	15:15:00	19.44	48.1	7.67
11/9/2021	15:30:00	19.42	48.3	7.73
11/9/2021	15:45:00	19.42	48.1	7.71
11/9/2021	16:00:00	19.41	48.1	7.69
11/9/2021	16:15:00	19.37	48.1	7.53
11/9/2021	16:30:00	19.32	48.1	6.82
11/9/2021	16:45:00	19.3	48	6.73
11/9/2021	17:00:00	19.28	48.2	6.7
11/9/2021	17:15:00	19.29	48.2	6.88
11/9/2021	17:30:00	19.26	48.1	6.71
11/9/2021	17:45:00	19.29	48	6.6
11/9/2021	18:00:00	19.28	48.1	6.61

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
11/9/2021	18:15:00	19.26	48.1	6.61
11/9/2021	18:30:00	19.24	48.1	6.5
11/9/2021	18:45:00	19.25	48	6.53
11/9/2021	19:00:00	19.26	48.2	6.47
11/9/2021	19:15:00	19.28	48.1	6.45
11/9/2021	19:30:00	19.21	48.1	7.4
11/9/2021	19:45:00	19.21	48.2	7.42
11/9/2021	20:00:00	19.22	48.2	7.47
11/9/2021	20:15:00	19.22	48.2	7.56
11/9/2021	20:30:00	19.21	48.4	7.54
11/9/2021	20:45:00	19.2	48.2	7.61
11/9/2021	21:00:00	19.2	48.2	7.52
11/9/2021	21:15:00	19.19	48.3	7.53
11/9/2021	21:30:00	19.19	48.3	7.55
11/9/2021	21:45:00	19.18	48.2	7.51
11/9/2021	22:00:00	19.17	48.3	7.61
11/9/2021	22:15:00	19.17	48.3	7.6
11/9/2021	22:30:00	19.16	48.5	7.64
11/9/2021	22:45:00	19.17	48.5	7.58
	Max	19.86	48.5	7.73
	Min	19.16	47.3	5.48

11/8/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185.7	158.9	10412	7215
2:00	3160	185.5	158.9	10274	7203
3:00	3160	185.4	158.9	10299	7180
4:00	3080	185.3	158.9	10193	7113
5:00	3160	185.2	158.9	10094	7156
6:00	3760	185.1	158.9	10075	7138
7:00	15495	185	158.9	10022	7124
8:00	27280	182.2	158.9	10068	7161
9:00	8494	185.6	158.9	10597	7350
10:00	8340	186	158.9	10614	7357
11:00	8340	186	158.9	10558	7302
12:00	7800	186.1	158.9	10898	7514
13:00	7720	186.1	158.9	10654	7323
14:00	6980	186.1	158.9	10721	7372
15:00	7960	185.8	158.9	10676	7350
16:00	7800	186.1	158.9	10715	7368
17:00	7280	186.1	158.9	10720	7354
18:00	7280	186.1	159	10729	7383
19:00	9435	186.1	158.9	10701	7339
20:00	14060	186.2	159	10705	7335
21:00	8180	186.3	159	10890	7399
22:00	8110	186.3	159	10836	7407
23:00	3007	186.3	159	10752	7369
24:00:00	2780	186.2		10673	7311
daily avg.	7611	186	159	10537	7297
Total Generation		252876]	
Projected discharge	<u>e</u>	8285			
Thurmond discharg	ge	7611			

11/9/2021

					Estimated
Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Total CFS
1:00	0	185.9	158.9	10550	7339
2:00	0	185.7	158.9	10516	7282
3:00	0	185.5	158.9	10471	7247
4:00	0	185.3	158.9	10223	7187
5:00	295	1851	158.9	10131	7131
6:00	4129	184.9	158.9	10022	7103
7:00	27120	184.8	158.9	9911	7064
8:00	23390	185.2	158.9	10311	7194
9:00	22750	185.7	158.9	10462	7241
10:00	10300	186.3	158.9	10747	7351
11:00	2780	186.5	159	10872	7367
12:00	2860	186.3	159.2	12689	8796
13:00	2700	186.2	159.2	12542	8724
14:00	2850	186	159.2	12484	8712
15:00	2770	185.9	159.5	12275	8578
16:00	3235	185.7	159.1	12242	8641
17:00	10175	185.5	159.1	12098	8542
18:00	24150	185.4	159.1	120149	8561
19:00	23070	185.5	159.1	12130	8549
20:00	3170	185.9	159.1	12349	8601
21:00	3100	186.2	159.1	12453	8686
22:00	3170	186.2	159.2	12399	8619
23:00	3100	186.1	159.2	12261	8538
24:00:00	3160	185.9	159.1	12150	8449
daily avg.	7428	186	159	15935	7979
Total Generation 382437]		
Projected discharge	2	8289			
Thurmond discharge		7428			
USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
11/8/2021 0:00	6440
11/8/2021 1:00	6840
11/8/2021 2:00	7110
11/8/2021 3:00	7070
11/8/2021 4:00	7040
11/8/2021 5:00	7010
11/8/2021 6:00	7310
11/8/2021 7:00	7010
11/8/2021 8:00	6960
11/8/2021 9:00	7060
11/8/2021 10:00	7040
11/8/2021 11:00	6840
11/8/2021 12:00	6800
11/8/2021 13:00	6740
11/8/2021 14:00	6920
11/8/2021 15:00	7130
11/8/2021 16:00	7250
11/8/2021 17:00	7350
11/8/2021 18:00	7360
11/8/2021 19:00	7300
11/8/2021 10:00	7300
11/8/2021 20:00	7410
11/8/2021 21:00	7490
11/0/2021 22:00	7300
11/0/2021 23:00	7420
11/9/2021 0.00	7430
11/9/2021 1.00	7470
11/9/2021 2:00	7450
11/9/2021 3.00	7330
11/9/2021 4.00	7490
11/9/2021 5.00	7490
11/9/2021 0.00	7440
11/9/2021 7:00	7420
11/9/2021 8:00	7570
11/9/2021 9:00	7570
11/9/2021 10:00	7470
11/9/2021 11:00	7500
11/9/2021 12:00	/380
11/9/2021 13:00	/360
11/9/2021 14:00	7540
11/9/2021 15:00	/860
11/9/2021 16:00	/830
11/9/2021 17:00	8180
11/9/2021 18:00	8470
11/9/2021 19:00	8180
11/9/2021 20:00	8260
11/9/2021 21:00	8270
11/9/2021 22:00	8250
11/9/2021 23:00	8210

Stevens Creek Hydroelectric Project FERC Project No. 2535 – GA, SC Water Quality Data Summary December 2021

	<u>Ten</u>	<u>Temperature</u> (°C)			<u>Dissolved Oxygen</u> (mg/L)		
<u>Location</u>							
Thurmond Forebay (Site 8)							
(12/15/21)	14.31	_	15.17	6.5		8.9	
Thurmond Tailrace (Site 7)							
(12/07/21 - 12/08/21)		—			_		
Stevens Creek Res. (Site 6)	15.05	_	15.31	9.2	_	9.5	
(12/07/21 - 12/08/21)							
Stevens Creek Res. (Site 1)	14.90	_	15.27	9.1	_	9.7	
(12/07/21 - 12/08/21)							
Stevens Creek Res. (Site 2)	14.80	_	15.18	9.0	_	9.1	
(12/07/21 - 12/08/21)							
Stevens Creek Tailrace (Site 3)	14.73	_	15.26	9.2	_	9.4	
(12/07/21 - 12/08/21)							
Stevens Creek (Site 5)	10.39	_	10.52	6.0	_	6.7	
(12/07/21 - 12/08/21)							
Stevens Creek (Site 4)	13.48	_	15.23	7.6	_	8.4	
(12/07/21 - 12/08/21)							
(, = , == ==, ==, ==,							

Stevens Creek Project Water Quality Data (Provided By USGS-WRD)

Date: 12/7/2021 Field Team: REH/EGM Field Meter Model/Number: YSI EXO3 / 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	10:24	surface	6.7	10.5	118	6.1	54
		1M	6.6	10.5	118	6.0	54
		2M	6.6	10.4	117	6.0	54
		3M	6.6	10.4	117	6.0	54
		4M	6.6	10.4	117	6.0	54
		5M	6.6	10.4	117	6.0	54
		6M	6.6	10.4	117	6.0	53
3	11:04	1M	7.1	15.3	47	9.4	94
4	12:23	surface	6.9	15.2	51	8.4	84
		1M	6.9	15.2	51	8.3	83
		2M	6.9	14.4	57	8.1	79
		3M	6.8	14.1	60	7.9	77
		4M	6.8	14.0	61	7.8	76
		5M	6.8	13.9	63	7.8	76
		6M	6.8	13.7	64	7.9	76
		7M	6.8	13.6	68	7.6	73
2	12:36	surface	6.9	15.2	47	9.1	90
		1M	6.9	15.2	47	9.0	90
		2M	6.9	15.2	47	9.0	90
		3M	6.9	15.2	47	9.0	90
		4M	6.9	15.2	47	9.0	90
		5M	6.9	15.2	47	9.0	89
		6M	6.9	15.2	47	9.0	89
1	12:00	surface	7.0	15.3	46	9.7	96
		1M	7.0	15.3	46	9.6	95
		2M	6.9	15.3	46	9.6	95
		3M	6.9	15.3	46	9.5	95
		4M	6.9	15.3	46	9.5	95
1A	11:45	surface	7.0	15.3	46	9.5	95
		1M	7.0	15.3	46	9.5	95
		2M	7.0	15.3	46	9.5	95
		3M	7.0	15.3	46	9.5	95
		4M	7.0	15.3	46	9.5	95

Stevens Creek Project Water Quality Data (Provided By USGS-WRD)

Date: 12/8/2021 Field Team: REH/EGM Field Meter Model/Number: YSI EXO3 / 17F104114

Site No.	Time	Depth	рН	Temperature	Sp. Cond.	DO	DO
	(EST)	(meters)		(degrees C)	(us/cm)	(mg/L)	(% saturation)
5	10:53	surface	6.8	10.5	118	6.7	60
		1M	6.8	10.5	118	6.5	58
		2M	6.8	10.4	118	6.5	58
		3M	6.8	10.4	118	6.4	58
		4M	6.8	10.4	119	6.4	57
		5M	6.8	10.4	119	6.4	57
3	10:17	1M	6.9	14.7	47	9.2	91
4	9:49	surface	6.6	13.6	66	7.9	75
		1M	6.6	13.6	66	7.8	75
		2M	6.6	13.6	67	7.8	75
		3M	6.6	13.6	67	7.8	75
		4M	6.6	13.6	67	7.8	75
		5M	6.5	13.5	68	7.7	73
		6M	6.5	13.5	69	7.6	73
		7M	6.5	13.5	69	7.6	73
		8M	6.5	13.5	69	7.6	73
2	10:04	surface	6.9	14.8	46	9.0	89
		1M	6.9	14.8	46	9.0	89
		2M	6.9	14.8	46	9.0	89
		3M	6.9	14.8	46	9.0	89
		4M	6.9	14.8	46	9.0	89
		5M					
1	11:50	surface	7.0	14.9	46	9.2	91
		1M	7.0	14.9	46	9.2	91
		2M	7.0	14.9	46	9.2	91
		3M	7.0	14.9	46	9.1	90
		4M	7.0	14.9	46	9.1	90
		5M	7.0	14.9	46	9.1	90
1A	11:39	surface	7.0	15.1	45	9.3	92
		1M	7.0	15.1	45	9.3	92
		2M	7.0	15.1	46	9.3	92
		3M	7.0	15.1	45	9.3	92
		4M	7.0	15.1	45	9.2	92

JST Forebay Water Quality Data (Provided By USACE-ERDC)

December 15, 2021

Time	Temp	LDO	SpCond	Depth
HHMMSS	°C	mg/l	μS/cm	meters
134050	15.17	8.85	44.2	0.4
134126	15.17	8.77	44.4	2.34
134153	15.14	8.72	44.3	4.11
134234	15.14	8.72	44.2	6.08
134300	15.12	8.69	44.2	8.36
134346	14.78	8.43	44.2	10.11
134438	14.76	8.36	44.3	12.18
134517	14.75	8.26	44.3	14.16
134546	14.75	8.23	44.2	16.21
134618	14.74	8.21	44.3	18.09
134658	14.72	8.26	44.3	20.04
134730	14.7	8.21	43.9	22.2
134855	14.64	7.25	43.2	24.31
134953	14.5	6.84	42.7	26.36
135117	14.39	6.54	43.1	28.38
135143	14.38	6.58	43.1	30.26
135224	14.36	6.74	43.2	32.2
135314	14.33	6.92	43.3	34.3
135359	14.33	6.9	43.3	36.11
135436	14.32	6.78	43.4	38.27
135509	14.32	6.71	43.4	40.11
135555	14.32	6.71	43.6	42.16
135622	14.31	6.72	43.9	44.13
Max:	15.17	8.85	44.4	44.13
Min:	14.31	6.54	42.7	0.4

JST Tailrace Water Quality Data (Provided By USACE-ERDC)

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
12/7/2021	0:00:00	15.64	47.2	8.53
12/7/2021	0:15:00	15.64	47.1	8.56
12/7/2021	0:30:00	15.65	47.2	9.44
12/7/2021	0:45:00	15.65	47.2	9.33
12/7/2021	1:00:00	15.65	47.2	9.14
12/7/2021	1:15:00	15.64	47.2	9.07
12/7/2021	1:30:00	15.64	47.2	9.08
12/7/2021	1:45:00	15.63	47.2	9.05
12/7/2021	2:00:00	15.62	47.2	8.95
12/7/2021	2:15:00	15.61	47.2	8.89
12/7/2021	2:30:00	15.59	47.2	8.83
12/7/2021	2:45:00	15.59	47.1	8.88
12/7/2021	3:00:00	15.57	47.1	8.72
12/7/2021	3:15:00	15.57	47.2	8.72
12/7/2021	3:30:00	15.57	47.2	8.8
12/7/2021	3:45:00	15.55	47.2	8.7
12/7/2021	4:00:00	15.53	47.1	8.7
12/7/2021	4:15:00	15.53	47.2	8.59
12/7/2021	4:30:00	15.58	47.4	8.86
12/7/2021	4:45:00	15.61	47.2	8.96
12/7/2021	5:00:00	15.62	47.1	9.04
12/7/2021	5:15:00	15.62	47.1	8.99
12/7/2021	5:30:00	15.63	47	9.02
12/7/2021	5:45:00	15.63	47.1	9.05
12/7/2021	6:00:00	15.62	47	9.06
12/7/2021	6:15:00	15.63	47.2	9.07
12/7/2021	6:30:00	15.62	47.4	8.75
12/7/2021	6:45:00	15.61	47.1	8.71
12/7/2021	7:00:00	15.61	47.2	8.74
12/7/2021	7:15:00	15.6	47.2	8.65
12/7/2021	7:30:00	15.59	47.1	8.66
12/7/2021	7:45:00	15.59	47.1	8.61
12/7/2021	8:00:00	15.58	47.2	8.62
12/7/2021	8:15:00	15.58	47.4	8.6
12/7/2021	8:30:00	15.57	47	8.55
12/7/2021	8:45:00	15.57	47.1	8.56
12/7/2021	9:00:00	15.58	47.2	8.5
12/7/2021	9:15:00	15.57	47.1	8.57
12/7/2021	9:30:00	15.57	47.1	8.59
12/7/2021	9:45:00	15.57	47.1	8.55
12/7/2021	10:00:00	15.55	47.2	8.61

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
12/7/2021	10:15:00	15.56	47.1	8.63
12/7/2021	10:30:00	15.58	47.2	8.7
12/7/2021	10:45:00	15.58	47.2	8.77
12/7/2021	11:00:00	15.58	46.9	8.76
12/7/2021	11:15:00	15.59	47.1	8.77
12/7/2021	11:30:00	15.61	47.4	8.94
12/7/2021	11:45:00	15.61	47.2	8.9
12/7/2021	12:00:00	15.62	47	8.92
12/7/2021	12:15:00	15.62	47.2	8.96
12/7/2021	12:30:00	15.62	47.1	8.95
12/7/2021	12:45:00	15.63	47.2	8.93
12/7/2021	13:00:00	15.63	47.2	9.01
12/7/2021	13:15:00	15.64	47.2	9.02
12/7/2021	13:30:00	15.63	47.4	8.95
12/7/2021	13:45:00	15.65	47.4	8.93
12/7/2021	14:00:00	15.64	47.4	8.98
12/7/2021	14:15:00	15.64	46.9	8.9
12/7/2021	14:30:00	15.65	47.4	8.89
12/7/2021	14:45:00	15.66	47.5	8.92
12/7/2021	15:00:00	15.64	47.1	9.01
12/7/2021	15:15:00	15.62	47.4	8.91
12/7/2021	15:30:00	15.63	47.2	8.91
12/7/2021	15:45:00	15.62	47.2	8.86
12/7/2021	16:00:00	15.62	47.1	8.87
12/7/2021	16:15:00	15.59	47.4	9.02
12/7/2021	16:30:00	15.57	47.1	8.34
12/7/2021	16:45:00	15.57	47.1	8.22
12/7/2021	17:00:00	15.55	47.2	8.15
12/7/2021	17:15:00	15.55	47	8.08
12/7/2021	17:30:00	15.54	47.1	8.05
12/7/2021	17:45:00	15.55	47.2	8.18
12/7/2021	18:00:00	15.56	47.2	8.16
12/7/2021	18:15:00	15.53	47.1	8.18
12/7/2021	18:30:00	15.55	47.4	8.19
12/7/2021	18:45:00	15.53	47.1	8.15
12/7/2021	19:00:00	15.52	47.1	8.13
12/7/2021	19:15:00	15.5	47.1	8.17
12/7/2021	19:30:00	15.52	47.1	8.21
12/7/2021	19:45:00	15.52	47.1	8.21
12/7/2021	20:00:00	15.51	47.2	8.23
12/7/2021	20:15:00	15.52	47.2	8.21
12/7/2021	20:30:00	15.52	47.1	8.18
12/7/2021	20:45:00	15.49	47.2	8.21
12/7/2021	21:00:00	15.5	47.2	8.09

Date	Time	Temp SpCond		LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
12/7/2021	21:15:00	15.48	47.4	8.18
12/7/2021	21:30:00	15.49	47.1	8.14
12/7/2021	21:45:00	15.5	47.1	8.16
12/7/2021	22:00:00	15.5	47	8.17
12/7/2021	22:15:00	15.47	47.1	8.24
12/7/2021	22:30:00	15.48	47.2	8.13
12/7/2021	22:45:00	15.49	47.1	8.21
12/7/2021	23:00:00	15.47	47.1	8.12
12/7/2021	23:15:00	15.48	47.1	8.12
12/7/2021	23:30:00	15.52	47.1	9.1
12/7/2021	23:45:00	15.51	47	9.42
12/8/2021	0:00:00	15.5	47.4	9.23
12/8/2021	0:15:00	15.49	47	8.97
12/8/2021	0:30:00	15.48	47.2	8.93
12/8/2021	0:45:00	15.48	47	8.96
12/8/2021	1:00:00	15.48	47.2	8.9
12/8/2021	1:15:00	15.46	47	8.9
12/8/2021	1:30:00	15.45	47	8.9
12/8/2021	1:45:00	15.46	47.2	8.84
12/8/2021	2:00:00	15.46	47.2	8.82
12/8/2021	2:15:00	15.45	47.2	8.9
12/8/2021	2:30:00	15.45	47.1	8.78
12/8/2021	2:45:00	15.45	47	8.82
12/8/2021	3:00:00	15.44	47.1	8.71
12/8/2021	3:15:00	15.44	47.2	8.72
12/8/2021	3:30:00	15.45	47.2	8.38
12/8/2021	3:45:00	15.45	47.5	8.25
12/8/2021	4:00:00	15.45	47.5	8.2
12/8/2021	4:15:00	15.46	47.7	8.09
12/8/2021	4:30:00	15.44	47.4	8.45
12/8/2021	4:45:00	15.42	47.1	8.59
12/8/2021	5:00:00	15.42	47.1	8.64
12/8/2021	5:15:00	15.4	47.1	8.64
12/8/2021	5:30:00	15.41	46.9	8.5
12/8/2021	5:45:00	15.4	47.1	8.39
12/8/2021	6:00:00	15.39	47	8.4
12/8/2021	6:15:00	15.4	47	8.53
12/8/2021	6:30:00	15.4	47.1	8.61
12/8/2021	6:45:00	15.42	47.1	8.68
12/8/2021	7:00:00	15.42	46.9	8.62
12/8/2021	7:15:00	15.44	46.9	8.69
12/8/2021	7:30:00	15.43	46.9	8.67
12/8/2021	7:45:00	15.42	47	8.61
12/8/2021	8:00:00	15.44	47	8.71

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
12/8/2021	8:15:00	15.44	46.9	8.69
12/8/2021	8:30:00	15.43	47	8.49
12/8/2021	8:45:00	15.43	47	8.57
12/8/2021	9:00:00	15.43	47.1	8.49
12/8/2021	9:15:00	15.42	46.9	8.56
12/8/2021	9:30:00	15.42	46.7	8.65
12/8/2021	9:45:00	15.42	46.9	8.51
12/8/2021	10:00:00	15.41	46.9	8.51
12/8/2021	10:15:00	15.42	47	8.45
12/8/2021	10:30:00	15.43	47.1	8.81
12/8/2021	10:45:00	15.42	47	8.78
12/8/2021	11:00:00	15.41	46.7	8.81
12/8/2021	11:15:00	15.41	46.7	8.84
12/8/2021	11:30:00	15.42	46.9	9.16
12/8/2021	11:45:00	15.43	46.7	9.3
12/8/2021	12:00:00	15.42	46.6	9.26
12/8/2021	12:15:00	15.42	46.9	9.32
12/8/2021	12:30:00	15.41	46.9	9.32
12/8/2021	12:45:00	15.42	46.9	9.23
12/8/2021	13:00:00	15.42	46.9	9.31
12/8/2021	13:15:00	15.42	46.9	9.31
12/8/2021	13:30:00	15.42	47	9.34
12/8/2021	13:45:00	15.42	46.7	9.18
12/8/2021	14:00:00	15.42	46.9	9.35
12/8/2021	14:15:00	15.42	46.7	9.25
12/8/2021	14:30:00	15.41	46.7	9.35
12/8/2021	14:45:00	15.41	46.7	9.3
12/8/2021	15:00:00	15.4	46.7	9.25
12/8/2021	15:15:00	15.39	47	9.12
12/8/2021	15:30:00	15.4	47	9.17
12/8/2021	15:45:00	15.39	46.9	9.21
12/8/2021	16:00:00	15.4	46.6	8.97
12/8/2021	16:15:00	15.39	47.1	8.8
12/8/2021	16:30:00	15.4	47	8.61
12/8/2021	16:45:00	15.39	46.7	8.6
12/8/2021	17:00:00	15.41	47.1	8.47
12/8/2021	17:15:00	15.45	47.4	8.21
12/8/2021	17:30:00	15.54	47	8.33
12/8/2021	17:45:00	15.57	46.9	8.29
12/8/2021	18:00:00	15.58	47	8.31
12/8/2021	18:15:00	15.59	47	8.27
12/8/2021	18:30:00	15.61	47.1	8.54
12/8/2021	18:45:00	15.64	47	8.49
12/8/2021	19:00:00	15.66	47.2	8.58

Date	Time	Temp	SpCond	LDO
MMDDYY	HHMMSS	°C	μS/cm	mg/l
12/8/2021	19:15:00	15.65	47.2	8.63
12/8/2021	19:30:00	15.66	47.4	8.58
12/8/2021	19:45:00	15.66	47.4	8.51
12/8/2021	20:00:00	15.66	47.6	8.62
12/8/2021	20:15:00	15.64	46.9	8.5
12/8/2021	20:30:00	15.65	47	8.59
12/8/2021	20:45:00	15.63	47.4	8.53
12/8/2021	21:00:00	15.62	47.4	8.49
12/8/2021	21:15:00	15.6	47.2	8.53
12/8/2021	21:30:00	15.55	47.6	8.59
12/8/2021	21:45:00	15.52	47.4	8.39
12/8/2021	22:00:00	15.49	47.1	8.26
12/8/2021	22:15:00	15.44	47.2	8.09
12/8/2021	22:30:00	15.42	47.1	7.93
12/8/2021	22:45:00	15.41	47.2	7.94
12/8/2021	23:00:00	15.39	47	7.87
12/8/2021	23:15:00	15.39	47.2	7.91
12/8/2021	23:30:00	15.39	47.1	7.9
12/8/2021	23:45:00	15.38	47.4	7.92
	Max	15.66	47.7	9.44
	Min	15.38	46.6	7.87

Stevens Creek Operations Data (Provided By DESC & USACE)

12/7/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated Total CES
1:00	0	187.9	159.3	4521	2574
2:00	0	187.6	159.1	4769	2814
3:00	590	187.3	158.9	4771	2884
4:00	8007	187	158.8	4745	2901
5:00	12030	186.9	158.6	4766	2952
6:00	13140	187	158.6	5664	3581
7:00	13140	187	158.7	5807	3703
8:00	13310	187.1	158.8	6547	4150
9:00	13230	187.2	158.9	6540	4128
10:00	12560	187.3	158.9	6577	4140
11:00	12270	187.3	159	6564	4106
12:00	12270	187.4	159	6523	4129
13:00	12410	187.4	159	6538	4095
14:00	12330	187.4	159	6615	4117
15:00	12490	187.4	159.1	6806	4253
16:00	19690	187.4	159.1	7148	4520
17:00	20120	187.5	159.2	7249	4565
18:00	20220	187.6	159.3	7282	4600
19:00	20320	187.7	159.4	7481	4657
20:00	20200	187.8	159.5	7561	4733
21:00	20640	188	159.6	7593	4747
22:00	20160	188.1	159.6	7674	4750
23:00	884	188.1	159.7	7622	4690
24:00:00	0	188.2	159.8	7547	4615
daily avg.	12084	187	159	6455	4017
Total Generation		154910]	
Projected discharge	<u>e</u>	13235			
Thurmond discharg	<u>ge</u>	12084			

Stevens Creek Operations Data (Provided By DESC & USACE)

12/8/2021

Hour	Thurmond Discharges	Headwater	Tailrace	Generation	Estimated
1.00		107 0	150.6	7212	
2:00	0	107.0	159.0	6059	4545
2.00	205	107.3	159.4	6617	4324
3.00	235	107.5	159.2	6504	4172
4.00 5.00	4140	107	159.1	6542	4113
5.00	10100	180.8	158.9	6674	4197
7:00	12420	196.7	150.0	6757	4302
7.00 8.00	12420	180.7	158.8	6747	4333
8.00	12140	180.8	158.8	7084	4531
10:00	7820	187	159	7829	5085
10:00	6060	187	159 1	8338	5300
12.00	2830	187	159	8346	5443
13.00	0	186.81	159	8211	5359
14.00	0	86.7	158.8	6489	4206
15:00	0	186.4	158.8	8161	5415
16:00	1769	186.2	158.7	8107	5445
17:00	34270	186	158.6	8049	5445
18:00	38010	186	158.5	8122	5470
19:00	38430	186.6	158.7	8378	5506
20:00	37750	187.2	158.9	8540	54995
21:00	20627	187.7	159.3	8503	5424
22:00	17880	188.1	159.6	8372	5219
23:00	17880	188.3	159.8	7201	4300
24:00:00	15390	188.4	159.8	5247	2982
daily avg.	12371	183	159	7466	6856
Total Generation		179180		7	
Projected discharge	<u>e</u>	16262			
Thurmond discharg	<u>ge</u>	12371			

USGS Gage 02197000 Provisional Hourly Flow Data (Provided By USGS-WRD)

Station: 02197000 (Savannah River at Augusta) PCode: FLOW (Instantaneous Discharge)

Date-Time	Flow (cfs)
12/7/2021 0:00	13100
12/7/2021 1:00	13200
12/7/2021 2:00	13200
12/7/2021 3:00	12900
12/7/2021 4:00	13100
12/7/2021 5:00	13200
12/7/2021 6:00	13100
12/7/2021 7:00	13200
12/7/2021 8:00	12800
12/7/2021 9:00	12800
12/7/2021 3:00	12700
12/7/2021 10:00	12700
12/7/2021 11:00	11000
12/7/2021 12:00	11500
12/7/2021 13.00	11100
12/7/2021 14:00	11100
12/7/2021 15:00	11100
12///2021 16:00	10800
12/7/2021 17:00	10800
12/7/2021 18:00	10700
12/7/2021 19:00	11100
12/7/2021 20:00	11200
12/7/2021 21:00	11500
12/7/2021 22:00	11700
12/7/2021 23:00	11500
12/8/2021 0:00	12700
12/8/2021 1:00	13200
12/8/2021 2:00	13500
12/8/2021 3:00	13600
12/8/2021 4:00	14300
12/8/2021 5:00	14600
12/8/2021 6:00	14900
12/8/2021 7:00	14900
12/8/2021 8:00	14000
12/8/2021 9:00	13300
12/8/2021 10:00	13100
12/8/2021 11:00	12700
12/8/2021 12:00	12500
12/8/2021 12:00	12300
12/8/2021 13:00	12300
12/8/2021 14.00	12100
12/0/2021 13.00	11000
12/8/2021 10.00	11900
12/8/2021 17:00	11/00
12/8/2021 18:00	11500
12/8/2021 19:00	11100
12/8/2021 20:00	10900
12/8/2021 21:00	9830
12/8/2021 22:00	9460
12/8/2021 23:00	9160

Docur	nent	Conter	nt(s)		
2021	WQ	Annual	Report	P-2535.pdf	1

Appendices

APPENDIX E-5

FRESHWATER MUSSEL STUDY

2021 MUSSEL STUDY EXECUTIVE SUMMARY

STEVENS CREEK HYDROELECTRIC PROJECT (FERC No. 2535)

Prepared for:

Dominion Energy South Carolina, Inc. Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina www.KleinschmidtGroup.com

June 2022

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Appendix A Freshwater Mussel Surveys Within Savannah River Basin - Alderman Environmental Services

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee for the Stevens Creek Hydroelectric Project (FERC No. 2535) (Project). On November 22, 1995, the Federal Energy Regulatory Commission (FERC) issued a 30-year license which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. DESC is currently progressing through a relicensing process for the Project which involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. DESC established a Water Quality, Fish and Wildlife Resource Conservation Group (RCG), with interested stakeholders to address Project issues related to aquatic and terrestrial resources. During an RCG meeting on November 13, 2019, the US Fish and Wildlife Service (USFWS) formally requested a freshwater mussel study at the Project, particularly in the Stevens Creek arm of the Project reservoir. In a letter dated June 10, 2020, the Georgia Department of Natural Resources (GADNR) requested that the large tributaries on the Georgia side of the Savannah River be included in the study. The mussel study plan was developed in consultation with the USFWS, GADNR, South Carolina Department of Natural Resources (SCDNR) and the RCG. This document summarizes the mussel survey that was conducted in 2021.

2.0 STUDY OBJECTIVE

The purpose of this study was to gather quantitative and qualitative data on the diversity, spatial distribution, and relative abundance of the mussel fauna occurring in portions of Stevens Creek, Little Kiokee Creek, and Uchee Creek within the Stevens Creek Project boundary.

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

Mussel surveys focused on selected habitats within the Stevens Creek Project boundary that were more likely to support populations of native freshwater mussels. Due to the accumulation of silt in the lower portions of Stevens Creek, a majority of the surveys took place in the upper portion of Stevens Creek within the Project boundary. USFWS requested that surveys included the reach between the upstream extent of the Stevens Creek reservoir to the confluence with Horn Creek (Figure 3.1). In addition, GADNR requested that surveys included representative sites in the portions of Little Kiokee Creek and Uchee Creek within the Project boundary. Specific survey points were identified in the field by the lead malacologist performing the study. Surveys were conducted in October 2021. Surveys were focused during non-rainy periods when water clarity and temperatures were sufficiently high to support wading, snorkeling, and other in-water survey methods.





4.0 DATA COLLECTION METHODS

Freshwater mussel surveys in Stevens Creek, Little Kiokee Creek, and Uchee Creek involved habitat reconnaissance and timed visual and tactile inspections of potentially suitable habitat for presence of live freshwater mussels and/or shell material.

Field survey methods followed freshwater mussel survey standard operating procedures (SOP) established by the SCDNR and were conducted by a qualified malacologist. The number and specific location of qualitative survey points were refined in the field based on the professional judgement of the lead malacologist, with four representative sites along Stevens Creek, two representative sites in Uchee Creek, and one site in Little Kiokee Creek. Substrates and mussel habitats were assessed at each sample location. The species collected during the survey, were noted and photo documented.

5.0 **RESULTS AND DISCUSSION**

Two freshwater mussel species were documented as extant within the areas surveyed for this project (Appendix A). In general, lotic habitats were of poor quality with slow flows or stagnant conditions across all sampling locations. Three mussel shells were found within Stevens Creek, but no live specimens were observed at any sampling location.

Stevens Creek

Habitat reconnaissance for Stevens Creek involved a 12-mile kayak paddle through the Stevens Creek project area. During reconnaissance and mussel surveys, it was observed that Stevens Creek has poor lotic habitat with little flow and unconsolidated organic rich substrate. Loose, sandy substrates appear to shift frequently, and do not provide the stable substrates for mussels. Although habitat was poor through Stevens Creek within the project area, the locations with potentially suitable mussel habitat were selected for mussel surveys during the 12-mile reconnaissance. After approximately 2.6 hours of effort, three shells and shell fragments were found during the mussel survey: one Eastern Elliptio *(Elliptio complanate)* and two Eastern Creekshell *(Villosa delumbis)*. The only live bivalve specimens found were the invasive Asiatic Clam (*Corbicula fluminea*), which were limited to a couple of individuals.

Although poor mussel habitats were observed within the project area, it should be noted that a portion of the Stevens Creek watershed, farther upstream from the surveyed reach, outside of the project boundary and the effects of impoundment, is of global conservation significance because of its high mussel diversity and presence of many rare species. Tributaries, such as Mountain Creek, Little Stevens Creek, and Sleepy Creek, provide habitat for the federally listed Carolina Heelsplitter (*Lasmigona decorata*). Stevens Creek, upstream from the Project boundary, and many of its headwater tributaries also provide habitat for several mussel taxa of significant conservation concern.

Uchee Creek

Approximately one mile of Uchee Creek was visually assessed for suitable mussel habitat, with some potentially suitable locations physically spot-checked to further examine habitat suitability. Two locations within Uchee Creek were surveyed using a four-person survey team, totaling about 1.7 person hours of effort. Although these two sample locations represented the best available habitat, the vast majority of Uchee Creek exhibited poor lotic habitat conditions. This was indicated by clay, silt, and organics as the substrate in the first location (Site 211027.2). The second survey location (Site 211027.3) consisted mostly of an artificial bed from a boulder fill (i.e., an armored area to protect an underwater sewer line), which created moderate-to-good potential mussel habitat with stable coarse substrates and pockets of softer sediments. No evidence of freshwater mussels (live or dead) was documented in the Uchee Creek survey areas, with only a few Asiatic Clams found within the second survey location.

Little Kiokee Creek

Accessible portions of Little Kiokee Creek exhibited poor mussel habitat, with slick, dense clay substrates and steep banks. A total effort of 0.7 person hours yielded no evidence of freshwater mussels in the survey area. The only living bivalves found were Asiatic clams.

Conclusion

Stevens Creek, and accessible portions of Uchee Creek and Little Kiokee Creek, within the Project area exhibited poor mussel habitat. In general, these impounded areas exhibit low base flow, but are subject to flashy flows during rain events and water levels and flow rates that fluctuate during power generation activities at J. Strom Thurmond Dam. Additionally, poor substrates (i.e., loose, sandy substrate; heavy silt and sediment loads; and/or compacted clay) did not provide suitable mussel habitats within the project area. Although the majority of areas investigated were unsuitable for mussels, the areas with the greatest potential suitability were surveyed. However, no live mussels were observed.

6.0 **REFERENCES**

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APPENDIX A

FRESHWATER MUSSEL SURVEYS WITHIN SAVANNAH RIVER BASIN - ALDERMAN ENVIRONMENTAL SERVICES

FRESHWATER MUSSEL SURVEYS WITHIN SAVANNAH RIVER BASIN

STEVENS CREEK HYDROELECTRIC

PROJECT 2535

Prepared for

Kleinschmidt Group

by

Joseph D. Alderman and John M. Alderman

Alderman Environmental Services, Inc. Hillsborough, NC

3 November 2021

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Introduction

More than 300 recognized species and subspecies of freshwater mussels are known from North America north of Mexico. Nearly 72% of these taxa are considered endangered, threatened, or of special concern to the scientific community (Williams et al. 1992).

Within the Savannah River Basin, Johnson (1970) lists 21 species from the basin. Because of incorrect synonymies, *Lasmigona decorata*, *Elliptio producta*, *E. angustata*, and *E. fisheriana* are now known to occur within the basin, and *E. arctata* is considered not present on the Atlantic Slope. During the past 30 years, *Ligumia nasuta* has been documented from the basin and, because of recent taxonomic work, is now known as Santee Pondmussel (*Sagittunio aldermani* Watters 2018). Therefore, there are currently 26 recognized freshwater mussel species from the Savannah River Basin (Table 1).

Alderman Environmental Services, Inc. was contracted by Kleinschmidt Group to perform a freshwater mussel survey during October 2021. The survey areas are located in Stevens Creek, South Carolina, and two tributaries of Stevens Creek Reservoir in Georgia (Figure 1).



Methods

Survey conditions were good to excellent during the survey period. Water was mostly clear to slightly turbid in most areas surveyed. Flows were maintained by Dominion Energy at low levels to facilitate the surveys. Two areas were surveyed by two biologists and five areas were surveyed by 4 biologists for freshwater mussels using visual (bathyscopes) and tactile techniques. Specific sites within survey areas or reaches were selected based upon various mussel species' microhabitat needs.

Results and Discussion

Two freshwater mussel species were documented as extant within the areas surveyed for this project (Table 1, Figure 1, and Appendix): Eastern Elliptio (*Elliptio complanata*) and Eastern Creekshell (*Villosa delumbis*). No live individuals were documented and only a few shells were found within Stevens Creek. No evidence of freshwater mussels was documented within the two Savannah River Georgia tributaries surveyed. All areas surveyed had very little flow and had significant sediment loads. Such conditions limit most lotic mussel taxa populations.

However, it should be noted that the Stevens Creek Subbasin, farther upstream from the surveyed reach, is of global conservation significance because of its high mussel diversity and presence of many rare species. Tributaries, such as Mountain Creek, Little Stevens Creek, and Sleepy Creek, provide habitat for the federally listed Carolina Heelsplitter mussel. Stevens Creek, upstream from the surveyed reach, and many of its headwater tributaries also provide habitat for several mussel taxa of significant conservation concern (Table 1).

Acknowledgement

Will Pruitt and Nicole Haibach with Kleinschmidt Group provided significant

administrative and logistical assistance with this project.

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Williams, J.D., M.L. Warren, Jr., K.S. Cummings, J.L. Harris, and R.J. Neves. 1992. Conservation status of freshwater mussels of the United States and Canada. Fisheries. 18(9):6-22. Table 1. The freshwater mussels of the Savannah River Basin

Species Historically or	Within	Upcreek	2021 Status
Recently Documented	Dominion	within	(NatureServe)*
from Within the	Surveyed	Stevens	(inatureserve)
Savannah River Basin	Study	Creek	
	Area	Subbasin	

Elliptio congaraea			G3
E. complanata	Х	X	G5
E. roanokensis			G3
E. icterina		X	G5
E. angustata		X	G4
E. fisheriana			G4
E. producta		X	G3
Uniomerus carolinianus		X	G4
Fusconaia masoni			G1
Lasmigona decorata		X	G1,
			Fed. E
Alasmidonta undulata			G4
A. triangulata			G1
A. varicosa		X	G3
Sagittunio aldermani			undetermined
Pyganodon cataracta		X	G5
Utterbackia imbecillis		X	G5
Utterbackiana couperiana			G4
Utterbackiana implicata			G5
Strophitus undulatus		X	G5
Toxolasma pullus			G2
Villosa vibex		X	G5
V. delumbis	Х	X	G4
V. constricta			G3
Leptodea ochracea			G3
Lampsilis cariosa		X	G3
L. splendida			G3

* Species statuses according to NatureServe:

NatureServe G Ranks:

G1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 Secure—Common; widespread and abundant.

APPENDIX – Survey station results from Savannah River

<u>Basin</u>



Alderman Environmental Services, Inc.

19 October 2021

PROJECT: Dominion Energy Steven Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211019.1

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Stevens Creek, 33.655531 N, 82.122784 W

SURVEY DATE: 19 October 2021

COMMENTS: Site within ~12 mile kayak habitat evaluation survey of Stevens Creek; poor lotic taxa habitat; little flow; organic rich substrate; note, on 10/19/2021 the ~ 12 mile inventory reach upstream from the Stevens Creek Reservoir was kayaked to assess overall habitat quality (poor throughout)

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Slack
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	20
SUBSTRATE:	Silt, sand, mud, organics
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	None
WOODY DEBRIS:	High

HABITAT (CONTINUED):

BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	None documented
CHANNEL WIDTH:	20 m
BANK HEIGHT:	2.5 m
BANK STABILITY:	Some erosion/undercutting
BUFFER WIDTH:	Varies
RIPARIAN VEGETATION:	Wooded, shrub-brush, grass
LAND USE:	Natural, timber, rural
PERCENT COVER:	30
WOODLAND EXTENT:	Varied
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Low
WEATHER:	Sunny, cool

TECHNIQUES: Visual/tactile

SURVEY TIME: 0.3 person-hour

FRESHWATER MUSSELS:

None Documented

OTHER DOCUMENTED TAXA:

Corbicula fluminea



Alderman Environmental Services, Inc.

19 October 2021

PROJECT: Dominion Energy Steven Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211019.2

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Stevens Creek, 33.655503 N, 82.120843 W

SURVEY DATE: 19 October 2021

COMMENTS: Site within ~12 mile kayak habitat evaluation survey of Stevens Creek; poor lotic taxa habitat; little flow; organic rich substrate

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Slack
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	20
SUBSTRATE:	Silt, sand, mud, organics
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	None
WOODY DEBRIS:	High
	-
HABITAT (CONTINUED):

BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	None documented
CHANNEL WIDTH:	20 m
BANK HEIGHT:	2.5 m
BANK STABILITY:	Some erosion/undercutting
BUFFER WIDTH:	Varies
RIPARIAN VEGETATION:	Wooded, shrub-brush, grass
LAND USE:	Natural, timber, rural
PERCENT COVER:	30
WOODLAND EXTENT:	Varied
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Low
WEATHER:	Sunny, cool

TECHNIQUES: Visual/tactile

SURVEY TIME: 0.3 person-hour

FRESHWATER MUSSELS:

Elliptio complanata – 1 shell *Villosa delumbis* – 2 shells

OTHER DOCUMENTED TAXA:

Corbicula fluminea



Alderman Environmental Services, Inc.

PROJECT: Dominion Energy Stevens Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211027.1

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman John Fridell Kim Morgan

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Stevens Creek, 33.635743 N, 82.098014 W

SURVEY DATE: 27 October 2021

COMMENTS: Site within ~12 mile kayak habitat evaluation survey of Stevens Creek; very poor lotic mussel taxa habitat

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Slack
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	5
SUBSTRATE:	Poor quality lotic mussel substrate – silt, woody debris, organics
COMPACTNESS:	Normal, unconsolidated
SAND/GRAVEL BARS:	None
WOODY DEBRIS:	High

HABITAT (CONTINUED):

BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	None observed
CHANNEL WIDTH:	30 m
BANK HEIGHT:	2.5 m
BANK STABILITY:	Mostly stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	30
WOODLAND EXTENT:	Mostly extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Turbid
WATER LEVEL:	Normal
WEATHER:	Sunny, cool

TECHNIQUES: Visual/tactile

SURVEY TIME: 1 person-hour

FRESHWATER MUSSELS:

None documented

OTHER DOCUMENTED TAXA:

None documented



Alderman Environmental Services, Inc.

PROJECT: Dominion Energy Stevens Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211027.5

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman John Fridell Kim Morgan

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Stevens Creek, 33.635743 N, 82.098014 W

SURVEY DATE: 27 October 2021

COMMENTS: Site within ~12 mile kayak habitat evaluation survey of Stevens Creek; very poor lotic mussel taxa habitat

HABITAT:

Stream
Slack
Shallow
5
Poor quality lotic mussel substrate - silt, muck, woody
debris, organics
Normal, unconsolidated
None
High

HABITAT (CONTINUED):

BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	None observed
CHANNEL WIDTH:	30 m
BANK HEIGHT:	2.5 m
BANK STABILITY:	Mostly stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	30
WOODLAND EXTENT:	Mostly extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Turbid
WATER LEVEL:	Normal
WEATHER:	Sunny, cool

TECHNIQUES: Visual/tactile

SURVEY TIME: 1 person-hour

FRESHWATER MUSSELS:

None documented

OTHER DOCUMENTED TAXA:

Campeloma decisum Corbicula fluminea



Alderman Environmental Services, Inc.

PROJECT: Dominion Energy Stevens Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211027.2

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman John Fridell Kim Morgan

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Utchee Creek, Georgia; 33.59192 N, 82.149483 W

SURVEY DATE: 27 October 2021

COMMENTS: Poor lotic mussel habitat

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Slack
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	5
SUBSTRATE:	Clay, silt, woody debris, organics
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	None
WOODY DEBRIS:	Average

HABITAT (CONTINUED):

BEAVER ACTIVITY:	None
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	Varies
BANK HEIGHT:	0.5 m
BANK STABILITY:	Very stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural near stream
PERCENT COVER:	10
WOODLAND EXTENT:	Mostly extensive
NATURAL LEVEES:	None
VISIBILITY:	Clear to slightly turbid
WATER LEVEL:	Low
WEATHER:	Sunny, warm

TECHNIQUES: Visual/tactile

SURVEY TIME: 0.7 person-hours

FRESHWATER MUSSELS:

None documented

OTHER DOCUMENTED TAXA:

Corbicula fluminea



Alderman Environmental Services, Inc.

PROJECT: Dominion Energy Stevens Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211027.3

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Utchee Creek, Georgia; 33.593094 N, 82.147921 W

SURVEY DATE: 27 October 2021

COMMENTS: Mostly artificial bed from boulder fill; relatively good potential mussel habitat

HABITAT:

Stream
Run
Shallow
40
Boulder with accumulated finer substrates
Normal
None
Average

HABITAT (CONTINUED):

BEAVER ACTIVITY:	None
WINDTHROW:	Low
TEMPORARY POOLS:	None
CHANNEL WIDTH:	Varies
BANK HEIGHT:	Varies
BANK STABILITY:	Mostly stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	20
WOODLAND EXTENT:	Mostly extensive
NATURAL LEVEES:	None
VISIBILITY:	Clear
WATER LEVEL:	Normal
WEATHER:	Sunny, warm

TECHNIQUES: Visual/tactile

SURVEY TIME: 0.7 person-hour

FRESHWATER MUSSELS:

None documented

OTHER DOCUMENTED TAXA:

Corbicula fluminea Ferrissia rivularis Hydrobiidae



Alderman Environmental Services, Inc.

PROJECT: Dominion Energy Stevens Creek Hydroelectric Project freshwater mussel survey

SITE NUMBER: 211027.4

TARGET SPECIES: Inventory Survey

BIOLOGISTS: Joseph Alderman John Alderman

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: TE065756-3

LOCATION: Little Kikoee Creek; 33.604997 N, 82.160171 W

SURVEY DATE: 27 October 2021

COMMENTS: Slick dense clay banks; dropped off quickly; no washout shells

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run/Slack
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	30
SUBSTRATE:	Clay, silt, organics
COMPACTNESS:	Normal
SAND/GRAVEL BARS:	Present
WOODY DEBRIS:	Average

HABITAT (CONTINUED):

BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	Varies
BANK HEIGHT:	Varies
BANK STABILITY:	Mostly stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	90
WOODLAND EXTENT:	Mostly extensive
NATURAL LEVEES:	None
VISIBILITY:	Clear
WATER LEVEL:	Low
WEATHER:	Sunny, warm

TECHNIQUES: Visual/tactile

SURVEY TIME: 0.7 person-hours

FRESHWATER MUSSELS:

None documented

OTHER DOCUMENTED TAXA:

Corbicula fluminea

Appendices

APPENDIX E-6

TURBINE SURVIVABILITY TECHNICAL REPORT

TURBINE SURVIVAL STUDY TECHNICAL REPORT

STEVENS CREEK HYDROELECTRIC PROJECT

FERC No. 2535



Prepared for: Dominion Energy South Carolina, Inc.

Prepared by: Kleinschmidt Associates

March 2023



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1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC; Licensee) is the Licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535; Project). The Project has an installed capacity of 17.28 megawatts (MW) and is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The project's dam is located approximately one mile upstream of the Augusta Diversion Dam, and approximately 13 miles downstream of the U.S. Army Corps of Engineers (USACE) J. Storm Thurmond Dam (JST Dam). The Stevens Creek reservoir is approximately 25 miles long, extending upstream to the JST Dam and 12 miles up Stevens Creek. The surface area of the reservoir at normal full pond level (elevation of 187.5 feet) is 2,400 acres. The project drainage area is approximately 7,173 square miles.

DESC operates the Project to generate clean, renewable energy and re-regulate highly variable river flows discharged by the USACE from the JST Dam. The Stevens Creek Project is operated in accordance with an Operating Plan on file with the Federal Energy Regulatory Commission (FERC; Order issued June 22, 2018). The plan was developed in consultation with the USACE, U.S. Fish and Wildlife (USFWS), Georgia Department of Natural Resources (GDNR), South Carolina Department of Natural Resources (SCDNR), and the City of Augusta. The normal operating target range for the Stevens Creek Project is to provide an hourly discharge of ±15 percent of the scheduled daily average discharge from the JST Dam, if the actual discharge from the JST Dam is within 500 cubic feet per second (cfs) of the scheduled discharge.

On November 22, 1995, FERC issued a 30-year license for the Project which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. DESC is currently conducting the relicensing process for the Project which involves cooperation and collaboration between DESC, as Licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. DESC established a Water Quality, Fish and Wildlife Resource Conservation Group (RCG) with interested stakeholders to address potential project resource issues related to aquatic and terrestrial resources. In its comments on the Preliminary Application Document, the National Marine Fisheries Service (NMFS) requested that DESC perform a desktop turbine survival study on adult Blueback Herring and American Eel. Kleinschmidt Associates (Kleinschmidt) presented preliminary results of blade strike model simulations at a Resource Conservation Group (RCG) Meeting on February 25, 2021. Based on resource agency comments at that meeting, additional simulations were performed and are summarized in this report.

1.1 Goals and Objectives

The objective of this study was to assess the turbine survival of adult Blueback Herring and American Eel at the Project.

1.2 Background Information

During the previous relicensing of the Project, DESC studied entrainment of fishes through the turbines. The study results provided the following:

- Some reservoir fish approaching the Stevens Creek Dam are entrained at the powerhouse intakes and become subject to mortality risks associated with turbine passage;
- Trash racks on the intake structures, consisting of vertical bars with 3-inch to 3.5inch spacing, generally exclude larger game fish from passing through the turbines;
- American Eel captured during the entrainment study ranged in size from 187 to 609 mm total length;
- Blueback Herring captured during the entrainment study ranged in size from 94 to 153 mm total length;
- Over 90 percent of fish entrained at the Project survived passage;
- Multi-seasonal fish entrainment surveys and intensive entrainment mortality studies conducted at the Project indicate that turbine- induced mortality results in the annual loss of approximately 15,000 fish representing 17 species under normal operating conditions (FERC 1995);
- Species with the highest losses to turbine mortality were Threadfin Shad, Bluegill, Yellow Perch, American Eel, and Blueback Herring (FERC 1995);
- Turbine-related mortality rates documented in the study (i.e., four to six percent) represent only a small proportion of the high natural mortality that occurs among small fish;

2.0 METHODS AND ANALYSIS

2.1 Blueback Herring

The software program Stryke (Nebiolo 2022) was used to simulate the results of passing adult Blueback Herring through the Project turbines. Stryke utilizes the Franke et al. (1997) equations to calculate the probability that a fish will be struck by a turbine blade. Parameter values that were used in the simulation are listed in Table 2.1. For adult Blueback Herring simulations, a total length of 10 inches with a standard deviation of 2 was used.

Parameter	Value
Turbine Type	Francis
Runner Diameter (D)	9.7 ft
Number of Blades (N)	16
Runner Height (β)	3.05
Turbine Discharge (Q)	1,000 cfs
Discharge at Optimal Efficiency (Q _{opt} /Q)	0.956
Net Head (H)	27 ft
Speed (ω)	75 rpm
Swirl Coefficient (ξ)	1.1
Correlation Coefficient (λ)	0.20
Runner Diameter at Inlet (D1)	7.0 ft
Runner Diameter at Outlet (D2)	8.3 ft
Turbine Efficiency (η)	0.95

 Table 2.1
 Parameter Values Used in the Turbine Blade Strike Analysis

2.2 American Eel

A literature search was conducted to identify sources of data for turbine passage survival of yellow/silver phase American Eel. A total of 11 studies were identified at hydropower sites with Francis turbines that included, at a minimum, the mean total length (TL) of eels that were tested and 48-hour survival data. Turbine survival data from the 11 studies were fit to a beta distribution using R (version 4.1.3, 2022) and the fitdistrplus package (Delignette-Muller and Dutang 2015) to produce a median turbine survival estimate with upper and lower credible intervals (CI).

3.0 **RESULTS**

3.1 Blueback Herring

The Stryke model simulation was run using a population of 1000 individual fish and 100 iterations. The simulations yielded a median survival rate of 95.2 percent, with lower CI of 93.8 percent and an upper CI of 96.4 percent.

3.2 American Eel

Studies identified in the literature search included results for eels that ranged in mean TL from 553 mm to 900 mm (Table 3.1). Most of these studies were conducted at sites with turbine characteristics that were very similar to the Stevens Creek Project. Survival rates from these studies ranged from 75.7 percent to 98 percent. Analysis of these data by beta distribution fitting yielded a median survival rate of 92.7 percent, with upper and lower CIs of 98.5 percent and 80.3 percent, respectively.

Project	No. of Blades	Runner Diameter (ft)	Head (ft)	Discharge (cfs)	Runner Speed (rpm)	Eel Mean TL (mm)	48-hr Survival %
Stevens Creek	16	9.7	27	1,000	75		
Bellows Falls ¹	15	14.8	57.4	3,214	85.7	846	98
Cabot Station Unit 2 ¹	15	9.8	57.4	2,295	97.3	683	96
Station1, Unit 1 ¹	13	4.6	44.0	650	200	636	90
Vernon (Unit 4) ¹	13	9.2	44.3	1,307	75	818	93.5
Vernon (Unit 9) ¹	12	9.2	34.4	992	62.5	796	97.9
Minetto ²	16	11.6	17.3	1,500	72	553	93.6
Beauharnois ³	-	17.8	78.0	7,200	75	900	84.2
Luray, Unit 2 ³	12	5.2	18.0	256	164	870	91.1
Newport ⁴	-	-	-	-	-	854	75.7
Warren ⁴	-	-	-	-	-	854	95.2
Millville ⁴	-	_	_	-	-	854	91.4

 Table 3.1
 American Eel Survival Studies at Sites with Francis Turbines

¹Heisey et al. 2019; ²Niagra Mohawk Power Corporation 1995; ³EPRI 2001; ⁴Eyler et al. 2016

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APPENDIX E-7

INFORMATION FOR PLANNING AND CONSULTATION REPORT



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: Project Code: 2022-0074126 Project Name: Stevens Creek Hydro August 12, 2022

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 cavedwelling 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.

Note: IPaC has provided all available attachments because this project is in multiple field office jurisdictions.

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

This project's location is within the jurisdiction of multiple offices. However, only one species list document will be provided for all offices. The species and critical habitats in this document reflect the aggregation of those that fall in each of the affiliated office's jurisdiction. Other offices affiliated with the project:

Georgia Ecological Services Field Office

355 East Hancock Avenue Room 320 Athens, GA 30601-2523 (706) 613-9493

Project Summary

Project Code:2022-0074126Project Name:Stevens Creek HydroProject Type:Dam - OperationsProject Description:Relicensing to Steven Creek DamProject Location:Stevens Creek Dam

Approximate location of the project can be viewed in Google Maps: <u>https://www.google.com/maps/@33.60967195,-82.16751409973568,14z</u>



Counties: Georgia and South Carolina

Endangered Species Act Species

No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/8489</u>

There is a total of 4 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 Fisheries¹, 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. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Red-cockaded Woodpecker <i>Picoides borealis</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/7614</u>	Endangered
Wood Stork <i>Mycteria americana</i> Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/8477</u>	Threatened
Insects NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/9743</u>	Candidate
Flowering Plants	STATUS
Relict Trillium Trillium reliquum	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 <u>National Wildlife Refuge</u> 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 <u>below</u>.

- 1. The Migratory Birds Treaty Act of 1918.
- 2. The <u>Bald and Golden Eagle Protection Act</u> 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
American Kestrel <i>Falco sparverius paulus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA <u>https://ecos.fws.gov/ecp/species/9587</u>	Breeds Apr 1 to Aug 31
Bald Eagle <i>Haliaeetus leucocephalus</i> 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.	Breeds Sep 1 to Jul 31

NAME	BREEDING SEASON
Brown-headed Nuthatch <i>Sitta pusilla</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 1 to Jul 15
Chimney Swift <i>Chaetura pelagica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will <i>Antrostomus vociferus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Kentucky Warbler <i>Oporornis formosus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail <i>Rallus elegans</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/8936</u>	Breeds May 1 to Sep 5
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/9679</u>	Breeds elsewhere
Painted Bunting Passerina ciris This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 25 to Aug 15
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> 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.

				prob	probability of presence			breeding season			survey effort –		
SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
American Kestrel BCC - BCR	₽┼┼┼	#†##	₩┼┿┼	$\left\{ \left\{ \right\} \right\}$	$\left\{ \left\{ \right\} \right\}$	$\left\{ \left\{ \right\} \right\}$	++++	++++	┼┼╪╢	***	┼┼빠┼	₩┼┼┼	
Bald Eagle Non-BCC Vulnerable		∎₿≢∔	 	∎∎†≢	↓ ↓↓↓	┼┼╇║	11.00	+	+111				
Brown-headed Nuthatch BCC - BCR													
Chimney Swift BCC Rangewide (CON)	++++	++++	+ <mark>++</mark> ≢					##+ I		**	++++	++++	
Eastern Whip-poor- will BCC Rangewide (CON)	∎+++	++++	++ +	++++	<mark>Ⅰ</mark> ┼┼≁			+ + + +	+++-	++++	++++	+++	
Kentucky Warbler BCC Rangewide (CON)	++++	++++	++++	++ <mark>∎</mark> ∎	∎≢∔∔	┼╋┻┼	++++	++++	++#+	++++	++++	++++	
King Rail BCC Rangewide (CON)	++++	++++	++++	++++	∎+++	++++	++++	++++	++++	++++	++++	++++	
Lesser Yellowlegs BCC Rangewide (CON)	++++	++++	++++	++++	++ +	++++	++++	++++	++++	++++	*++*	++++	
Painted Bunting BCC - BCR	++++	++++	++++	* * #	### +	1111	+11+	┼┼∎┼	₩┼┼₩	++++	++++	++++	
Prairie Warbler BCC Rangewide (CON)	++++	++++	┼┼ ₩₩	┼║╪║	¢₿∳∔	┼╋┼┼	++++	+++#	+##+	₩+++	++++	++++	
Prothonotary Warbler BCC Rangewide (CON)	++++	++++	┼┼┼╇	┼┼╋╪	 	┼┼∎∎	┼┼║┼	++#+	++++	++++	++++	++++	
Red-headed Woodpecker BCC Rangewide (CON)	•***	U ###	## ##	****	 	1111	1111	ŧŧ+∎	1 # 11	*###	[]+]	▋▋▋∔	
SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	



Additional information can be found using the following links:

- Birds of Conservation Concern <u>https://www.fws.gov/program/migratory-birds/species</u>
- Measures for avoiding and minimizing impacts to birds <u>https://www.fws.gov/library/</u> <u>collections/avoiding-and-minimizing-incidental-take-migratory-birds</u>
- Nationwide conservation measures for birds <u>https://www.fws.gov/sites/default/files/</u> <u>documents/nationwide-standard-conservation-measures.pdf</u>

Migratory Birds FAQ

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

<u>Nationwide Conservation Measures</u> 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. <u>Additional measures</u> or <u>permits</u> 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 list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS <u>Birds of Conservation Concern</u> (<u>BCC</u>) 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 <u>Avian</u> <u>Knowledge Network (AKN)</u>. The AKN data is based on a growing collection of <u>survey</u>, <u>banding</u>, <u>and citizen science datasets</u> 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 (<u>Eagle Act</u> 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 <u>Rapid Avian Information</u> <u>Locator (RAIL) Tool</u>.

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 <u>Avian Knowledge Network (AKN)</u>. This data is derived from a growing collection of <u>survey, banding, and citizen science datasets</u>.

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 or migrating in my 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 query your location using the <u>RAIL Tool</u> and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. 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 <u>Birds of Conservation Concern</u> (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 <u>Eagle Act</u> 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 <u>Northeast Ocean Data Portal</u>. 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 <u>NOAA NCCOS Integrative Statistical</u> <u>Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic</u> <u>Outer Continental Shelf</u> 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 <u>Diving Bird Study</u> and the <u>nanotag studies</u> or contact <u>Caleb Spiegel</u> or <u>Pam Loring</u>.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to <u>obtain a permit</u> 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 <u>NWI wetlands</u> 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>U.S. Army Corps of</u> <u>Engineers District</u>.

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 <u>HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML</u> OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.
IPaC User Contact Information

Agency:Kleinschmidt AssociatesName:Will PruittAddress:141City:PittsfieldState:MEZip:04967Emailwpruittl@gmail.comPhone:7062557741

APPENDIX E-8

RARE, THREATENED, AND ENDANGERED SPECIES LIST

Federal Rare, Threatened & Endangered Species				
Common Name Scientific Name Status Critical Habitat				
Red-cockaded Woodpecker	Picoides borealis	Endangered	None	
Wood Stork	Mycteria americana	Threatened	None	
Carolina Heelsplitter	Lasmigona decorata	Endangered	Critical habitat is outside the Project boundary.	
Miccosukee Gooseberry	Ribes echinellum	Threatened	None	
Relict Trillium	Trillium reliquum	Endangered	None	

Source: USFWS IPaC Lists, Georgia and South Carolina, 2020

Migratory Birds/Birds of Conservation Concern/Protected Birds			
Common Name	Scientific Name	Breeding Season within the Project Area	
American Kestrel	Falco sparverius paulus	April 1 to August 31	
Bald Eagle	Haliaeetus leucocephalus	September 1 to July 31	
Blue-winged Warbler	Vermivora pinus	May 1 to June 30	
Kentucky Warbler	Oporornis formosus	April 20 to August 20	
Prairie Warbler	Dendroica discolor	May 1 to July 31	
Prothontary Warbler	Protonotaria citrea	April 1 to July 31	
Red-headed Woodpecker	Melanerpes erythrocephalus	May 10 to September 10	
Red-throated Loon	Gavia stellata	Breeds elsewhere	
Rusty Blackbird	Euphagus caorlinus	Breeds elsewhere	
Short-billed Dowitcher	Limnodromus griseus	Breeds elsewhere	
Wood Thrush	Hylocichla mustelina	May 10 to August 31	
Prairie Warbler Prothontary Warbler Red-headed Woodpecker Red-throated Loon Rusty Blackbird Short-billed Dowitcher Wood Thrush	Dendroica discolor Protonotaria citrea Melanerpes erythrocephalus Gavia stellata Euphagus caorlinus Limnodromus griseus Hylocichla mustelina	May 1 to July 31 April 1 to July 31 May 10 to September 10 Breeds elsewhere Breeds elsewhere Breeds elsewhere May 10 to August 31	

Source: USFWS IPaC List, South Carolina, 2020

Forest Service Threatened, Endangered, and Sensitive Species: Long Cane Ranger District of the Sumter National			
Forest			
Common Name	Status		
	Animals		
Atlantic Spike	Elliptio producta	Sensitive	
Bachman's Sparrow	Peucaea aestivalis	Sensitive	
Bartam's Bass	Micropterus coosae	Sensitive	
Brook Floater	Alasmidonta varicosa	Sensitive	
Carolina Heelsplitter	Lasmigona decorata	Endangered	
Monarch Butterfly	Danaus plexippus	Sensitive	
Piedmont Prairie Burrowing Cray	Distocambarus crockeri	Sensitive	
Red-Cockaded Woodpecker	Dryobates borealis	Endangered	
Roanoke Slabshell	Elliptio roanokensis	Sensitive	
Robust Redhorse	Moxostoma robustrum	Sensitive	
Tricolored Bat	Perimyotis subflavus	Sensitive	
Webster's Salamander	Plethodon websteri	Sensitive	
Wood Stork	Mycteria americana	Endangered	

Yellow Lampmussel	Lampsilis cariosa	Sensitive			
	Plants				
Faded Trillium	Trillium discolor	Sensitive			
Georgia Aster	Symphyotrichum georgianus	Sensitive			
Lanceleaf Trillium	Trillium lancifolium	Sensitive			
Miccosukee Gooseberry	Ribes echinellum	Threatened			
Oglethorpe Oak	Quercus oglethorpensis	Sensitive			
Relict Trillium	Trillium reliquum	Endangered			
Shoals Spider Lily	Hymenocallis coronaria	Sensitive			
Sweet Pinesap	Monotropsis odorata	Sensitive			

Source: US Forest Service, 2020

Georgia and South Carolina State Protected Species			
Common Name Georgia Protected Species ¹ South Carolina Protected Specie			
	Animals		
American Eel		highest	
Atlantic Pigtoe	high		
Atlantic Spike		high	
Atlantic Sturgeon	high		
Bald Eagle		high	
Baltimore Oriole		high	
Bartram's Bass		highest	
Brother Spike	high		
Carolina Slabshell	*		
Christmas Darter		highest	
Delicate Spike	high		
Dwarf Waterdog	high		
Eastern Creekshell		moderate	
Eastern Elliptio		moderate	
Flat Bullhead		moderate	
Florida Pondhorn		*	
Highfin Shiner		moderate	
Ironcolor Shiner	*		
Notchlip Redhorse		moderate	
Roanoke Slabshell	*		
Rosyface Chub		moderate	
Robust Redhorse	high	highest	
Savannah Elimia	*		
Savannah Lilliput	high		
Shortnose Sturgeon	high		
Snail Bullhead		moderate	
Spotted Turtle	high		

Tiger Salamander		highest
Turquoise Darter		high
Webster's Salamander		highest
Yellow Lampmussel	high	highest
	Plants	
Aethusa-like Trepocarpus		moderate
American Barberry	high	
American Ginseng		high
Carolina Larkspur		moderate
Carolina Trefoil	high	
Curly-Heads	*	
Dixie Mountain Breadroot	high	
Dutchman's Breeches		moderate
Eared Goldenrod		moderate
Faded Trillium		*
False-Rue Anemone	*	moderate
Georgia Aster		highest
Georgia Plume	high	
James' Sedge		moderate
Lanceleaf Wakerobin (Narrow-		hiah
leaved Trillium)		nign
Log Fern	*	
Lowland Bladderfern		*
Miccosukee Gooseberry		highest
Ocmulgee Skullcap	high	*
One-Flowered Broomrape		*
Pale Yellow Trillium	*	
Pineland Barbara Buttons	*	
Relict Trillium	high	highest
Shoals Spider Lily	high	high
Side-Oats Grama	*	
Slender Sedge		moderate
Smooth Indigobush		*
Southern Nodding Trillium		high
Streambank Mock Orange		*
Tall Bellflower		moderate
Tuberous Gromwell		moderate
Virginia Spiderwort		moderate
Weak Nettle		*
Whiteleaf Sunflower		moderate
Wingpod Purslane	high	
Yellow Nailwort	high	

¹GA SWAP species with state protection are indicated with an asterisk (*); species identified as "high" are state protected species with high priority status.

² Listed species categorized in the SC SWAP are noted as having moderate, high or highest priority status; species identified with an asterisk (*) are state "tracked" species.

Source: Georgia DNR, 2019; South Carolina DNR, 2020

Appendices

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RARE, THREATENED, AND ENDANGERED SPECIES WHITEPAPER

STEVENS CREEK HYDROELECTRIC PROJECT

FERC No. 2535

RARE, THREATENED AND ENDANGERED SPECIES WHITEPAPER

Prepared for:

Dominion Energy South Carolina, Inc. Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina www.KleinschmidtGroup.com

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RARE, THREATENED AND ENDANGERED SPECIES WHITEPAPER DOMINION ENERGY SOUTH CAROLINA, INC.

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STEVENS CREEK HYDROELECTRIC PROJECT FERC No. 2535

RARE, THREATENED AND ENDANGERED SPECIES WHITEPAPER DOMINION ENERGY SOUTH CAROLINA, INC.

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535) (Project). The Project, which has an installed capacity of 17.28 megawatts (MW), is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The Project's dam is located approximately one mile upstream of the Augusta Diversion Dam, and approximately 13 miles downstream of the J. Strom Thurmond Dam. The Project occupies approximately 104 acres of federal lands within the Sumter National Forest. A project location map is included in Figure 3-1.

On November 22, 1995, FERC issued a 30-year license for the Project which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. The Project is currently undergoing a relicensing process which involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. During early stakeholder meetings, DESC and stakeholders identified the need for a Rare, Threatened and Endangered (RTE) Species Whitepaper to provide baseline information on federal and state-listed RTE species within the FERC project boundary¹ and the area of potential Project influence (project area)². The information included in this whitepaper will be used during the development of the Draft License Application (DLA) and Final License Application (FLA) and identify potential Project effects on RTE species within the project area.

¹ The FERC-delineated boundary surrounding those lands and waters necessary for operation of a federally-licensed hydroelectric project.

² For the purposes of this whitepaper the "project area" is considered those lands and waters in the vicinity of the Project that may be influenced by operation and maintenance of the Project. The Project area may include lands and water adjacent to, but outside of, the FERC Project boundary.

2.0 CONSULTATION HISTORY

When developing the Pre-Application Document (PAD), DESC reached out to the Georgia Department of Natural Resources (GDNR), South Carolina Department of Natural Resources (SCDNR), United States Forest Service (Forest Service), and the United States Fish and Wildlife Service (USFWS) to compile a comprehensive list of federal and state-listed RTE species and Forest Service species of conservation concern. Consultation records are included in Appendix A.

3.0 METHODOLOGY

The Project area for the purpose of this study includes the main stem of the Savannah River from the Thurmond Dam downstream to the Stevens Creek Dam (approximately 13 River Miles [RMs]), the main stem of Stevens Creek, from the Stevens Creek Dam upstream to the top of the Project boundary (approximately 12 RMs), and associated shoreline habitats (Figure 3-1).

As an initial step, a comprehensive list was developed that includes federal-protected and Forest Service Threatened, Endangered and Sensitive (TES) species that may occur in the Project boundary (Table 3-1). In order to identify federal-protected species in the Project area, the USFWS's Information for Planning and Consultation (IPaC) online system was reviewed. Results from the IPaC review are included in Table 3-1 and Appendix A. Forest Service TES species that may occur in the Project area were also identified. The Forest Service provided a list of their Threatened, Endangered and Sensitive (TES) Species for the Long Cane Ranger District of the Sumter National Forest on January 15, 2020. These species are also in Table 3-1 and Appendix A.

After identification of federal-protected and Forest Service TES species, habitat requirements for each species were reviewed to determine the likelihood of each species to occur within the Project boundary. Species that were deemed likely to occur within the Project boundary were then analyzed to determine if continued Project operations would have any adverse effect on the species.

In addition to USFWS and Forest Service protected species, the National Marine Fisheries Service (NMFS) is responsible for the protection of threatened and endangered anadromous and marine fish species. Atlantic Sturgeon and Shortnose Sturgeon, two species that inhabit freshwater seasonally, are listed under the Endangered Species Act (ESA) as threatened and endangered, respectively. These species are not known to occur in the Project area at this time, however there is potential for the species to occur in the future, following the implementation of fish passage downstream of Stevens Creek dam. These species are discussed further in Section 4.0.



FIGURE 3-1 STEVENS CREEK RARE, THREATENED, AND ENDANGERED SPECIES STUDY AREA

TABLE 3-1 FEDERAL-PROTECTED AND FOREST SERVICE TES SPECIES IN THE STEVENS CREEK PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	FEDERAL	FOREST SERVICE
		PROTECTION	I ES SPECIES - SNF
	ANIMALS		~
Atlantic Spike	Elliptio producta		Sensitive
Bachman's Sparrow	Peucaea aestivalis		Sensitive
Bald Eagle	Haliaeetus leucocephalus	*	
Bartam's Bass	Micropterus coosae		Sensitive
Brook Floater	Alasmidonta varicosa		Sensitive
Carolina Heelsplitter	Lasmigona decorata	Endangered	Endangered
Monarch Butterfly	Danaus plexippus		Sensitive
Piedmont Prairie	Distocambarus crockeri		Sensitive
Burrowing Crayfish			
Red-Cockaded	Dryobates borealis	Endangered	Endangered
Woodpecker			
Roanoke Slabshell	Elliptio roanokensis		Sensitive
Robust Redhorse	Moxostoma robustrum		Sensitive
Tricolored Bat	Perimyotis subflavus		Sensitive
Webster's Salamander	Plethodon websteri		Sensitive
Wood Stork	Mycteria americana	Threatened	Endangered
Yellow Lampmussel	Lampsilis cariosa		Sensitive
	PLANTS		
Faded Trillium	Trillium discolor		Sensitive
Georgia Aster	Symphyotrichum georgianus		Sensitive
Lanceleaf Trillium	Trillium lancifolium		Sensitive
Miccosukee Gooseberry	Ribes echinellum	Threatened	Threatened
Oglethorpe Oak	Quercus oglethorpensis		Sensitive
Relict Trillium	Trillium reliquum	Endangered	Endangered
Shoals Spider Lily	Hymenocallis coronaria		Sensitive
Sweet Pinesap	Monotropsis odorata		Sensitive

* This species is protected under the Bald and Golden Eagle Protection Act of 1940.

In addition to federal-protected and Forest Service TES species, this report identifies stateprotected species that may occur in the Project area. On February 4, 2019, the Georgia Department of Natural Resources (Georgia DNR) provided a letter summarizing plant and animal species of the highest priority conservation status near the Stevens Creek Project in Columbia County, GA. On March 27, 2020, the South Carolina Department of Natural Resources (South Carolina DNR) provided information on the South Carolina State Wildlife Action Plan (SWAP) priority species and other "tracked species" that may occur in the Project area. Tracked species are those within the state's natural heritage database that are deemed vulnerable or imperiled within the state but may be more secure in other parts of the species' range. These species are also included in Table 3-2 and Appendix A.

Although these species were not analyzed for likelihood of existence within the Project boundary and potential Project operations effects, they are included in this report for informational purposes.

 TABLE 3-2
 GEORGIA AND SOUTH CAROLINA STATE-PROTECTED SPECIES IN THE PROJECT AREA

	GEORGIA PROTECTED	SOUTH CAROLINA PROTECTED
COMMON NAME	SPECIES ¹	SPECIES ²
	ANIMALS	
American Eel		highest
Atlantic Pigtoe	high	
Atlantic Spike		high
Atlantic Sturgeon	high	
Bald Eagle		high
Baltimore Oriole		high
Bartram's Bass		highest
Brother Spike	high	
Carolina Slabshell	*	
Christmas Darter		highest
Delicate Spike	high	
Dwarf Waterdog	high	
Eastern Creekshell		moderate
Eastern Elliptio		moderate
Flat Bullhead		moderate
Florida Pondhorn		*
Highfin Shiner		moderate
Ironcolor Shiner	*	
Notchlip Redhorse		moderate
Roanoke Slabshell	*	
Rosyface Chub		moderate
Robust Redhorse	high	highest
Savannah Elimia	*	
Savannah Lilliput	high	
Shortnose Sturgeon	high	
Snail Bullhead		moderate
Spotted Turtle	high	
Tiger Salamander		highest
Turquoise Darter		high
Webster's Salamander		highest

COMMON NAME	GEORGIA PROTECTED Species ¹	SOUTH CAROLINA PROTECTED		
Vellow Lampmussel	high	bighest		
Tenow Lampinussei ingliest				
Aethusa-like				
Trepocarpus		moderate		
American Barberry	high	inodoluto		
American Ginseng		high		
Carolina Larkspur		moderate		
Carolina Trefoil	high	moderate		
Curly-Heads	*			
Dixie Mountain				
Breadroot	high			
Dutchman's Breeches		moderate		
Eared Goldenrod		moderate		
Faded Trillium		*		
False-Rue Anemone	*	moderate		
Georgia Aster		highest		
Georgia Plume	high	ingnest		
James' Sedge		moderate		
Lanceleaf Wakerobin		moderate		
(Narrow-leaved Trillium)		high		
Log Fern	*	6		
Lowland Bladderfern		*		
Miccosukee Gooseberry		highest		
Ocmulgee Skullcap	high	*		
One-Flowered				
Broomrape		*		
Pale Yellow Trillium	*			
Pineland Barbara Buttons	*			
Relict Trillium	high	highest		
Shoals Spider Lily	high	high		
Side-Oats Grama	*			
Slender Sedge		moderate		
Smooth Indigobush		*		
Southern Nodding				
Trillium		high		
Streambank Mock				
Orange		*		
Tall Bellflower		moderate		
Tuberous Gromwell		moderate		
Virginia Spiderwort		moderate		
Weak Nettle		*		
Whiteleaf Sunflower		moderate		

COMMON NAME	GEORGIA PROTECTED SPECIES ¹	SOUTH CAROLINA PROTECTED SPECIES ²
Wingpod Purslane	high	
Yellow Nailwort	high	

¹GA SWAP species with state protection are indicated with an asterisk (*); species identified as "high" are state

protected species with high priority status. ² Listed species categorized in the SC SWAP are noted as having moderate, high or highest priority status; species identified with an asterisk (*) are state "tracked" species.

4.0 PROPOSED ACTION, SPECIES DESCRIPTIONS AND ANALYSIS

4.1 **PROPOSED ACTION**

For the purpose of this analysis, we have assumed that the Project will continue operating as a reregulating facility for flows released from the upstream U.S. Army Corps of Engineers' J. Strom Thurmond Dam. Stevens Creek reservoir fluctuations and downstream releases are anticipated to continue under the new license in the same form and capacity as they have over the past 30 years. Moreover, much of the land in the Project area is easement/Forest Service lands, not owned by DESC. Therefore, DESC does not actively manage or maintain these lands, and they are generally left in a natural state. If the proposed action changes prior to submittal of the Final License Application, species discussions will be updated accordingly.

4.2 FEDERAL-PROTECTED SPECIES

Table 4-1 lists the federal-protected species that may occur in the Project area. Habitat descriptions of each species along with an analysis of likelihood to exist in the Project boundary and potential for adverse effects from continued Project operations are included below. As mentioned, Atlantic Sturgeon and Shortnose Sturgeon do not occur in the Project area, however they have the potential to occur in the future following the implementation of fish passage downstream of Stevens Creek dam. These species are not listed in Table 4-1 however they are discussed further in the following sections.

COMMON NAME	SCIENTIFIC NAME	FEDERAL PROTECTION STATUS
Bald Eagle	Haliaeetus leucocephalus	*
Carolina Heelsplitter	Lasmigona decorata	Endangered
Miccosukee Gooseberry	Ribes echinellum	Threatened
Red-Cockaded Woodpecker	Dryobates borealis	Endangered
Relict Trillium	Trillium reliquum	Endangered
Wood Stork	Mycteria americana	Threatened

 TABLE 4-1
 FEDERAL-PROTECTED SPECIES IN THE PROJECT AREA

* This species is protected under the Bald and Golden Eagle Protection Act of 1940.

4.2.1 BALD EAGLE

The bald eagle was removed from the federal list of threatened species in 2007 (USFWS 2007) but remains protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (16 U.S.C. 668-668d) (72 FR 37345-37372). Bald eagles are found throughout North American, typically around water bodies, where they feed on fish and carrion. Studies have shown that foraging bald eagles are particularly attracted to reservoirs associated with hydroelectric facilities (Brown 1996). Bald eagles nest in large trees near water and typically use the same nest for several years (Degraaf and Rudis 1986).

Status in the Project Boundary and Effects of Continued Project Operations

The USACE monitors eagles on an annual basis on Lake Thurmond and in the immediate tailrace. During the 2020 survey, approximately 37 bald eagles were documented. In addition, SCDNR tracks bald eagle nests around the state. One nest is documented very close to the Project, however outside the Project boundary. It is likely that bald eagles reside and forage within the Project boundary, although no nests have been documented. Since much of the land surrounding the Project reservoir is maintained in a natural state, continued operation of the Project is not likely to result in negative effects on eagle foraging or nesting.

4.2.2 CAROLINA HEELSPLITTER

The Carolina heelsplitter is found in cool, well-oxygenated reaches of rivers and streams. The current range of this species is limited as compared to its historic range. These declines and loss of populations are associated with factors including pollutants from municipal and industrial wastewater releases. The species is sensitive to silt and is generally found in silt-free areas with banks that are stabilized and shaded by trees and shrubs (USFWS 2011). One of the eight surviving populations of Carolina heelsplitter is found in Turkey Creek and its tributaries. These creeks are part of the Savannah River drainage, located in Edgefield County, SC (NRC 2020).

Status in the Project Boundary and Effects of Continued Project Operations

As mentioned, the Carolina heelsplitter is known to occur in the Savannah River drainage in Edgefield County, SC. DESC is conducting a mussel study as part of the relicensing process, with special focus on identification of this species. Effects of continued Project operations will be

determined as part of that study in the event this species is found within the project area of influence.

4.2.3 MICCOSUKEE GOOSEBERRY

The Miccosukee gooseberry is a bushy shrub that flowers in late February to early April and produces spiny green berries. The Miccosukee gooseberry is associated with a deciduous, mixed hardwood forest with an overstory canopy dominated by oak and hickory trees. Specifically, the species is known to occur in three locations, including the shores of Lake Miccosukee in Jefferson County, Florida; and along Stevens Creek and a site on the Sumter National Forest in McCormick and Edgefield counties, South Carolina (NatureServe 2019).

Status in the Project Boundary and Effects of Continued Project Operations

This species is known to occur on north-facing hardwood slopes in the Stevens Creek drainage and at a site in the Long Cane Ranger District of the Sumter National Forest in McCormick and Edgefield counties. It is likely a portion of this population occurs within the Project boundary. Continued Project effects are unlikely to adversely affect this species, as the population in the Sumter National Forest appears stable and no modifications to Project operations are proposed.

4.2.4 **Red-cockaded Woodpecker**

The red-cockaded woodpecker is found in open, mature, and old growth pine ecosystems in the southeastern portion of the United States (USFWS 2003). Suitable nesting habitat includes open pine forests and savannahs with large, older pines and minimal hardwood midstory or overstory. Older living trees that are easily excavated due to susceptibility to red-heart disease are preferred nesting trees for the species. Suitable foraging habitat includes open-canopy, mature pine forests with low densities of small pines, little midstory vegetation, limited hardwood overstory, and abundance bunchgrass and forb groundcover (USFWS 2003).

Status in the Project Boundary and Effects of Continued Project Operations

Although the species is known to occur in Edgefield County (Forest Service 2020), it is unlikely the species occurs in the Project boundary, since there is limited suitable woodland habitat within the Project boundary. The potential of Project effects to this species are minimal and would likely only occur during any development activities involving logging that may be proposed through the new license. Consideration of the potential occurrence of this species should take place prior to the development or expansion of recreation facilities proposed under the new license.

4.2.5 **RELICT TRILLIUM**

Relict trillium is typically found in mesic hardwood forests that can be on slopes or on bottomlands and floodplains. Soils and subsoils include rocky clays to alluvial sands all with high organic matter content. The largest populations are found in the drainages of the Savannah and Chattahoochee Rivers. The species is not indicated to occur in areas that have ever been disturbed by fire. The species is known to occur in Aiken County in proximity to the Sumter National Forest (Forest Service 2020).

Status in the Project Boundary and Effects of Continued Project Operations

This species is known to occur in Edgefield County and likely occurs within the Project boundary. This species is most often threatened by residential and urban development. The potential of Project effects to this species are minimal and would likely only occur during any development activities that may be proposed through the new license. Consideration of the potential occurrence of this species should take place prior to the development or expansion of recreation facilities proposed under the new license.

4.2.6 WOOD STORK

The wood stork, a large colonial wading bird, is the only stork species that breeds in the United States (USFWS 1996). The wood stork uses a variety of wetlands for nesting, feeding, and roosting. Wood storks require periods of flooding, during which fish populations increase, alternating with dryer periods, during which receding water levels trap fish, leaving higher densities for easier foraging (USFWS 2020b). Nesting habitat includes primarily cypress swamps with nests located in the upper branches of large black gum or cypress trees. Nesting in the United States is currently thought to be limited to the coastal plain of South Carolina, North Carolina, Georgia and Florida (Murphy and Hand 2013).

Although the wood stork is not likely to nest within the Project boundary, it may forage periodically in the freshwater wetlands associated with the Stevens Creek reservoir. Project operations are expected to result in no adverse effects on wood storks or their foraging habitat.

4.2.7 ATLANTIC STURGEON

The Atlantic Sturgeon is a large anadromous fish found in rivers and coastal waters along the Atlantic coast, from Canada to Florida (NOAA Fisheries 2020). After hatching in freshwater rivers, juveniles leave their birthplace for ocean waters only to return to their birthplace as adults to spawn. Atlantic sturgeon populations have largely declined due to overfishing and habitat loss. All five US Atlantic sturgeon distinct population segments are listed as endangered or threatened under the ESA (NOAA Fisheries 2020).

Status in the Project Boundary and Effects of Continued Project Operations

Historically, Atlantic Sturgeon migrated through the Savannah River to reach spawning or rearing grounds at the Augusta Shoals. Today there are six dams along the Savannah River with only one, the New Savannah Bluff Lock and Dam, having an upstream fish passage system. The Augusta Diversion Dam, located one mile downstream of Stevens Creek dam, does not have fish passage at this time. For these reasons, the Atlantic Sturgeon is not located within the Project area, although there is potential for the species to occur in the future, following fish passage implementation at August Diversion Dam.

4.2.8 SHORTNOSE STURGEON

The Shortnose Sturgeon is an anadromous fish found in rivers and coastal waters along the Atlantic coast, from Canada to Florida (NOAA Fisheries 2020b). Shortnose Sturgeon hatch in freshwater rivers and spend a majority of their lifetime in the estuaries of these rivers. They spend relatively little time in the ocean. Adults travel far upstream in rivers to spawn and then move back downstream to the estuaries to feed and rest. The Shortnose Sturgeon is listed as endangered under the ESA (NOAA Fisheries 2020b).

Similar to the Atlantic Sturgeon, Shortnose Sturgeon historically migrated through the Savannah River to reach spawning or rearing grounds at the Augusta Shoals. Access in Savannah River beyond the New Savannah Bluff Lock and Dam is impeded by dams. The Augusta Diversion Dam, located one mile downstream of Stevens Creek dam, does not have fish passage at this time. For these reasons, the Shortnose Sturgeon is not located within the Project area, although there is potential for the species to occur in the future, following fish passage implementation at August Diversion Dam.

4.3 U.S. FOREST SERVICE THREATENED, ENDANGERED AND SENSITIVE SPECIES

Table 4-2 lists the Forest Service TES species that may occur in the Project area. Habitat descriptions of each species along with an analysis of likelihood to exist in the Project boundary and potential for adverse effects from continued Project operations are included below. See Section 4.1 for the habitat descriptions and analysis of species that are also federal-protected species, as indicated in Table 4-2 with an asterisk (*).

		FOREST SERVICE TES
COMMON NAME	SCIENTIFIC NAME	SPECIES
	ANIMALS	
Atlantic Spike	Elliptio producta	Sensitive
Bachman's Sparrow	Peucaea aestivalis	Sensitive
Bartam's Bass	Micropterus coosae	Sensitive
Brook Floater	Alasmidonta varicosa	Sensitive
Carolina Heelsplitter*	Lasmigona decorata	Endangered
Monarch Butterfly	Danaus plexippus	Sensitive
Piedmont Prairie Burrowing Crayfish	Distocambarus crockeri	Sensitive
Red-Cockaded Woodpecker*	Dryobates borealis	Endangered
Roanoke Slabshell	Elliptio roanokensis	Sensitive
Robust Redhorse	Moxostoma robustrum	Sensitive
Tricolored Bat	Perimyotis subflavus	Sensitive
Webster's Salamander	Plethodon websteri	Sensitive
Wood Stork*	Mycteria americana	Endangered
Yellow Lampmussel	Lampsilis cariosa	Sensitive
PLANTS		
Faded Trillium	Trillium discolor	Sensitive
Georgia Aster	Symphyotrichum georgianus	Sensitive

 TABLE 4-2
 FOREST SERVICE TES SPECIES FOR THE LONG CANE DISTRICT OF SUMTER

 NATIONAL FOREST

		FOREST SERVICE TES
COMMON NAME	SCIENTIFIC NAME	SPECIES
Lanceleaf Trillium	Trillium lancifolium	Sensitive
Miccosukee Gooseberry*	Ribes echinellum	Threatened
Oglethorpe Oak	Quercus oglethorpensis	Sensitive
Relict Trillium*	Trillium reliquum	Endangered
Shoals Spider Lily	Hymenocallis coronaria	Sensitive
Sweet Pinesap	Monotropsis odorata	Sensitive

4.3.1 ATLANTIC SPIKE

The Atlantic spike is found throughout South Carolina (Bogan and Alderman 2008) and prefers streams or rivers with sandy, rocky, and/or muddy bottoms in sections where the current is not too rapid (Forest Service 2020). This species is found throughout Maryland, Pennsylvania, North Carolina, Virginia, and South Carolina, although it has been extirpated from some reaches where it was previously found, possibly due to environmental factors including decreased water quality associated with sedimentation and pollution. The host fish for this species is not known (NatureServe 2020a).

This species is found throughout the Savannah River Basin (NatureServe 2020a) and is found in the Long Cane Ranger District of the Sumter National Forest (Forest Service 2020).

Status in the Project Boundary and Effects of Continued Project Operations

As mentioned, this mussel is found throughout the Savannah River Basin and may occur within the Project boundary. DESC is conducting a mussel survey as part of the relicensing process and will document any individuals found during the survey. Effects of continued Project operations on the species will be assessed as part of that survey, if the species is found.

4.3.2 BACHMAN'S SPARROW

Bachman's sparrow, known by its "buffy" brownish-gray under plumage tinged with reddish streaks, typically yields two broods each breeding season (USFWS 2015). The female sparrow builds nests of grasses at or just above ground level. The species historically preferred mature pine forests, however since most of these areas have been logged, today the sparrow is typically found in pine forests with a more open understory and herbaceous understories. The sparrow is known to span the Coastal Plains and Piedmont regions of the southeastern United States.

Bachman's sparrow is found in the Piedmont region of the southeastern United States and within the Long Cane Ranger District of the Sumter National Forest. This species is unlikely to occur in the Project boundary area as it has not been documented in the counties in which the Project is located. Continued Project operations are not expected to affect this species.

4.3.3 BARTRAM'S BASS

The Bartram's Bass is a small to medium sized black bass species that occurs in the Savannah River drainage above the fall line and has been introduced in the Saluda River drainage (Forest Service 2020). This species utilizes shoal habitats in small to moderate size upland streams, particularly upland reaches with cool water temperatures. Specifically, it is generally found in areas with boulders, submerged logs, and undercut banks with vegetation such as water willow (Forest Service 2020). It can also be found in some lentic habitats over rocky substrates. The diet consists of terrestrial insects, crayfish, small fish, salamanders, and aquatic insects. Threats to the species include hybridization with Spotted Bass and Smallmouth Bass. Spotted Bass have spread throughout the upper Savannah River system, and hybridization between the two species has eliminated Bartram's Bass from several reaches. Additional threats include increased water temperatures and increased turbidity from loss of riparian vegetation along stream banks (SCDNR 2020).

Status in the Project Boundary and Effects of Continued Project Operations

Bartram's Bass have been collected from the mainstem of the Savannah River and in upstream reaches of Stevens Creek well upstream of the Project Boundary (SCDNR 2020, Freeman et al. 2015). Bartram's Bass inhabiting reaches of Stevens Creek upstream of the Project Boundary would not be affected by Project operations. Bartram's Bass inhabiting the Savannah River downstream of the Project would likely benefit from flow reregulation resulting habitat stability in the Augusta Shoals.

4.3.4 BROOK FLOATER

The brook floater is a freshwater mussel species that is usually found in high gradient, consistently flowing reaches of rivers and streams. Preferred substrates are characterized by sand and gravel, often with adjacent boulders (PNHP 2020; USFWS 2019). This species is sensitive to habitat

degradation, including excessive silt and nutrient inputs, and is also sensitive to hypoxia (PNHP 2020; USFWS 2019). Potential host fish include blacknose dace, longnose dace, golden shiner, pumpkinseed, slimy sculpin, yellow perch, and margined madtom (PNHP 2020). This species is known to occur in Edgefield and McCormick counties in SC. Specifically, it has been documented in several streams in the Steven's Creek basin (USFWS 2019).

Status in the Project Boundary and Effects of Continued Project Operations

The brook floater is known to occur in the Upper Stevens Creek watershed on the Long Cane Ranger District in the Sumter National Forest. DESC is conducting a mussel survey as part of the relicensing process and will document any individuals found during the survey. Effects of continued Project operations on the species will be assessed as part of that survey, if the species is found.

4.3.5 MONARCH BUTTERFLY

The monarch butterfly is a migratory insect that passes through South Carolina and Georgia on a seasonal basis. The species has declined 80 percent during the last 20 years, in large part due to habitat loss at overwintering sites in Mexico and breeding sites in the American Midwest. The monarch butterfly population in Eastern North America overwinters in central Mexico, with northern migrations to the United States and Canada occurring during March, and southward migrations occurring between August and September. Adult female monarch butterflies lay their eggs on milkweed plants and utilize a variety of other plant species as nectar sources throughout their migrations (USFWS 2020). Summer breeding habitat includes woodlands, roadsides, or utility rights-of-way containing nectaring plants (Forest Service 2020).

Status in the Project Boundary and Effects of Continued Project Operations

As mentioned, the monarch butterfly passes through South Carolina and Georgia on a seasonal basis. Summer breeding may occur within the Project boundary in woodlands, roadsides, or utility rights-of-way. Continued Project operations are not expected to affect the species as significant disturbance of these potential breeding areas is not expected to occur as a result of Project operation or maintenance activities.

4.3.6 PIEDMONT PRAIRIE BURROWING CRAYFISH

The Piedmont prairie burrowing crayfish is a semi-terrestrial species that utilizes the eastern watershed of the South Carolina Piedmont. Habitats can include intermittently flooded low lying areas and agricultural land. Specifically, it is found in terrestrial habitats around intermittent streams and colluvial valleys with treeless, prairie-like characteristics. Non-hydric well drained soils with seasonally perched water tables are necessary for the species' life history needs, as compared to species that require more aquatic and semi-aquatic habitats (Eversole and Welch 2013; NatureServe 2020b). Piedmont prairie burrowing crayfish spend much of the year in burrows, often below layers of leaf litter and organic matter, and are most likely to venture from burrows during wet periods in search of food or breeding opportunity. (Eversole and Welch 2013).

Status in the Project Boundary and Effects of Continued Project Operations

This species is present in Thurmond Lake – Savannah River, Upper Stevens Creek, Kiokee Creek – Savannah River, Turkey Creek – Stevens Creek, Bush River – Saluda River, and Little River – Savannah River watersheds that contain Forest Service land on the Long Cane Ranger District (Forest Service 2020). It is not likely that this species occurs within the Project boundary as it is most often found on a perched water table along ridge tops and not in aquatic habitats (Forest Service 2020). Continued Project operations are not expected to affect this species.

4.3.7 ROANOKE SLABSHELL

The Roanoke slabshell is typically found in large rivers and occasionally in small creeks. The mussel tolerates large variations in flow levels and higher water temperatures, making it able to survive in some locations near dams and hydroelectric plants (Price 2006). In South Carolina, the mussel is found in the Pee Dee River and the Catawba, Congaree and Savannah River basins. Although it has the potential to be found in watersheds on the Long Cane Ranger District in the Savannah River basin, no known records in the Sumter National Forest exist (Forest Service 2020).

Status in the Project Boundary and Effects of Continued Project Operations

In 2006, the Catena Group inventoried freshwater mussels in the Savannah River from the Augusta Shoals area (near RM 203) downstream to RM 23. The Roanoke slabshell was identified during this inventory. DESC is conducting a mussel survey as part of the relicensing process and will

document any individuals found during the survey. Effects of continued Project operations on the species will be assessed as part of that survey, if the species is found.

4.3.8 ROBUST REDHORSE

Once presumed extinct, the Robust Redhorse, a large, heavy-bodied sucker, was rediscovered in the Oconee River below Georgia Power's Sinclair Hydroelectric Project (FERC No. 1951) in the early 1990s. This rediscovery sparked the formation of the Robust Redhorse Conservation Committee (RRCC) in 1995 to guide recovery efforts for the species. While little is still known about habitat preferences of juvenile Robust Redhorse, adults typically inhabit areas of the river where the current is moderately swift. Preferred habitat includes riffle areas or in/near outside bends, where depths are greater, and accumulations of logs and other woody debris are present (Evans 1997). Spawning occurs between April and June over gravel substrate in deep and shallow waters (Hendricks 1998). In South Carolina, it is found in the Savannah River and Pee Dee River basins (Forest Service 2020).

Status in the Project Boundary and Effects of Continued Project Operations

The Robust Redhorse is known to occur in the Savannah River and the Georgia DNR documented the species in the shoals below the Augusta Diversion Dam in 2005. Within the last five years, Robust Redhorse has been documented as occurring in the Savannah River immediately downstream of the Stevens Creek dam (RRCC 2020). Continued Project operations are not expected to adversely affect the species since the Project reregulates large pulses from Thurmond Dam, providing increased flow and associated habitat stability in the Augusta Shoals and further downstream.

4.3.9 TRICOLORED BAT

The tricolored bat is a small bat weighing 0.2 to 0.3 ounces, that roosts in trees in the summertime and hibernates in caves, mines and rock crevices during the winter (USFWS 2019b). The species is found statewide in South Carolina, but populations have declined recently due to the white-nose-syndrome (USFWS 2019b).

The tricolored bat may roost in trees around the Project reservoir in the summertime but is unlikely to hibernate in the area due to a lack of hibernacula. Continued Project operations are unlikely to have any effect on the species as DESC does not plan to significantly change the Project shoreline or remove trees used for roosting.

4.3.10 WEBSTER'S SALAMANDER

The Webster's salamander is a woodland species that is often found on hardwood-forested hillsides underneath cover including rocks, logs, and leaf litter. The species breeds in early winter and lays eggs during the summer months. With the exception of June and July breeding activity, adults are mostly active between October and May, likely to avoid the high heat of the summer months. Unlike some other salamander species, there is no aquatic larval lifestage, and hatchlings emerge during August and September. The range of the species is fragmented, with isolated populations occurring across Louisiana, Mississippi, Alabama, Georgia, and South Carolina (Rogers 2020). In South Carolina, it has been documented in both Edgefield and McCormick counties (NatureServe 2020c).

Status in the Project Boundary and Effects of Continued Project Operations

This species may occur in the forested habitat surrounding the Project boundary. Nevertheless, much of the land surrounding the Project has been left in its natural state, and there are no Project-related disturbance activities proposed under the new license. Therefore, continued Project operations are unlikely to affect populations occurring in the Project boundary.

4.3.11 YELLOW LAMPMUSSEL

The yellow lampmussel is a freshwater mussel species found primarily in medium to large rivers and streams with a variety of substrates including silt or sand, gravel bars and bedrock cracks (Price 2006b). Distribution in South Carolina spans the Savannah, Broad, Wateree, Congaree, and Pee Dee River basins. The species is found in the Long Cane Ranger District in the Lower Stevens Creek and Turkey Creek-Stevens Creek watersheds with the potential to also occur in the Upper Stevens Creek watershed (Forest Service 2020).

The yellow lampmussel may occur within the Project boundary, as it is found throughout the Savannah River basin, including Stevens Creek watersheds. DESC is conducting a mussel survey as part of the relicensing process and will document any individuals found during the survey. Effects of continued Project operations on the species will be assessed as part of that survey, if the species is found.

4.3.12 FADED TRILLIUM

The faded trillium (or pale-yellow trillium) is a perennial herb characterized by three whorled leaves and a pale yellow or cream-colored flower. The faded trillium sends up leaves and flowers in early spring before the forest canopy has fully leafed out. The above ground plant is not present during the fall and winter, persisting as an underground rhizome. Mature faded trillium are long lived, as the rhizomes continue to persist and produce shoots as other portions decay (Chafin 2007). Habitat types for the species include wooded slopes, rich cove forests, oak-pine woods, and cane breaks. They are often found in areas that are sheltered with dense forest canopies (NatureServe 2020d).

This species is only found in the Savannah River Basin across Georgia, North Carolina, and South Carolina (Chafin 2007), and has been documented in Columbia County, GA and Edgefield and McCormick counties, SC (NatureServe 2020d).

Status in the Project Boundary and Effects of Continued Project Operations

Although the faded trillium has not been documented within the Project boundary, it may occur in wooded areas around the shoreline. As no changes to Project operation or maintenance activities are proposed, continued Project operations are unlikely to affect this species.

4.3.13 GEORGIA ASTER

Georgia aster is a flowering plant that prefers a habitat of open woodlands, savannas and prairies, including open woodlands associated with utility and roadside rights-of-way (Forest Service 2020). It is thought to be a relict species of the post oak-savannah communities that existed in the southeast prior to fire suppression.

Georgia aster is known to occur in the Long Cane Ranger District of the Sumter National Forest and in McCormick and Edgefield counties, SC. Habitat for Georgia aster may exist within the Project boundary, however potential occurrences would be limited to terrestrial sites, which should not be affected by continued operation of the Project.

4.3.14 LANCELEAF TRILLIUM

The lanceleaf trillium occurs in a variety of habitat types, including floodplains, rocky upland woodlands, brushy thickets, canebrakes, and shaded or open woods. It is most commonly associated with alluvial soils. This regional endemic species is relatively small compared to other southeastern trilliums, with narrow leaves, a flower comprised of 3 maroon petals, and an ovoid pulpy fruit that contains several seeds (NatureServe 2020i).

Known populations of this species exist in Edgefield and McCormick Counties, SC (NatureServe 2020i).

Status in the Project Boundary and Effects of Continued Project Operations

Lanceleaf trillium is known to occur in the Long Cane Ranger District of the Sumter National Forest and in McCormick and Edgefield counties, SC. Habitat for this species may exist within the Project boundary, however potential occurrences would be limited to terrestrial sites, which should not be affected by continued operation of the Project.

4.3.15 OGLETHORPE OAK

The Oglethorpe oak is a "white oak" species that is associated with wet clay soils and is found in disjunct populations throughout Georgia, Alabama, Mississippi, Louisiana, and South Carolina. The species can grow up to 80 ft. tall and is characterized by reddish-gray bark that covers the tree in loose plates. It is generally found in seepage swamps, stream edges, and moist areas of hardwood forests adjacent to these types of habitats. Like other oak species, the Oglethorpe oak is wind-pollinated, and must be cross pollinated in order to produce acorns. Habitat fragmentation can isolate individuals, decreasing pollination and associated acorn production (Chafin 2008).

Oglethorpe oak has been documented in McCormick and Edgefield counties in SC (NatureServe 2020f).

The Oglethorpe oak is known to occur in the Long Cane Ranger District of the Sumter National Forest and in McCormick and Edgefield counties, SC. Habitat for this species within the Long Cane Ranger District is limited to streamside forests and depressional wetlands in the Carolina Slate belt, located north and outside of the Project boundary (Forest Service 2020). It is unlikely this species exists within the Project boundary and therefore, continued Project operations should have no effect on this species.

4.3.16 SHOALS SPIDER LILY

The shoals spider lily occurs mostly above the fall line in Alabama, Georgia, and South Carolina. This flowering plant is often found in bedrock outcroppings or in large cobble and boulder substrates where the plants' roots and bulbs can anchor into the substrate. Habitat requirements for the species include direct sunlight, constantly flowing water, and low sediment loads (Kleinschmidt 2015).

Status in the Project Boundary and Effects of Continued Project Operations

Shoals spider lilies are currently found at multiple locations in Edgefield and McCormick counites, SC and Columbia County, GA, with populations known in Stevens Creek (NatureServe 2020h). This population is located outside of the Project boundary, east of Plum Branch, South Carolina, approximately 52 km upstream of Stevens Creek Dam (Gordon and Wear 2011). Due to this species' distance from the Project, and since no changes to Project operations are proposed, no adverse effects to this species are expected.

4.3.17 SWEET PINESAP

The sweet pinesap is an herbaceous perennial wildflower characterized by a fleshy stalk, scalelike leaves, and pink or yellowish flowers that produce a strong odor of violets. The flowers are present in mid to late spring. The sweet pinesap is generally found in mature, moist hardwood forests under areas that are well shaded by the canopy (Forest Service 2020b). Specifically, the species is known to occur in shortleaf pine-oak heaths in the Southern Appalachians and Piedmont (Forest Service 2020).

The sweet pinesap is not expected to occur within the Project boundary due to a lack of habitat. Continued Project operations should not have any effect on this species.

4.4 STATE-PROTECTED SPECIES

On February 4, 2019, the Georgia DNR provided a list of Natural Heritage Database occurrences within 3 miles of the Project site for terrestrial species and within the local HUC10 watershed for aquatic species. These species are listed below in Table 4-3. For more information on the locations of these species, see Appendix A.

COMMON NAME	SCIENTIFIC NAME
American Barberry	Ververis canadensis
Atlantic Pigtoe	Fusconaia masoni
Atlantic Sturgeon	Acipenser oxyrinchus
Brother Spike	Elliptio fraterna
Carolina Slabshell	Elliptio congaraea
Carolina Trefoil	Acmispon helleri
Curly-Heads	Clematis ochroleuca
Delicate Spike	Elliptio arctata
Dixie Mountain Breadroot	Pediomelum piedmontanum
Dwarf Waterdog	Necturus punctatus
False-Rue Anemone	Enemion biternatum
Georgia Plume	Elliottia racemosa
Ironcolor Shiner	Notropis chalybaeus
Log Fern	Dryopteris celsa
Ocmulgee Skullcap	Scutellaria ocmulgee
Pale Yellow Trillium	Trillium discolor
Pineland Barbra Buttons	Marshallia ramosa
Relict Trillium	Trillium reliquum
Roanoke Slabshell	Elliptio roanokensis
Robust Redhorse	Moxostoma robustum
Savannah Elimia	Elimia caelatura
Savannah Lilliput	Toxolasma pullus
Shoals Spiderlily	Hymenocallis coronaria
Shortnose Sturgeon	Acipenser vrevirostrum
Spotted Turtle	Clemmys guttata
Wingpod Purslane	Portulaca umbraticola ssp.coronata
Yellow Lampmussel	Lampsilis cariosa
Yellow Nailwort	Paronychia virginica

 TABLE 4-3
 GEORGIA STATE-PROTECTED SPECIES WITHIN 3 MILES OF THE PROJECT AREA

Source: GDNR, Letter dated February 4, 2019

On March 27, 2020, the South Carolina DNR provided a list of species having conservation priority through the South Carolina State Wildlife Action Plan (SWAP) and other state tracked species that are located within the Project boundary and within 3 miles of the Project boundary. These species are listed below in Table 4-4. Additional details on these species are included in Appendix A.

COMMON NAME	SCIENTIFIC NAME
Aethusa-like Trepocarpus	Trepocarpus aethusae
American Eel	Anguilla rostrate
American Ginseng	Panax quinquefolius
Atlantic Spike	Elliptio producta
Bald Eagle	Haliaeetus leucocephalus
Baltimore Oriole	Icterus galbula
Bartram's Bass	Micropterus
Carolina Larkspur	Delphinium carolinianum
Christmas Darter	Etheostoma hopkinsi
Dutchman's Breeches	Dicentra cucullaria
Eared Goldenrod	Solidago auriculate
Eastern Creekshell	Villosa delumbis
Eastern Elliptio	Elliptio complanate
Faded Trillium	Trillium discolor
False-Rue Anemone	Enemion biternatum
Flat Bullhead	Ameiurus platycephalus
Florida Pondhorn	Uniomerus caroliniana
Georgia Aster	Symphyotrichum georgianum
Highfin Shiner	Notropis altipinnis
James' Sedge	Carex jamesii
Lanceleaf Wakerobin	Trillium lancifolium
Lowland Bladderfern	Cystopteris protrusa
Miccosukee Gooseberry	Ribes echinellum
Notchlip Redhorse	Moxostoma collapsum
Ocmulgee Skullcap	Scutellaria ocmulgee
One-Flowered Broomrape	Orobanche uniflora
Relict Trillium	Trillium reliquum
Robust Redhorse	Moxostoma robustum
Rosyface Chub	Hybopsis rubrifrons
Shoals Spider Lily	Hymenocallis coronaria

 TABLE 4-4
 SOUTH CAROLINA STATE-PROTECTED SPECIES IN THE PROJECT AREA
COMMON NAME	SCIENTIFIC NAME
Slender Sedge	Carex gracilescens
Smooth Indigobush	Amorpha glabra
Snail Bullhead	Ameiurus brunneus
Southern Nodding Trillium	Trillium rugelii
Streambank Mock Orange	Philadelphus hirsutus
Tall Bellflower	Campanulastrum americanum
Tiger Salamander	Ambystoma tigrinum
Tuberous Gromwell	Lithospermum tuberosum
Turquoise Darter	Etheostoma inscriptum
Virginia Spiderwort	Tradescantia virginiana
Weak Nettle	Urtica chamaedryoides
Webster's Salamander	Plethodon webster
Whiteleaf Sunflower	Helianthus glaucophyllus
Yellow Lampmussel	Lampsilis cariosa

5.0 SUMMARY

There are several federal-protected and Forest Service TES species that have either been documented within the Project boundary or have potential to occur within the Project boundary due to availability of suitable habitat. These species are listed below.

- Atlantic Spike
- Bald Eagle
- Bartram's Bass
- Brook Floater
- Carolina Heelsplitter
- Faded Trillium
- Miccosukee Gooseberry
- Monarch Butterfly
- Relict Trillium
- Roanoke Slabshell
- Robust Redhorse
- Shoals Spider Lily
- Tricolored Bat
- Webster's Salamander
- Wood Stork
- Yellow Lampmussel

Although these species occur or have the potential to occur within the Project boundary, continued Project operations are not expected to have any adverse effect on these species. DESC is not proposing any changes to Project operations and does not have any plans for significant logging or shoreline changes within the Project boundary. If the need arises for tree removal, construction, or other shoreline modifications in the future, DESC will consult with the USFWS, Forest Service, and the Georgia DNR and/or South Carolina DNR (as appropriate) prior to the commencement of these activities.

In addition, DESC is conducting a mussel survey within the Project boundary with methodology developed in consultation with federal and state agencies. The results of this study will determine the presence of any mussel species listed in this report within the Project boundary and will identify the potential for Project effects on these species. The results of this study will be included in the Project's Final License Application.

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- US Forest Service (Forest Service). 2020b. Sweet Pinesap Info Sheet. [Online] URL <u>https://www.fs.fed.us/wildflowers/beauty/mycotrophic/monotropsis_odorata.shtml</u>

APPENDIX A

CONSULTATION RECORD

Threatened, Endangered, and Sensitive (TES) Species Sumter National Forest

Spacios	Species	Status	Habitat Description	District	Habitat
CAROLINA HEELSPLITTER Lasmigona decorata	Mussel	Federally Endangered	Known historically from Catawba, Pee Dee, and Savannah River basins in North Carolina and South Carolina with a possibility that they were historically found in the Saluda River basin in South Carolina; it is found in the Upper Stevens Creek, Bush River – Saluda River, and Turkey Creek –Stevens Creek watersheds on or adjacent to the Forest; on the Forest it has been found in the Beaverdam Creek – Turkey Creek and Lower Turkey Creek – Stevens Creek subwatersheds	LC	1
FLORIDA (MICCOSUKEE) GOOSEBERRY Ribes echinellum	Plant	Federally Threatened	Known from the Stevens Creek drainage on north-facing hardwood slopes in association with basic soils	LC	8
NORTHERN LONG-EARED BAT Myotis septentrionalis	Mammal	Federally Threatened	Winters in caves and cave-like structures (e.g., mines, railroad tunnels); summer roosts include cavities, underneath bark, crevices, or hollows of both live and dead trees	AP	3,4,5,6,7
PERSISTENT TRILLIUM Trillium persistens	Plant	Federally Endangered	Known from one site in South Carolina in proximity to the Sumter National Forest; occurs in mixed mesic forest in the Tugaloo River Composite watershed	AP	7
RED-COCKADED WOODPECKER Dryobates borealis	Bird	Federally Endangered	Known from Edgefield County; historically known from Laurens County; nests in live large pines and forages in open pine woodlands	LC	4,5
RELICT TRILLIUM Trillium reliquum	Plant	Federally Endangered	Occurs in basic mesic forests in Savannah and Chattahoochee drainages; known from Aiken County in proximity to the Sumter National Forest	LC	8
SMALL WHORLED POGONIA Isotria medeoloides	Plant	Federally Threatened	Occurs in mixed mesic forests at moderate elevations (>1,000 feet)	AP	7
SMOOTH CONEFLOWER <i>Echinacea laevigata</i>	Plant	Federally Endangered	Occurs along the Brevard Geologic Belt in open woodlands, including select roadsides and utility rights-of-ways	AP	4,10
WOOD STORK Mycteria americana	Bird	Federally Endangered	Known to forage in freshwater wetlands on both Enoree and Long Cane Ranger Districts	EN, LC	1,3
ASHLEAF GOLDENBANNER Thermopsis mollis	Plant	Sensitive	Occurs on dry slopes and ridges; documented from one location on the Sumter National Forest	AP	4,5
ATLANTIC SPIKE Elliptio producta	Mussel	Sensitive	Widespread in South Carolina, the species is found in streams or rivers with sandy, rocky, and/or muddy bottoms in sections where the current is not too rapid; on the Forest it is known from the Long Cane and Andrew Pickens Ranger Districts	AP, LC	1
BACHMAN'S SPARROW <i>Peucaea aestivalis</i>	Bird	Sensitive	Inhabits forest stands with open canopies and herbaceous understories	EN, LC	4
BARTRAM'S REDEYE BASS Micropterus coosae	Fish	Sensitive	In South Carolina this species occurs in the Savannah River drainage and has been introduced in the Saluda River drainage; it inhabits small upland streams and rivers with undercut banks and vegetation such as water willow, as well as boulders and submerged logs; it is found on the Andrew Pickens and Long Cane Ranger Districts	AP, LC	1
BROOK FLOATER Alasmidonta varicosa	Mussel	Sensitive	Small streams and rivers with gravel bottoms; known from Chattooga, Turkey, and Upper Stevens Creek watersheds on the Andrew Pickens and Long Cane Ranger Districts	AP, LC	1
BUTTERNUT Juglans cinerea	Plant	Sensitive	Basic mesic forests along the Brevard Geologic Belt	AP	3,8

CAROLINA PLAGIOMNIUM Plagiomnium carolinianum	Plant	Sensitive	Damp, shaded, vertical rock faces along streams in mountain gorges; known from Long Creek, Opossum Creek, and Fishtrap Creek at their junction with the Chattooga River	AP	2
CHAUGA CRAYFISH Cambarus chaugaensis	Crustacean	Sensitive	Fast-moving, rocky 3 rd and 4 th order streams and tributaries of the Savannah and Saluda River basins in South Carolina; on the Forest known from all the watersheds on the Andrew Pickens Ranger District	AP	1
EASTERN SMALL-FOOTED BAT Myotis leibii	Mammal	Sensitive	At southern terminus of range on Andrew Pickens Ranger District; known from Moody Creek near Lake Cherokee; may commonly roost in hemlock trees near streams in summer	AP	3,4,5
EDMUND'S SNAKETAIL Ophiogomphus edmundo	Insect	Sensitive	Clear moderately flowing mountain streams and rivers with sand or gravel riffles; known to occur in the Chattooga River	AP	1
FADED TRILLIUM Trillum discolor	Plant	Sensitive	Basic mesic hardwood forests restricted to the Savannah River drainage system	AP, LC	4
FORT MOUNTAIN SEDGE Carex communis var. amplisquama	Plant	Sensitive	Found in rich coves and basic mesic forests, at Tamassee Knob, East Fork of the Chattooga, and White Rock Cove on the Andrew Pickens Ranger District	AP	8
FRASER'S LOOSESTRIFE Lysimachia fraseri	Plant	Sensitive	Found at several locations ranging from woodlands, riparian disturbance zones, roadsides, and utility rights-of-way – including Highway 28, Highway 107, and the Chattooga River corridor	AP	3,4
GEORGIA ASTER Symphyotrichum georgianus	Plant	Sensitive	Known from select open woodlands, including those associated with utility and roadside rights-of-way	All	4
GREEN SALAMANDER Aneides aeneus	Amphibian	Sensitive	Overwintering in cliff faces and damp rock crevices, moving under bark and logs (preferably hardwoods) in spring and summer; known from the Chattooga Wild and Scenic River Corridor	AP	2,7
JEWELED TRILLIUM Trillium simile	Plant	Sensitive	Basic mesic hardwood forests of the Southern Blue Ridge mountains	AP	8
LANCELEAF TRILLIUM Trillium lancifolium	Plant	Sensitive	Basic mesic hardwood and floodplain forests	LC, EN	3,8
LIVERWORT Cheilolejeunea evansii	Plant	Sensitive	Bark of trees in moist escarpment gorges or gorge-like habitats	AP	2
LIVERWORT Plagiochila caduciloba	Plant	Sensitive	Found on damp, shaded, vertical rock faces along streams in mountain gorges; Southern Appalachian endemic	AP	2
LIVERWORT Radula sullivantii	Plant	Sensitive	Wet shaded rocks and crevices; known from Whetstone Falls, downstream of Sandy Ford, and approximately 0.75 of Whetstone's confluence with the Chattooga River, and King Creek Falls	AP	2
MAY WHITE AZALEA Rhododendron eastmanii	Plant	Sensitive	Mesic hardwood forests, known from several locations on the Enoree Ranger District	EN	7
MONARCH BUTTERFLY Danaus plexippus	Insect	Sensitive	Summer breeding habitat includes woodlands, roadsides, or utility rights-of-way containing nectaring plants throughout summer for the adults and abundant, healthy, larval plants (milkweeds)	All	3,4,5,7,8
MOUNTAIN WITCH ALDER Fothergilla major	Plant	Sensitive	Occurs in oak-hickory forests; may occur on monadnocks or north-facing slopes in piedmont	AP	5
OGLETHORPE OAK Quercus oglethorpensis	Plant	Sensitive	Streamside forests and depressional wetlands in the Carolina Slate belt	LC	3,5,9
PIEDMONT PRAIRIE BURROWING CRAYFISH Distocambarus crockeri	Crustacean	Sensitive	This species is most abundant on a perched water table along ridge tops and negatively associated with aquatic habitats; found in forest canopy openings like roadside ditches usually with sedges present; it is present in Thurmond Lake – Savannah River, Upper Stevens Creek, Kiokee Creek – Savannah River, Turkey Creek – Stevens Creek, Bush River – Saluda River, and Little River – Savannah River watersheds that contain Forest Service land on the Long Cane Ranger District; on the Forest it has only been found in the Mountain Creek – Turkey Creek subwatershed	LC	4,9

PIEDMONT STRAWBERRY Waldsteinia lobata	Plant	Sensitive	Occurs in mixed mesic hardwood forests in the lower elevations of the Southern Blue Ridge mountains	AP	8
RADFORD'S SEDGE Carex radfordii	Plant	Sensitive	Occurs in basic mesic and mixed mesic hardwood forests in the Southern Appalachians	AP	7,8
RAFINESQUE'S BIG-EARED BAT Corynorhinus rafinesquii	Mammal	Sensitive	Restricted to the mountains, sandhills, and coastal plain Physiographic regions; may be found in hollow trees or behind loose bark near streams, caves, mines, or human-made structures	AP	2,3,4,5,6
ROANOKE SLABSHELL Elliptio roanokensis	Mussel	Sensitive	In South Carolina, it is found in the Pee Dee River and in the Catawba, Congaree, and Savannah River basins, typically in large rivers but can occasionally be found in small creeks; It has the potential to be found in watersheds on the Long Cane Ranger District that are in the Savannah River basin but no known records on the Forest exist	LC	1
ROBUST REDHORSE Moxostoma robustrum	Fish	Sensitive	In South Carolina it is found in the Savannah River and Pee Dee River basins; it was extirpated from the Santee River basin but recent stocking has been completed in the Broad and Wateree River systems to reestablish a population in the Santee River basin; on the Forest it has the potential to be found on the Enoree Ranger District within the Broad River and lower parts of the Enoree Tyger, and Sandy River	LC, EN	1
SHOAL'S SPIDER LILY Hymenocallis coronaria	Plant	Sensitive	Rocky river shoals; known from Stevens Creek and historically from the Broad River	LC, EN	2
SOUTHERN OCONEE BELLS Shortia galacifolia	Plant	Sensitive	Large colonies in mixed mesic forests near Lake Jocassee	AP	7
SUN-FACING CONEFLOWER Rudbeckia heliopsidis	Plant	Sensitive	Known from open woodlands, roadsides, and nearby riparian areas in the vicinity of Lake Cherokee	AP	3,4,5
SWEET PINESAP Monotropsis odorata	Plant	Sensitive	Shortleaf pine-oak heaths in the Southern Appalachians and piedmont	All	5
TRI-COLORED BAT Perimyotis subflavus	Mammal	Sensitive	Found in mines and caves in winter	All	2,3,4,5,6
WEBSTER'S SALAMANDER Plethodon websteri	Amphibian	Sensitive	Mesic hardwood slopes with rocky outcrops	LC	7
WHORLED HORSEBALM Collinsonia verticillata	Plant	Sensitive	Found in basic mesic forests along the Brevard Geologic Belt in South Carolina	AP	8
YELLOW LAMPMUSSEL Lampsilis cariosa	Mussel	Sensitive	In South Carolina it is found in the Savannah, Wateree, Cogaree, and Pee Dee River Basins; on the Forest it is found on the Long Cane Ranger District in the Lower Stephens Creek and Turkey Creek – Stevens Creek watersheds; it also has the potential to occur in the Upper Stevens Creek watershed	LC	1
YOUNG'S CRAYFISH Distocambarus youngineri	Crustacean	Sensitive	In South Carolina it is found in the Saluda and Broad River basins only in Newberry County; it is found in moist, terrestrial areas with leaf litter and a mixed-hardwood overstory usually near stream headwaters or intermittent streams (Eversole 1995); it is found in areas with a perched water table and is not found very close to streambanks and does not appear to be directly associated with the streams themselves; on the Forest it is found only on the Enoree Ranger District within the Indian Creek watershed; it has also been found in the Cannos Creek- Broad River watershed outside the Forest Service boundary	EN	3

¹Habitat Group: 1 =Aquatic habitats; 2 = Rock outcrops associated with streams; 3 = Riparian forests and native canebrakes; 4 = Woodlands, savannas, prairies, and openings; 5 = Upland oak and pine forests; 6 = Mines and caves; 7 = Mesic forests; 8 =Basic mesic forests and rich coves; 9 = Upland depression ponds, bogs, and seepage areas; 10 = Glades and mafic woodlands

From:	Magniez, Jeff -FS
To:	Kelly Kirven
Cc:	Miller, Derrick L -FS
Subject:	RE: Stevens Creek - Forest Service Species of Conservation Concern
Date:	Wednesday, January 15, 2020 1:17:23 PM
Attachments:	image002.png
	Sumter NF TES List 011520.docx

Attached please find the Sumter National Forest list of threatened, endangered, and Forest Service sensitive species.

From: Miller, Derrick L -FS <derrick.miller@usda.gov>
Sent: Wednesday, January 15, 2020 12:52 PM
To: Magniez, Jeff -FS <jeff.magniez@usda.gov>
Cc: Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>
Subject: FW: Stevens Creek - Forest Service Species of Conservation Concern

Jeff

Can you respond to Kelly for me.



Derrick L. Miller, Forester Special Uses Program Manager President NFFE, Local 466

National Federation of Federal Employees Francis Marion & Sumter National Forest

p: 803-561-4056 f: 803-561-4004 derrick.miller@usda.gov

4931 Broad River Road Columbia, SC 29212 http://www.nffe-fsc.org

From: Kelly Kirven [mailto:Kelly.Kirven@KleinschmidtGroup.com]
Sent: Wednesday, January 15, 2020 12:43 PM
To: Miller, Derrick L -FS <<u>derrick.miller@usda.gov</u>>
Subject: Stevens Creek - Forest Service Species of Conservation Concern

Hi Derrick,

I hope you are doing well and had a great Christmas and New Year's! I wanted to reach out to you to see if you could provide a list of the Forest Service Species of Conservation Concern that may exist on Forest Service lands within the Stevens Creek project area. We are beginning to pull together our Rare, Threatened, and Endangered Species Whitepaper and would like to list the species that are important to the Forest Service.

Thanks so much! Kelly

Kelly Kirven Project Licensing Coordinator Kleinschmidt Office: 803.462.5633 Cell: 423.747.2660 www.KleinschmidtGroup.com

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United States Department of the Interior

FISH AND WILDLIFE SERVICE Georgia Ecological Services Field Office 355 East Hancock Avenue Room 320 Athens, GA 30601 Phone: (706) 613-9493 Fax: (706) 613-6059



In Reply Refer To: Consultation Code: 04EG1000-2020-SLI-1041 Event Code: 04EG1000-2020-E-01928 Project Name: Stevens Creek Hydrelectric Project Relicensing P-2535 February 03, 2020

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

To Whom It May Concern:

This list identifies threatened, endangered, proposed and candidate species, as well as critical habitat, that may be affected by your proposed project. This list may change before your project is completed. Under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation.

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*). Projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html).

Wind energy projects should follow the wind energy guidelines http://www.fws.gov/windenergy/ for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts of communcation towers on migratory birds can be found under the "Bird Hazards" tab at: <u>www.fws.gov/migratorybirds</u>.

Attachment(s):

Official Species List

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:

Georgia Ecological Services Field Office

355 East Hancock Avenue Room 320 Athens, GA 30601 (706) 613-9493

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

South Carolina Ecological Services

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

Project Summary

Consultation Code:	04EG1000-2020-SLI-1041
Event Code:	04EG1000-2020-E-01928
Project Name:	Stevens Creek Hydrelectric Project Relicensing P-2535
Project Type:	DAM

Project Description: FERC Relicensing for the Stevens Creek Hydroelectric Project

Project Location:

Approximate location of the project can be viewed in Google Maps: <u>https://www.google.com/maps/place/33.610026431497204N82.17446483698222W</u>



Counties: Columbia, GA | Edgefield, SC | McCormick, SC

Endangered Species Act Species

There is a total of 1 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 Fisheries¹, 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. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Flowering Plants

NAME	STATUS
Relict Trillium Trillium reliquum	Endangered
No critical habitat has been designated for this species.	
Species profile: https://ecos.fws.gov/ecp/species/8489	

Critical habitats

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



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: Consultation Code: 04ES1000-2020-SLI-0371 Event Code: 04ES1000-2020-E-00735 Project Name: Stevens Creek Hydrelectric Project Relicensing P-2535 February 03, 2020

Subject: List of threatened and endangered species that may occur in your proposed project location, and/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

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/ eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/correntBirdIssues/Hazards/towers/comtow.html.

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 Tracking Number 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

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

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Georgia Ecological Services Field Office

355 East Hancock Avenue Room 320 Athens, GA 30601 (706) 613-9493

Project Summary

Consultation Code:	04ES1000-2020-SLI-0371
Event Code:	04ES1000-2020-E-00735
Project Name:	Stevens Creek Hydrelectric Project Relicensing P-2535
Project Type:	DAM

Project Description: FERC Relicensing for the Stevens Creek Hydroelectric Project

Project Location:

Approximate location of the project can be viewed in Google Maps: <u>https://www.google.com/maps/place/33.610026431497204N82.17446483698222W</u>



Counties: Columbia, GA | Edgefield, SC | McCormick, SC

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 Fisheries¹, 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. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Red-cockaded Woodpecker <i>Picoides borealis</i> No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/7614</u>	Endangered
Wood Stork <i>Mycteria americana</i> Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/8477</u>	Threatened
Clams	
NAME	STATUS
Carolina Heelsplitter Lasmigona decorata	Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: <u>https://ecos.fws.gov/ecp/species/3534</u>

Flowering Plants

NAME	STATUS
Miccosukee Gooseberry Ribes echinellum	Threatened
No critical habitat has been designated for this species.	
Species profile: <u>https://ecos.fws.gov/ecp/species/3580</u>	
Relict Trillium Trillium reliquum	Endangered

No critical habitat has been designated for this species. Species profile: <u>https://ecos.fws.gov/ecp/species/8489</u>

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 <u>National Wildlife Refuge</u> 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 Act¹ and the Bald and Golden Eagle Protection Act².

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 <u>below</u>.

- 1. The <u>Migratory Birds Treaty Act</u> of 1918.
- 2. The <u>Bald and Golden Eagle Protection Act</u> 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 <u>USFWS</u> <u>Birds of Conservation Concern</u> (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 <u>below</u>. 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 <u>E-bird data</u> <u>mapping tool</u> (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 <u>below</u>.

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
American Kestrel <i>Falco sparverius paulus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 1 to Aug 31
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 Jul 31

NAME	BREEDING SEASON
Blue-winged Warbler <i>Vermivora pinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Kentucky Warbler <i>Oporornis formosus</i> 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 <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-throated Loon <i>Gavia stellata</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Short-billed Dowitcher <i>Limnodromus griseus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. <u>https://ecos.fws.gov/ecp/species/9480</u>	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> 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.

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
American Kestrel BCC - BCR	++++	++ +	I +++	• • • •	++++	• • • •		++++	+++	+++++++++++++++++++++++++++++++++++++++	+++++++++++++++++++++++++++++++++++++++	++
Bald Eagle Non-BCC Vulnerable	<u> </u> ++	111+	11++	11++	++++	++	+] +]	+111	+1++	11+1		1++1
Blue-winged Warbler BCC - BCR	++++	++++	++++	++			++	++++	1+++	++++	++++	++
Kentucky Warbler BCC Rangewide (CON)	++++	++++	++++	-+-+	+ + +		• • • • •	++++	++++	++++	++++	++
Prairie Warbler BCC Rangewide (CON)	++++	++++	++++	+	+11++	++++	++++	++++	++++	++++	++++	++++
Prothonotary Warbler BCC Bangewide (CON)	++++	++++	++++	++ I +	+++	+		+-+	+++	++++	+	
Red-headed Woodpecker BCC Rangewide (CON)	111	1111	 ++	++	111+	I + I +	++1+	11+1	+	1111	11++	111+
Red-throated Loon BCC Rangewide (CON)	++++	+++	++++	-+-+	++++	++++	++	++++	++++	++++	++++	++
Rusty Blackbird BCC Rangewide (CON)	+++++++++++++++++++++++++++++++++++++++	++++	++++	-+-+	++++	++++	++	++++	++++	++++	++++	++
Short-billed Dowitcher BCC Rangewide (CON)	++++	++++	++++	-+-+	+++++	++++	++	++1+	++++	++++	++++	++
Wood Thrush BCC Rangewide (CON)	++++	++++	++++	+++	+111	11++	1+++	++++	++++	+ +++	++++	++++

Additional information can be found using the following links:

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

Migratory Birds FAQ

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

<u>Nationwide Conservation Measures</u> 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. <u>Additional measures</u> and/or <u>permits</u> 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 <u>Birds of Conservation Concern</u> (<u>BCC</u>) 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 <u>Avian</u> <u>Knowledge Network (AKN)</u>. The AKN data is based on a growing collection of <u>survey</u>, <u>banding</u>, <u>and citizen science datasets</u> 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 (<u>Eagle Act</u> 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 <u>AKN Phenology Tool</u>.

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 <u>Avian Knowledge Network (AKN</u>). This data is derived from a growing collection of <u>survey, banding, and citizen science datasets</u>.

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: <u>The Cornell Lab of Ornithology All About Birds Bird Guide</u>, or (if you are unsuccessful in locating the bird of interest there), the <u>Cornell Lab of Ornithology Neotropical Birds guide</u>. 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 <u>Birds of Conservation Concern</u> (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 <u>Eagle Act</u> 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 <u>Northeast Ocean Data Portal</u>. 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 <u>NOAA NCCOS Integrative Statistical</u> <u>Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic</u> <u>Outer Continental Shelf</u> 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 <u>Diving Bird Study</u> and the <u>nanotag studies</u> or contact <u>Caleb Spiegel</u> or <u>Pam Loring</u>.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to <u>obtain a permit</u> 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.



WILDLIFE RESOURCES DIVISION

MARK WILLIAMS COMMISSIONER RUSTY GARRISON DIRECTOR

February 04, 2019

Caleb Gaston Sr. Environmental Specialist SCANA CALEB.GASTON@scana.com

Subject: Known occurrences of natural communities, plants and animals of highest priority conservation status on or near Stevens Creek Project, Columbia County, Georgia

Dear Mr. Gaston:

This is in response to your request of January 10, 2019. According to our records, within 3 miles of the project site for terrestrial elements (TR) and within the local HUC10 watershed for aquatic elements (AQ), there are the following Natural Heritage Database occurrences:

Savannah River Middle 3 (0306010605) - Upstream from Dam

GA Acmispon helleri (Carolina Trefoil) [EXTIRPATED] (TR), approx. 2.3 mi NW of site Bouteloua curtipendula var. curtipendula (Side-oats Grama) (TR), in an uncertain location near the project site

Clematis ochroleuca (Curly-heads) (TR), approx. 0.4 mi W of site

Clematis ochroleuca (Curly-heads) (TR), in an uncertain location near the project site *Dryopteris celsa* (Log Fern) (TR), approx. 0.9 mi SE of site

- GA *Elliottia racemosa* (Georgia Plume) (TR), approx. 1.4 mi NW of site *Enemion biternatum* (False Rue-anemone) (TR), approx. 0.8 mi SE of site
- GA Hymenocallis coronaria (Shoals Spiderlily) (TR), approx. 1.6 mi SE of site
- GA Hymenocallis coronaria (Shoals Spiderlily) (TR), approx. 0.9 mi SE of site
- GA Marshallia ramosa (Pineland Barbara Buttons) (TR), on site
- GA Marshallia ramosa (Pineland Barbara Buttons) (TR), approx. 0.4 mi NW of site
- GA Paronychia virginica (Yellow Nailwort) (TR), on site
- GA Pediomelum piedmontanum (Dixie Mountain Breadroot) (TR), approx. 0.6 mi NW of site
- GA *Pediomelum piedmontanum* (Dixie Mountain Breadroot) (TR), in an uncertain location near the project site

Portulaca umbraticola ssp. coronata (Wingpod Purslane) [HISTORIC?] (TR), on site

- GA Scutellaria ocmulgee (Ocmulgee Skullcap) (TR), approx. 0.9 mi SE of site
- GA *Scutellaria ocmulgee* (Ocmulgee Skullcap) (TR), approx. 2.6 mi SE of site *Trillium discolor* (Pale Yellow Trillium) (TR), approx. 0.2 mi N of site
- US Trillium reliquum (Relict Trillium) (TR), approx. 0.8 mi SE of site
- US Trillium reliquum (Relict Trillium) (TR), in an uncertain location near the project site
- US Trillium reliquum (Relict Trillium) (TR), approx. 0.5 mi SE of site

US Trillium reliquum (Relict Trillium) (TR), on site 2009009 [Georgia Land Trust] (TR), on site 2010058 [Central Savannah River Land Trust] (TR), on site Savannah River Lakes [U.S. Army Corps of Engineers] (TR), approx. 0.1 mi N of site Greenspace program acquisition (TR), approx. 1.1 mi S of site Greenspace program acquisition (TR), approx. 1.2 mi S of site Greenspace program acquisition (TR), approx. 1.3 mi S of site Greenspace program acquisition (TR), approx. 1.4 mi S of site Greenspace program acquisition (TR), approx. 1.7 mi S of site Greenspace program acquisition (TR), approx. 1.8 mi S of site Greenspace program acquisition (TR), approx. 1.9 mi S of site Greenspace program acquisition (TR), approx. 2.1 mi S of site Greenspace program acquisition (TR), approx. 2.1 mi SW of site Greenspace program acquisition (TR), approx. 2.2 mi S of site Greenspace program acquisition (TR), approx. 2.9 mi S of site Greenspace program acquisition (TR), on site Savannah River Upper 1, Clark Hill (0306010310) [SWAP High Priority Watershed] (TR), approx. 0.8 mi N of site Little River 1, Little R, Clark Hill (0306010504) [SWAP High Priority Watershed] (TR), approx. 1.9 mi NW of site Savannah River Middle 4 (0306010603) [SWAP High Priority Watershed] (TR), on site

Savannah River Middle 4 (0306010603) [SWAP High Priority Watershed] (TR), on site Savannah River Middle 3 (0306010605) [SWAP High Priority Watershed] (TR), on site

Savannah River Middle 4 (0306010603) - Downstream from Dam

- US Acipenser brevirostrum (Shortnose Sturgeon) (AQ) approx. 18.5 mi SE of site in the Savannah River
- US Acipenser oxyrinchus oxyrinchus (Atlantic Sturgeon) (AQ), approx. 19.2 mi SE of site in the Savannah River
- GA Berberis canadensis (American Barberry) [HISTORIC] (TR), approx. 2.9 mi S of site
- GA Clemmys guttata (Spotted Turtle) [HISTORIC] (AQ), approx. 20.8 mi S of site Dryopteris celsa (Log Fern) (TR), in an uncertain location near the project site Elimia caelatura (Savannah Elimia) [HISTORIC] (AQ), approx. 0.4 mi SE of site in the Savannah River
- GA *Elliptio arctata* (Delicate Spike) (AQ), approx. 1.3 mi SE of site in the Savannah River *Elliptio congaraea* (Carolina Slabshell) (AQ), approx. 1.3 mi SE of site in the Savannah River

Elliptio fraterna (Brother Spike) (AQ), approx. 3.4 mi SE of site in the Savannah River *Elliptio roanokensis* (Roanoke Slabshell) (AQ), approx. 1.4 mi SE of site in the Savannah River

- *Elliptio roanokensis* (Roanoke Slabshell) (AQ), approx. 21.9 mi S of site in the Savannah River
- Enemion biternatum (False Rue-anemone) (TR), in an uncertain location near the project site
- GA Fusconaia masoni (Atlantic Pigtoe) [HISTORIC] (AQ), on site in the Savannah River

- GA Hymenocallis coronaria (Shoals Spiderlily) (TR), approx. 1.8 mi SE of site
- GA Hymenocallis coronaria (Shoals Spiderlily) (TR), in an uncertain location near the project site
- GA Hymenocallis coronaria (Shoals Spiderlily) (TR), in an uncertain location near the project site
 - Lampsilis cariosa (Yellow Lampmussel) (AQ), approx. 21.9 mi S of site in McBean Creek
 - Lampsilis cariosa (Yellow Lampmussel) (AQ), approx. 1.3 mi SE of site in the Savannah River
- GA Moxostoma robustum (Robust Redhorse) (AQ), on site in the Savannah River
- GA Moxostoma robustum (Robust Redhorse) (AQ), approx. 13.0 mi SE of site in the Savannah River
 - *Necturus punctatus* (Dwarf Waterdog) (AQ), approx. 21.2 mi S of site in McBean Creek *Notropis chalybaeus* (Ironcolor Shiner) (AQ), approx. 9.5 mi S of site in Butler Creek *Notropis chalybaeus* (Ironcolor Shiner) [HISTORIC?] (AQ), approx. 21.6 mi SE of site in the Savannah River
 - Portulaca umbraticola ssp. coronata (Wingpod Purslane) [HISTORIC?] (TR), approx. 1.5 mi W of site
- GA Scutellaria ocmulgee (Ocmulgee Skullcap) (TR), on site
- GA Scutellaria ocmulgee (Ocmulgee Skullcap) (TR), approx. 1.1 mi S of site
- GA *Toxolasma pullus* (Savannah Lilliput) (AQ), approx. 15.7 mi SE of site in the Savannah River
- US Trillium reliquum (Relict Trillium) in an uncertain location near the project site
- US Trillium reliquum (Relict Trillium) in an uncertain location near the project site
- US Trillium reliquum (Relict Trillium) (TR), approx. 1.8 mi NW of site
- 2010058 [Central Savannah River Land Trust] (TR), approx. 2.2 mi NW of site
 Greenspace program acquisition (TR), approx. 0.7 mi SW of site
 Greenspace program acquisition (TR), approx. 2.3 mi SW of site
 Greenspace program acquisition (TR), approx. 2.4 mi SW of site
 Greenspace program acquisition (TR), approx. 2.8 mi W of site
 Greenspace program acquisition (TR), approx. 2.8 mi W of site
 Greenspace program acquisition (TR), approx. 3.0 mi SW of site
 Greenspace program acquisition (TR), approx. 3.0 mi SW of site
 Savannah River Middle 4 (0306010603) [SWAP High Priority Watershed] (TR), approx.
 0.5 mi NW of site
 Savannah River Middle 3 (0306010605) [SWAP High Priority Watershed] (TR), on site

Recommendations:

Federally listed species have been documented within three miles of the proposed project. To minimize potential impacts to federally listed species, we recommend consultation with the United States Fish and Wildlife Service. Please contact the following: In North Georgia, email Robin Goodloe at GAES_Assistance@fws.gov. In Southeast Georgia, call the Coastal Georgia Office at 912-832-8739. In Southwest Georgia, please contact John Doresky at 706-544-6030 or John_Doresky@fws.gov.

Please be aware that state protected species have been documented within three miles of the proposed project. For information about these species, including survey recommendations, please visit our webpage at http://georgiawildlife.com/conservation/species-of-concern#rare-locations. Surveys for species of federal or state conservation concern should be conducted prior to commencement of construction.

This project occurs within a high priority watershed. As part of Georgia's State Wildlife Action Plan, high priority watersheds were identified to protect the best-known populations of high priority aquatic species, important coastal habitats, and migratory corridors for anadromous species. Please refer to Appendix F of Georgia's State Wildlife Action Plan to find out more specific information about this high priority watershed (https://georgiawildlife.com/wildlifeactionplan).

Disclaimer:

Please keep in mind the limitations of our database. The data collected by the Nongame Conservation Section comes from a variety of sources, including museum and herbarium records, literature, and reports from individuals and organizations, as well as field surveys by our staff biologists. In most cases the information is not the result of a recent on-site survey by our staff. Many areas of Georgia have never been surveyed thoroughly. Therefore, the Nongame Conservation Section can only occasionally provide definitive information on the presence or absence of rare species on a given site. Our files are updated constantly as new information is received. Thus, information provided by our program represents the existing data in our files at the time of the request and should not be considered a final statement on the species or area under consideration.

If you know of populations of highest priority species that are not in our database, please fill out the appropriate data collection form and send it to our office. Forms can be obtained through our web site https://georgiawildlife.com/conservation/species-of-concern#providing or by contacting our office.

If I can be of further assistance, please let me know.

Sincerely,

Anna Yellin Wildlife Biologist II

Data Available on the Wildlife Conservation Section Website

- Georgia protected plant and animal profiles are available on our website. These accounts cover basics like descriptions and life history, as well as threats, management recommendations and conservation status. Visit http://georgiabiodiversity.org/natels/general-info.html.
- Rare species and natural community information can be viewed by Quarter Quad, County and HUC8 Watershed. To access this information, please visit our GA Rare Species and Natural Community Data Portal at: <u>http://georgiabiodiversity.org/</u>
- Downloadable files of rare species and natural community data by Quarter Quad and County are also available. Please visit: <u>http://georgiabiodiversity.org/natels/natural-element-locations.html</u>

South Carolina Department of Natural Resources



PO Box 167 Columbia, SC 29202 (803) 734-1396 Hagerty]@dnr.sc.gov

Robert H. Boyles, Jr Interim Director

Emily C. Cope Deputy Director for Wildlife and Freshwater Fisheries

March 27, 2020

Kelly Kirven Project Licensing Coordinator Kleinschmidt 204 Caughman Farm Lane Suite 301 Lexington, SC 29072

Electronic submission

Re: Request for Threatened and Endangered Species Review Stevens Creek Hydro Project - Edgefield, SC

Dear Ms. Kirven,

The South Carolina Department of Natural Resources has received your request for threatened and endangered species consultation for the Stevens Creek Hydro Project area in Edgefield County (approximately 33.65° N, -82.192° E). The project consists of a hydroelectric dam and surrounding facilities and impact areas. A detailed project description was not provided. Aerial images indicate the existing project site and surrounding area consists of wetlands, waterways and wooded areas.

According to SCDNR data, there are no records of listed threatened and endangered species or designated critical habitat within the project footprint. However, there are several species of concern within 3-miles of the site, including the federally endangered relict trillium (*Trillium reliquum*), federally threatened Miccosukee gooseberry (*Ribes echinellum*), the state endangered Webster's salamander (*Plethodon websteri*), and the state threatened bald eagle (*Haliaeetus leucocephalus*). Please keep in mind that this information is derived from existing databases and do not assume that it is complete. Areas not yet inventoried may contain significant species or communities.

Table 1: Species documented within the boundary

Bald eagle (<i>Haliaeetus leucocephalus</i>)	State Threatened, Bald &
	Golden Eagle Protection Act
Aethusa-like trepocarpus (<i>Trepocarpus aethusae</i>)	SWAP
Atlantic spike (Elliptio producta)	SWAP
Baltimore oriole (Icterus galbula)	SWAP
Bartram's bass (Micropterus)	SWAP
Carolina larkspur (Delphinium carolinianum)	SWAP
Christmas darter (Etheostoma hopkinsi)	SWAP
Highfin shiner (Notropis altipinnis)	SWAP
Lanceleaf wakerobin (Trillium lancifolium)	SWAP
Rosyface chub (Hybopsis rubrifrons)	SWAP
Shoals spider-lily (Hymenocallis coronaria)	SWAP

Snail bullhead (Ameiurus brunneus)	SWAP
Turquoise darter (<i>Etheostoma inscriptum</i>)	SWAP
Faded trillium (Trillium discolor)	Tracked Species
Smooth indigobush (Amorpha glabra)	Tracked Species

Table 2: Species documented within 3 miles of the boundary

Relict Trillium - Trillium reliquum	Federally Endangered
Relict Trillium - Trillium reliquum	Federally Endangered
Miccosukee Gooseberry - Ribes echinellum	Federally Threatened
Georgia Aster - Symphyotrichum georgianum	Federal Candidate
Webster's Salamander - Plethodon webster	State Endangered
Bald Eagle - Haliaeetus leucocephalus	State Threatened, Bald & Golden Fagle Protection Act
Robust Redhorse - Moxostoma robustum	Federal At-Risk Species
Ocmulgee Skullcap - Scutellaria ocmulgee	Federal At-Risk Species
Aethusa-like Trepocarpus - <i>Trepocarpus</i> aethusae	SWAP
American Eel - Anguilla rostrata	SWAP
American Ginseng - Panax quinquefolius	SWAP
American Ginseng - Panax quinquefolius	SWAP
Atlantic Spike - Elliptio producta	SWAP
Baltimore Oriole - Icterus galbula	SWAP
Bartram's Bass - Micropterus	SWAP
Carolina Larkspur - <i>Delphinium</i> carolinianum	SWAP
Christmas Darter - Etheostoma hopkinsi	SWAP
Dutchman's Breeches - Dicentra cucullaria	SWAP
Eared Goldenrod - Solidago auriculata	SWAP
Eastern Creekshell - Villosa delumbis	SWAP
Eastern Elliptio - Elliptio complanata	SWAP
False Rue-anemone - Enemion biternatum	SWAP
Flat Bullhead - Ameiurus platycephalus	SWAP
Highfin Shiner - Notropis altipinnis	SWAP
James' Sedge - Carex jamesii	SWAP
Lanceleaf Wakerobin - Trillium lancifolium	SWAP
Miccosukee Gooseberry - Ribes echinellum	SWAP
Notchlip Redhorse - Moxostoma collapsum	SWAP
Rosyface Chub - Hybopsis rubrifrons	SWAP
Rosyface Chub - Hybopsis rubrifrons	SWAP
Shoals Spider-lily - Hymenocallis coronaria	SWAP
Slender Sedge - Carex gracilescens	SWAP
Snail Bullhead - Ameiurus brunneus	SWAP
Southern Nodding Trillium - Trillium rugelii	SWAP
Tall Bellflower - Campanulastrum	SWAP
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Tiger Salamander - Ambystoma tigrinum	SWAP
Tuberous Gromwell - <i>Lithospermum</i>	SWAP
Turquoise Darter - Etheostoma inscriptum	SWAP
Virginia Spiderwort - Tradescantia virginiana	SWAP
Virginia Spiderwort - Tradescantia virginiana	SWAP
Whiteleaf Sunflower - <i>Helianthus</i> glaucophyllus	SWAP
Yellow Lampmussel - Lampsilis cariosa	SWAP
Florida Pondhorn - Uniomerus caroliniana	Tracked Species
Faded Trillium - Trillium discolor	Tracked Species
Lowland Bladderfern - Cystopteris protrusa	Tracked Species
Lowland Bladderfern - Cystopteris protrusa	Tracked Species
One-flowered Broomrape - Orobanche uniflora	Tracked Species
Smooth Indigobush - Amorpha glabra	Tracked Species
Streambank Mock Orange - Philadelphus hirsutus	Tracked Species
Weak Nettle - Urtica chamaedryoides	Tracked Species

Active bald eagle nests are known to occur within or near to your project area. Surveys to rule out nests in the project area are advised to avoid negative impacts to bald eagle. bald eagles are a state listed threatened species and are federally protected under the Bald and Golden Eagle Protection Act. If bald eagle nests are found to be within the project area, please consult with the U.S. Fish and Wildlife Service before proceeding with any construction activities.

Webster's salamander is known to occur within 3 miles of the project area. This species prefers hardwood forested hillsides and is usually found under rocks, logs or leaflitter. Surveys to identify Webster's salamander in the project area should be done in August/September (for hatchlings) or October through May (adults). This species is state listed as endangered; therefore, no individuals shall be removed without first obtaining a permit through SCDNR.

Georgia aster, relict trillium and Miccosukee gooseberry are both federally listed plant species found within 3 miles of the project area. Should either of these species be found within the project area, please contact SCDNR and the US Fish & Wildlife Service.

The aforementioned species are designated as having conservation priority as designated through the South Carolina State Wildlife Action Plan (SWAP). SWAP species are those species of greatest conservation need not traditionally covered under any federal funded programs. Species are listed in the SWAP because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but listed rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions. SCDNR recommends that appropriate measures should be taken to minimize or avoid impacts to the aforementioned species of concern.

Review of National Wetlands Inventory (NWI) indicate that wetlands and/or hydric soils are present within your project area. SCDNR advises that you consult with the U.S. Army Corps of Engineers (www.sac.usace.army.mil/Missions/Regulatory) to determine if jurisdictional wetlands are present and if a permit and mitigation is required for any activities impacting these areas. If jurisdiction features are present, SCDNR recommends that developed project plans avoid or minimize impacts where practicable. Additionally, a 401 Water Quality Certification may also be required from the SC Department of Health & Environmental Control. For more information, please visit their website at https://www.scdhec.gov/environment/water-quality/water-quality-certification-section-401-clean-water-act.

SCDNR offers the following comments and Best Management Practices (BMPs) regarding this project's potential impacts to natural resources:

- All necessary measures must be taken to prevent oil, tar, trash and other pollutants from entering the adjacent offsite areas/wetlands/water.
- Once the project is initiated, it must be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.
- Upon project completion, all disturbed areas must be permanently stabilized with vegetative cover (preferable), riprap or other erosion control methods as appropriate.
- The project must be in compliance with any applicable floodplain, stormwater, land disturbance, shoreline management guidance or riparian buffer ordinances.
- Prior to beginning any land disturbing activity, appropriate erosion and siltation control measures (e.g. silt fences or barriers) must be in place and maintained in a functioning capacity until the area is permanently stabilized.
- Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts.
- Land disturbing activities must avoid encroachment into any wetland areas (outside the permitted impact area). Wetlands that are unavoidably impacted must be appropriately mitigated.
- If clearing must occur, riparian vegetation within wetlands and waters of the U.S. must be conducted manually and low growing, woody vegetation and shrubs must be left intact to maintain bank stability and reduce erosion.
- Construction activities must avoid and minimize, to the greatest extent practicable, disturbance of woody shoreline vegetation within the project area. Removal of vegetation should be limited to only what is necessary for construction of the proposed structures.
- Where necessary to remove vegetation, supplemental plantings should be installed following completion of the project. These plantings should consist of appropriate native species for this ecoregion.

These technical comments are submitted to speak to the general impacts of the activities as described through inquiry by parties outside the South Carolina Department of Natural Resources. These technical comments are submitted as guidance to be considered and are not submitted as final agency comments that might be related to any unspecified local, state or federal permit, certification or license applications that may be needed by any applicant or their contractors, consultants or agents presently under review or not yet made available for public review. In accordance with its policy 600.01, Comments on Projects Under Department Review, the South Carolina Department of Natural Resources, reserves the right to comment on any permit, certification or license application that may be published by any regulatory agency which may incorporate, directly or by reference, these technical comments.

Interested parties are to understand that SCDNR may provide a final agency positon to regulatory agencies if any local, state or federal permit, certification or license applications may be needed by any applicant or their contractors, consultants or agents. For further information regarding comments and input from SCDNR on your project, please contact our Office of Environmental Programs by emailing <u>environmental@dnr.sc.gov</u> or visiting <u>www.dnr.sc.gov/environmental</u>.

Thank you for the opportunity to review this project and provide comments. Please feel free to contact Joseph Lemeris via email at LemerisJ@dnr.sc.gov or via phone at 803-734-1396 regarding needs for additional information.

Sincerely,

ustoper

James Hagerty Heritage Trust Program

SC Department of Natural Resources

From:	Joe Lemeris
То:	Kelly Kirven
Subject:	RE: Revised species review, Stevens Creek Hydro Project
Date:	Friday, March 27, 2020 1:03:21 PM
Attachments:	image003.png image001.png

Unfortunately right now it does not, since it was not reviewed/tracked at the time of the 2015 SWAP. It will almost certainly be included in the upcoming revision of the SWAP, in which I'd imagine it will receive a high or highest status, but as it stands it is not on our list. It is definitely one of our tracked species for sure!

Cheers, Joe

Joseph Lemeris, Jr.

GIS/Data Manager, Natural Heritage Program | o: 803-734-1396 | m: 843-729-0679 | e: LemerisJ@dnr.sc.gov South Carolina Dept. of Natural Resources | 1000 Assembly St, Columbia, SC 29201 | www.dnr.sc.gov



From: Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>
Sent: Friday, March 27, 2020 12:40 PM
To: Joe Lemeris <LemerisJ@dnr.sc.gov>
Subject: RE: Revised species review, Stevens Creek Hydro Project

Hi Joe,

One follow-up question. Does the Ocmulgee skullcap have a state priority status (highest, high, or moderate) or is it a tracked species?

Thanks, Kelly

Kelly Kirven Project Licensing Coordinator Office: 803.462.5633 www.KleinschmidtGroup.com

From: Joe Lemeris <LemerisJ@dnr.sc.gov>
Sent: Friday, March 27, 2020 11:37 AM
To: Kelly Kirven <Kelly.Kirven@KleinschmidtGroup.com>
Cc: Elizabeth Miller <MillerE@dnr.sc.gov>; speciesreview <speciesreview@dnr.sc.gov>
Subject: Revised species review, Stevens Creek Hydro Project

Good morning Ms. Kirven,

I was forwarded your request for more information from Elizabeth Miller about the species list included in our response to the Stevens Creek Hydro Project. Unfortunately one of our previous staff members had made some errors listing the status of several species in this list, therefore please find a revised copy which reflects accurate status. Note that species listed as 'Tracked Species' are species within our natural heritage database deemed to be vulnerable or imperiled within the state, but may be more secure in other parts of its range.

Please let me know if you have any other questions!!!

Cheers, Joe

Joseph Lemeris, Jr.

GIS/Data Manager, Natural Heritage Program | o: 803-734-1396 | m: 843-729-0679 | e: <u>LemerisJ@dnr.sc.gov</u> South Carolina Dept. of Natural Resources | 1000 Assembly St, Columbia, SC 29201 | <u>www.heritagetrust.dnr.sc.gov</u>



EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Appendices

APPENDIX E-10

RECREATION USE AND NEEDS STUDY REPORT

RECREATION USE AND NEEDS STUDY REPORT

STEVENS CREEK HYDROELECTRIC PROJECT

FERC No. 2535



Prepared for: Dominion Energy South Carolina, Inc.

Prepared by: Kleinschmidt Associates

June 2022

Kleinschmidtgroup.com



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- Appendix A Stevens Creek Recreation Study Plan and Data Collection Forms
- Appendix B Stakeholder Consultation Record

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee of the Stevens Creek Hydroelectric Project (Stevens Creek Project) (FERC No. 2535). The Stevens Creek Project is in Edgefield and McCormick counties, South Carolina, and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The Steven Creek Project dam is approximately 1 mile upstream of the Augusta Diversion Dam and approximately 13 miles downstream of the J. Strom Thurmond dam (Thurmond dam) (Figure 2.1). The Stevens Creek Project occupies approximately 104 acres of federal lands within the Sumter National Forest. Three existing project recreation sites are on federal land and are managed through an agreement with the U.S. Forest Service (Forest Service).

1.1 Study Purpose and Objectives

On November 22, 1995, the Federal Energy Regulatory Commission (FERC) issued a 30year license for the Stevens Creek Project which is scheduled to expire on October 31, 2025. DESC is developing a new license application for the Stevens Creek Project and intends to file the final application with FERC on or before October 31, 2023. The relicensing process involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations, and interested individuals. As part of relicensing, DESC established a Recreation and Land Management Resource Conservation Group (RCG), with interested stakeholders to address issues related to recreation and land management at the Stevens Creek Project. DESC and the RCG agreed that a recreation study was necessary for relicensing.

DESC conducted a Recreation Use and Needs (RUN) study in 2021 and 2022 which assessed existing and future recreational use, opportunities, and needs for the Stevens Creek Project. The study was designed to provide information pertinent to the current and future availability and adequacy of DESC-owned and managed recreation sites, Forest Service owned and managed recreation sites, and Columbia County (Georgia) owned and managed recreation sites at the Stevens Creek Project. The overall study objective was to identify current and potential recreation opportunities, use, and needs at the Stevens Creek Project by addressing the specific goals and objectives listed below. Results from the study will be used to develop a new Recreation Management Plan (RMP) for the Stevens Creek Project.

- <u>Goal 1</u>: Characterize the existing use of recreation sites at the Stevens Creek Project by meeting the following objectives:
 - i. Identify recreation sites; inventory the services and facilities offered; and assess the general condition of each site (including whether the site provides barrier free access).
 - ii. Identify patterns of use at each site (type, volume, and daily patterns of use).
 - iii. Assess existing recreation sites located on federal land for consistency with Forest Service Sustainable Recreation Strategy.
- <u>Goal 2</u>: Identify future needs relating to public recreation sites at the Stevens Creek Project by meeting the following objectives:
 - i. Identify existing user needs and preferences, including perceptions of crowding at recreation sites.
 - ii. Estimate future recreation use of existing recreation sites.
 - iii. Identify future needs for new recreation sites and facilities.

1.2 Study Development and Consultation

Early in the relicensing process, stakeholders requested additional recreation information for the Stevens Creek Project beyond what was included in the Pre-Application Document. DESC and stakeholders collaborated to develop the Stevens Creek Recreation Study Plan between 2019 and 2021 (Appendix A). On May 27, 2021, DESC and stakeholders visited the Stevens Creek Project to discuss and view locations of potential recreation improvements (Appendix B). Information collected during the RUN study and presented in this report will help inform the possible need for additional recreation opportunities at the Stevens Creek Project.

This report was distributed to stakeholders for review and comment in June 2022. A complete consultation record, including a comment matrix that lists all substantial stakeholder comments and how DESC addressed these comments, is included in Appendix B.

2.0 METHODOLOGY

This section describes data collection and analysis efforts used for this study. Data collection focused on obtaining information related to existing public recreation sites and facilities owned by DESC and the Forest Service, estimating recreational use of those sites, learning recreation user perceptions, and determining site capacities. Analysis was performed to support study objectives, characterize existing and potential future recreational use at DESC's public access sites, and assess future requirements necessary to adequately support public recreational use of the Stevens Creek Project.

2.1 Study Area

Four recreation sites at the Stevens Creek Project were included in this assessment: Stevens Creek recreation site, Fury's Ferry recreation site, Chota Drive recreation site, and Betty's Branch/Riverside Park (Figure 2.1). Recreation sites are described in detail in the following sections.







2.2 Study Season

Data were collected from April 1, 2021, through March 31, 2022. During this time, traffic counters were deployed at all four recreation sites to collect continuous traffic data for 1 year. Between October 1 and October 31, 2021, traffic counters were removed from the recreation sites for counter maintenance. During this time, traffic counts were estimated based on data from September and November of 2021. Recreation user surveys and spot counts were collected during the peak recreation season between April 1, 2021, and September 6, 2021 (Labor Day weekend).

2.3 Data Collection Methods

Primary and secondary data were used to meet the study objectives and goals. Primary recreation data were collected at the four recreation sites by several methods, including site inventory, spot counts, traffic counter data, and recreation user surveys. In accordance with the study plan, some methods were used periodically (Table 2.1).

Recreation Site	Site Inventory	Spot Count ¹	Traffic Counter Data	Recreation User Surveys ²
Stevens Creek recreation site	*	*	*	*
Fury's Ferry recreation site	*	Periodic	*	Periodic
Chota Drive recreation site	*	Periodic	*	Periodic
Betty's Branch/Riverside Park	*	*	*	*

Table 2.1Recreation Sites Assessed and Corresponding Data CollectionMethodology

¹Spot counts were administered at Fury's Ferry and Chota Drive during traffic counter data download events. ²In accordance with the study plan, recreation user surveys were to only be administered at Fury's Ferry and Chota Drive if recreation users were present during traffic counter data download events and willing to complete a survey. No surveys were collected at Fury's Ferry and Chota Drive. Secondary data sources included the U.S. Bureau of Census data, the South Carolina Statewide Comprehensive Outdoor Recreation Plan (SCORP), South Carolina Recreation Participation and Preference Study, the Forest Service's Sustainable Recreation Strategy, U.S. Army Corps of Engineers (USACE) existing recreation data collected at the Thurmond Project, Columbia County existing recreation data collected at the Savannah Rapids Pavilion, and other relevant, readily available literature. Additional input was solicited from the RCG.

Table 2.2 summarizes the study objectives, information needed to meet these objectives, and sources for information. Sections 2.3.1 through 2.3.4 summarize the primary data collection methods.

Objectives	Information Needed	Source	
Goal 1: Characterize existing recreational u	ise of project recreation sites		
Goal 1a: Identify formal recreation sites, inventory the services and facilities offered at each, and assess the general condition and ADA compliance of each site	 Physical inventory of all facilities at each recreation site General assessment of site condition to include maintenance, basic rehabilitation needs, etc. Visitors' assessment of site conditions Identification of activities that occur at each site Barrier free/ADA compliance assessment 	 Recreation site inventory Recreation user surveys 	
Goal 1b: Identify the patterns of use at each site (type, volume, and daily patterns of use)	 Use vehicle counts as an estimation of people Estimate of # people/vehicle Estimate of # vehicles/site Parking capacity 	 Traffic counter data Spot count data Recreation user surveys - # of people per vehicle and length of visit Recreation site inventory - # of parking spaces Columbia County/Forest Service data, if available 	
Goal 1c: Assess existing recreation sites located on federal land for consistency with Forest Service Sustainable Recreation Strategy	 Results from Goal 1a and Goal 1b for recreation sites located on federal land 	 Forest Service input Forest Service Sustainable Recreation Strategy 	

Table 2.2Recreation Use and Needs Study Plan Objectives and Efforts

Objectives	Information Needed	Source	
Goal 2: Identify future recreation needs at	the Project		
Goal 2a: Identify existing user needs and	• User preferences and opinions of	Recreation user surveys	
preferences, including perceptions of	needs and crowding at sites	Recreation site inventory	
crowding at project recreation sites	Condition assessment		
Goal 2b: Estimate future recreation use	 Inventory and use data 	Results of goal 1	
of existing project recreation sites	 Population projections for the 	U.S. Bureau of Census data	
	project area	 SC Division of Research and 	
	Recreational use trends	Statistics (Budget and Control	
		Board)	
		SCORP, SC Recreation Participation	
		and Preference study, or other	
		readily available literature	
		 USACE recreation data from 	
		Thurmond Project	
		Columbia County recreation data for	
		Savannah Rapids Pavilion	
Goal 2c: Identify future needs for new	 Estimate of future recreation use at 	 Results of goal 1a, 1b, 2a, and 2b 	
recreation sites and/or facilities	the Project	 Columbia County, Forest Service, 	
	 Parking capacity at recreation sites 	and RCG input on future needs	
	vs. existing and projected use		
	density		
	 Condition/perception assessment 		

2.3.1 Recreation Site Inventory

DESC completed a recreation site inventory at the four project recreation sites listed in Table 2.1. Information was collected on the type, number, and size of facilities (restrooms, parking areas, boat ramps, picnic shelters and tables, etc.) at each site. The general condition of each recreation facility was noted during the inventory. In addition, any facilities that are barrier free or ADA-compliant were identified as such. Barrier free facilities and amenities are those that are designed or planned so that people with disabilities are not prevented from using them. A copy of the inventory form is provided as part of Appendix A. The information collected during the recreation site inventory is listed in Table 4.1.

2.3.2 Traffic Counts

DESC installed five traffic counters at the Stevens Creek recreation sites to record the number of vehicles that entered and exited (Table 2.3). One traffic counter (referred to throughout as "Riverside Park parking lot") was installed at Riverside Park along the road that connects the two large parking areas and a second traffic counter (referred to throughout as "Betty's Branch") was installed along the narrow access road connecting Riverside Park and Bettys Branch recreation site. The Riverside Park parking lot counter data were subtracted from the Betty's Branch counter data to determine how many vehicles used Riverside Park's large parking area near Betty's Branch.

Traffic counter data were collected for 1 year to assess use during the various seasons. Counters were installed on April 1, 2021 and removed April 1, 2022. Traffic counter data were downloaded biweekly to ensure the counters were working properly and archive data. The traffic counters did not collect data in October of 2021 due to counter maintenance. Traffic counts for October were extrapolated based on data collected during September and November of 2021.

Table 2.3	GPS Locations for Traffic Counters

Site name	Latitude	Longitude
Riverside Park Parking Lot	33.582410	-82.133151
Betty's Branch Recreation Site	33.583934	-82.133369
Choata Drive Recreation Site	33.574643	-82.050570
Fury's Ferry Recreation Site	33.599415	-82.117598
Stevens Creek Recreation Site	33.577714	-82.046599

Traffic counter data were used to determine recreation use at each site, which is reported in recreation days. A recreation day is defined by FERC as each visit by a person to a development for recreational purposes during any portion of a 24-hour period. Traffic counters tallied vehicles and not people. Based on survey information, it was estimated that each vehicle contained approximately 1.9 people. Recreation days were determined by multiplying each vehicle by 1.9. Recreation days are reported by month and by day type. Day types include weekdays, weekends, and peak weekends (or holiday weekends). Weekends identified as "peak weekends" during the 2021-2022 data collection period are listed in Table 2.4.

Peak Weekends	Dates
Memorial Day	May 29-31, 2021
Independence Day	July 2-4, 2021
Labor Day	September 4-6, 2021
Columbus Day	October 9-11, 2021
Thanksgiving	November 26-28, 2021
Christmas	December 24-26, 2021
New Years	December 31, 2021, and January 1-2, 2022
Martin Luther King Day	January 15-17, 2022
Presidents' Day	February 19-21, 2022

Table 2.4 2021-2022 Peak Weekends

Traffic counters were also used to determine average percent capacity at a recreation site by month and day type. To determine capacity using traffic counter data, the average number of total vehicles that used the access area on a specific day type was divided by the estimated turnover. Because traffic counter data only accounts for vehicles entering an access area, length of stay must be considered. Length of stay is the average amount of time (hours) a visitor spends at an access area per recreation visit. Length of stay information was determined during surveys. Length of stay is ultimately used to determine turnover at a site. Turnover is how often a vehicle leaves a site and is replaced over a 24-hour period. Turnover is applied to the average total vehicles, which is then compared to the total parking spaces available at the recreation site. The formula for determining percent capacity is shown below.

$$\left(\frac{\frac{Total Average Vehicles}{Turnover}}{Available Parking Spaces}\right) * 100$$

2.3.3 User Surveys

DESC conducted user surveys at project recreation sites according to the schedule shown in Table 2.5. In accordance with the study plan, surveys were periodically collected at Chota Drive recreation site and Fury's Ferry recreation site when staff were on-site to download traffic counter data. Surveys were administered to recreation users at the close of their recreation day. Data collected included user demographics, group size, the type of land-based and water-based recreation activities individuals participated in, length of stay, and perceptions of crowdedness and condition of recreation facilities at the Stevens Creek Project. Because there is a large Hispanic population in the project area, surveys were also available in Spanish. A copy of the survey in English is provided as part of Appendix A. The data were used to identify recreation use patterns and use estimates at project recreation sites. The data were also used to characterize user perceptions on crowdedness, which was considered during the future needs analysis.

Surveys were administered at the Stevens Creek recreation site and Betty's Branch during the peak recreation season between April 1 and Labor Day weekend of 2021. Each recreation site was sampled according to a schedule that included weekdays, weekends, and peak weekends (Table 2.5). The schedule was developed using a stratified random sampling method, with weekends being sampled at a greater rate than weekdays to account for the heavier use that typically occurs on these days. During each sampling day, field staff were on-site for a 4-hour shift collecting as many complete surveys as possible. The shifts occurred randomly throughout the day within the window of 8:00 AM to 8:00 PM. Shift start times were 8:00 AM to 12:00 PM for the morning shift, 12:00 PM to 4:00 PM for the afternoon shift, and 4:00 PM to 8:00 PM for the evening shift. On-site staff were trained thoroughly as a means of quality control.

Location	Shift	Day	Day type
Stevens Creek	12:00 PM	Saturday, April 3, 2021	Weekend
Betty's Branch	4:00 PM	Wednesday, April 7, 2021	Weekday
Stevens Creek	12:00 PM Thursday, April 8, 2021		Weekday
Stevens Creek	8:00 AM	Monday, April 12, 2021	Weekday
Betty's Branch	4:00 PM	Monday, April 12, 2021	Weekday
Stevens Creek	4:00 PM	Friday, April 16, 2021	Weekday
Betty's Branch	8:00 AM	Saturday, April 17, 2021	Weekend
Betty's Branch	4:00 PM	Wednesday, April 21, 2021	Weekday
Betty's Branch	8:00 AM	Thursday, April 22, 2021	Weekday

Table 2.5 Survey Collection Schedule

Location	Shift	Day	Day type
Betty's Branch	12:00 PM	Sunday, April 25, 2021	Weekend
Stevens Creek	4:00 PM	Tuesday, April 27, 2021	Weekday
Stevens Creek	4:00 PM	Saturday, May 1, 2021	Weekend
Betty's Branch	8:00 AM	Wednesday, May 5, 2021	Weekday
Stevens Creek	12:00 PM	Thursday, May 6, 2021	Weekday
Betty's Branch	4:00 PM	Saturday, May 8, 2021	Weekend
Stevens Creek	12:00 PM	Tuesday, May 11, 2021	Weekday
Betty's Branch	4:00 PM	Wednesday, May 12, 2021	Weekday
Stevens Creek	4:00 PM	Thursday, May 13, 2021	Weekday
Stevens Creek	4:00 PM	Sunday, May 16, 2021	Weekend
Betty's Branch	12:00 PM	Thursday, May 20, 2021	Weekday
Stevens Creek	8:00 AM	Friday, May 21, 2021	Weekday
Betty's Branch	8:00 AM	Wednesday, May 26, 2021	Weekday
Betty's Branch	8:00 AM	Sunday, May 30, 2021	Holiday
Stevens Creek	4:00 PM	Sunday, May 30, 2021	Holiday
Betty's Branch	4:00 PM	Saturday, June 5, 2021	Weekend
Stevens Creek	8:00 AM	Tuesday, June 8, 2021	Weekday
Stevens Creek	12:00 PM	Friday, June 11, 2021	Weekday
Betty's Branch	8:00 AM	Friday, June 11, 2021	Weekday
Betty's Branch	12:00 PM	Tuesday, June 15, 2021	Weekday
Stevens Creek	4:00 PM	Tuesday, June 15, 2021	Weekday
Betty's Branch	8:00 AM	Wednesday, June 16, 2021	Weekday
Betty's Branch	8:00 AM	Friday, June 18, 2021	Weekday
Betty's Branch	4:00 PM	Monday, June 21, 2021	Weekday
Stevens Creek	12:00 PM	Sunday, June 27, 2021	Weekend
Stevens Creek	4:00 PM	Wednesday, June 30, 2021	Weekday
Stevens Creek	4:00 PM	Wednesday, July 7, 2021	Weekday
Betty's Branch	4:00 PM	Saturday, July 10, 2021	Weekend
Betty's Branch	8:00 AM	Monday, July 12, 2021	Weekday
Bettys Branch	8:00 AM	Saturday, July 17, 2021	Weekend
Betty's Branch	4:00 PM	Monday, July 19, 2021	Weekday
Stevens Creek	8:00 AM	Tuesday, July 20, 2021	Weekday
Betty's Branch	12:00 PM	Tuesday, July 20, 2021	Weekday
Betty's Branch	12:00 PM	Saturday, July 24, 2021	Weekend
Stevens Creek	4:00 PM	Sunday, July 25, 2021	Weekend
Stevens Creek	12:00 PM	Wednesday, July 28, 2021	Weekday
Stevens Creek	8:00 AM	Saturday, July 31, 2021	Weekend
Betty's Branch	8:00 AM	Thursday, August 5, 2021	Weekday
Stevens Creek	4:00 PM	Friday, August 6, 2021	Weekday
Stevens Creek	4:00 PM	Sunday, August 15, 2021	Weekday
Betty's Branch	8:00 AM	Monday, August 16, 2021	Weekday
Stevens Creek	4:00 PM	Tuesday, August 17, 2021	Weekday
Stevens Creek	8:00 AM	Thursday, August 19, 2021	Weekday

Location	Shift	Day	Day type
Stevens Creek	8:00 AM	Saturday, August 21, 2021	Weekend
Betty's Branch	12:00 PM	Monday, August 23, 2021	Weekday
Betty's Branch	4:00 PM	Tuesday, August 24, 2021	Weekday
Stevens Creek	12:00 PM	Thursday, August 26, 2021	Weekday
Betty's Branch	8:00 AM	Monday, August 30, 2021	Weekday
Stevens Creek	12:00 PM	Monday, August 30, 2021	Weekday
Stevens Creek	12:00 PM	Saturday, September 4, 2021	Holiday
Betty's Branch	4:00 PM	Monday, September 6, 2021	Holiday

2.3.4 Spot Counts

According to the study plan, DESC completed spot counts at project recreation sites once per sampling day, prior to the start of survey collection. Spot counts documented the number of vehicles present at a recreation site at one moment in time, and other information including: date, time, and weather; number of vehicles and vehicles with trailers at the recreation site; types of activities observed at the site; and state license plate data (Appendix A). Spot counts were only collected at Chota Drive recreation site and Fury's Ferry recreation site when field staff were on-site to download traffic counter data. Because traffic counters were installed at all recreation sites, spot counts were not necessary for estimating recreation use. Instead, spot counts provided insight into the types of activities that occurred at the sites and the ratio of vehicles versus vehicles with trailers at each site.

3.0 **RECREATION RESOURCES**

3.1 **Project Recreation Resources**

3.1.1 Stevens Creek Recreation Site

The Stevens Creek recreation site (Photo 3.1) is in North Augusta, South Carolina, on the Stevens Creek arm of Stevens Creek Reservoir. The site is owned and operated by DESC and includes a parking lot with space for six vehicles with trailers, one concrete boat launch, three picnic tables, and one unisex restroom.



Photo 3.1 Stevens Creek Recreation Site

3.1.2 Betty's Branch Recreation Site and Riverside Park

The Betty's Branch recreation site (Photo 3.2) is in Evans, Georgia, on Betty's Branch of the Little River, adjacent to the Georgia side of Stevens Creek Reservoir. This site is located at the north end of Riverside Park, which is operated and maintained by Columbia County, Georgia. Betty's Branch recreation site is operated and maintained by DESC. This site has a small parking lot with four Americans with Disabilities Act (ADA) parking spots, one

concrete boat ramp, one courtesy dock, one fishing pier, and two picnic tables. Adjacent to Betty's Branch recreation site is a large parking area associated with Riverside Park. Betty's Branch recreators that don't require ADA parking use the Riverside Park parking lot.



Photo 3.2 Bettys Branch Recreation Site

Riverside Park is a multi-use recreational facility. There is a men's and women's multi-stall restroom, a large parking lot, and a large picnic shelter near the Betty's Branch recreation site. The parking lot provides 67 parking spaces for vehicles (no trailers) and an additional seven ADA accessible parking spaces. This parking lot is located adjacent to Betty's Branch recreation site and serves as the site's overflow parking. Therefore, this parking area was included in the recreation study and is referred to throughout the report as "Riverside Park Parking Lot." A kayak outfitter provides canoe and kayak rentals and guided tours at Riverside Park. Riverside Park also includes tennis courts, a beach volleyball court, eight baseball and softball fields, a large playground, and a dog park. A second large parking lot is near these amenities.



Photo 3.3 Riverside Park Restrooms and Picnic Pavilion Near Betty's Branch Recreation Site

3.1.3 Fury's Ferry Recreation Site

Fury's Ferry recreation site (Photo 3.4) is in Clarks Hill, South Carolina, on the Savannah River arm of the Stevens Creek Reservoir. The site is owned, operated, and maintained by the Forest Service. This site has one concrete boat ramp, two picnic tables, and a gravel parking lot. The parking lot can hold approximately five vehicles with trailers or 11 without trailers.



Photo 3.4 Fury's Ferry Recreation Area

3.1.4 Chota Drive Recreation Site

Chota Drive recreation site (Photo 3.5) is in Clarks Hill, South Carolina, on the Stevens Creek arm of the Stevens Creek Reservoir. Chota Drive recreation site is owned, operated, and maintained by the Forest Service. The site provides bank fishing access, non-motorized boat launch access, and a gravel parking area with space for approximately two vehicles.



Photo 3.5 Chota Drive Recreation Area

3.2 Regional Recreation Resources

In addition to recreational sites at the Stevens Creek Project, there are many recreation opportunities in the region. Table 3.1 lists recreation areas in Edgefield and McCormick counties, South Carolina, and Columbia County, Georgia.

Columbia County, GA	Edgefield County, SC	McCormick County, SC
Blanchard Park	Baseball Complex	Cannady Ball Field
Blanchard Woods Park	Edgefield County Park at Bettis Academy	Clarks Hill Ball Field
Bobby Waters Gymnasium at Patriots Park	Edgefield Jaycee's Park	Dorn Boating Facility
Euchee Creek Greenway Trails (Grovetown Section)	Jaycee's Park	Lake Thurmond
Evans Towne Center Park	Johnston Elementary	Long Cane District, Sumter National Forest

Table 3.1	Recreation Fa	acilities Located	Near the Project

Columbia County, GA	Edgefield County, SC	McCormick County, SC
Gateway Park	Long Cane District, Sumter National Forest	Mt. Carmel Ball Field
Goodale Park	Rail Trail	Parksville Wayside Park
Harlem Park	Soccer Complex	Plum Branch Ball Field
Heggie's Rock Preserve	Town Gym	Westowne Ball Field
International Disc Golf Center	Watson Park	
Lakeside Park		
Lake Thurmond		
Liberty Park and Community		
Center		
Lonnie Morris, Sr. Park		
Memorial Gardens Park		
Patriots Park		
Reed Creek Nature Park and		
Interpretive Center		
Riverside Park		
Savannah Rapids Park		
(Historical Canal Headgates		
and Savannah Rapids		
Pavilion)		
Wildwood Park		

3.2.1 Sumter National Forest, Long Cane District

Sumter National Forest has three ranger districts in South Carolina, including the Andrew Pickens, the Enoree, and the Long Cane districts. The Long Cane District is east of the Savannah River and Stevens Creek Reservoir and offers the public a variety of recreation opportunities, including the Fury's Ferry recreation site. The Long Cane and Highway 28 boat ramps, which provide access to the backwaters of Lake Thurmond are among other recreation opportunities in the district. The Forks Area Trail System, in the southern portion of the Long Cane District along the South Carolina side of the Stevens Creek Reservoir, consists of six stacked recreation loops accessible from various locations that provide approximately 34 miles of hiking or biking through a variety of terrain. The Modoc Trail is in the southeastern portion of the Long Cane District along the Long Cane District along the Upper reaches of Stevens Creek, outside of the project boundary. The trail includes the 5.5-mile-long Modoc Trail and the 12-mile-long Wine-Turkey Trail (USDA 2022).

3.2.2 J. Strom Thurmond Lake

Lake Thurmond (known locally as Clarks Hill Lake), formed by Thurmond dam on the Savannah River and owned and managed by USACE, is approximately 1 mile upstream of Stevens Creek Reservoir and provides a multitude of public recreation opportunities, including 15 campgrounds and day use facilities. USACE maintains two recreation sites downstream of Thurmond dam that provide access to the Thurmond Project tailrace. One site is on the South Carolina side of the Savannah River (Photo 3.6) and the other is on the Georgia side (Photo 3.7). The South Carolina tailrace site has seven picnic pavilions, a playground, a concrete boat ramp, a fishing pier, and a restroom. The Georgia tailrace site has a restroom, a concrete boat ramp, and bank fishing access. These recreation sites are not associated with the Stevens Creek Project, but they do provide access to the Stevens Creek Reservoir.



Photo 3.6 Thurmond Tailrace Recreation Site – South Carolina Side



Photo 3.7 Thurmond Tailrace Recreation Site – Georgia Side

USACE collects annual visitation data for the tailrace sites. The South Carolina tailrace site receives approximately four times the use that the Georgia site receives (Table 3.2), likely because there are more developed recreational facilities. The South Carolina site received its highest use in July of 2021 and the Georgia site received its highest use in October of 2020, followed closely by July of 2021.

Month	South Carolina Tailrace Site	Georgia Tailrace Site							
October 2020	4,896	1,529							
November 2020	3,689	702							
December 2020	3,917	917							
January 2021	3,126	705							
February 2021	3,745	821							
March 2021	4,561	1,271							
April 2021	4,743	1,370							
May 2021	4,271	1,015							
June 2021	4,481	453							

Table 3.2Visitors per Month at the Thurmond Dam Tailrace Recreation Sites –
Fiscal Year 2021

Month	South Carolina Tailrace Site	Georgia Tailrace Site
July 2021	5,182	1,541
August 2021	3,491	983
September 2021	4,303	1,040
Total	50,405	12,347

Source: personal communication, C. Alford (Chief Ranger/COR, USACE) with K. Kirven (Recreational Specialist, Kleinschmidt), May 13, 2022.

4.0 **RESULTS**

4.1 Recreation Site Inventory

The four project recreation sites and the Riverside Park parking lot were inventoried during the study. The results of the inventory are summarized in Table 4.1.

Site Name	\$ Fee	ADA Amenities ¹	Picnicking	# Shelters	# of Tables	# of Grills	Trails	Campgrounds	Swimming	Bank Fishing	Dock Fishing	# Ramps	# Docks	Parking Spaces	Restrooms	Playground and Sport Facilities	Owner
Stevens Creek Recreation Site	\$0	\checkmark	V	0	3	0	0	0	0		-	1	0	6	1	-	DESC
Fury's Ferry Recreation Site	\$0	-	\checkmark	0	2	0	0	0	0	~	-	1	0	8	0	-	Forest Service
Chota Drive Recreation Site	\$0	-	-	0	0	0	0	0	0	\checkmark	-	1	0	2	0	-	Forest Service
Betty's Branch	\$0	V	Z	0	4	0	0	0	0	-	\checkmark	1	1	4	0	-	DESC
Riverside Park Parking Lot	\$0	V	V	1	5	0	0	0	0	-	-	0	0	74	6	\checkmark	Columbia County
Totals	\$0			1	9	0	0	0	0			4	1	94	7		

Table 4.1Public Recreation Site Inventory Summary

¹Although a recreation site may not be entirely ADA-compliant, this column indicates that the facility provides some level of ADA-complaint amenities. ADA-compliant amenities at specific recreation sites are discussed further in Section 3.0.

4.2 Current Recreation Use

Table 4.2 provides a summary of the recreation days that occurred at each recreation site by month and day type. Traffic counter data demonstrated that there were 100,213 visits, or recreation days, at the Stevens Creek recreational areas between April 2021 and March 2022. The Stevens Creek recreation site and Fury's Ferry recreation site received comparable use with approximately 11,723 recreation days and 12,813 recreation days, respectively. The least developed site, Chota Drive recreation site, received the lowest number of recreation days of all project recreation sites (approximately 1,600). Betty's Branch and Riverside Park parking lot, the most developed recreation area at the Stevens Creek Project, received the most recreation days with approximately 26,000 visitors to Betty's Branch and approximately 48,000 to the Riverside Park parking lot.

Month, Day Type	Stevens Creek Recreation Site	Fury's Ferry Recreation Site ¹	Chota Drive Recreation Site	Riverside Park	Betty's Branch Recreation Site	Total
April 2021	incereation bite	Recication Dite	Recreation bite			
Weekdays	950	608	60	1,036	3,928	6,582
Weekends	428	427	77	2,159	563	3,654
Holidays						
May 2021						
Weekdays	828	543	154	2,151	2,764	6,440
Weekends	585	376	37	3,566	795	5,359
Holidays	218	197	17	1,590	237	2,259
June 2021						
Weekdays	701	583	118	3,589	2,539	7,530
Weekends	436	369	62	3,295	737	4,899
Holidays						
July 2021						
Weekdays	562	459	164	2,595	2,087	5,867
Weekends	291	318	33	2,240	314	3,196
Holidays	162	187	15	1,118	362	1,844
August 2021	-					-
Weekdays	625	1,048	100	2,137	1,549	5,459
Weekends	344	396	33	2,689	443	3,905
Holidays						
September 2021	-					-
Weekdays	471	742	81	2,003	1,216	4,513
Weekends	197	286	29	1,376	197	2,085
Holidays	98	135	12	778	162	1,185
October 2021 ³						
Weekdays	488	674	79	2,216	889	4,346
Weekends	242	340	25	988	176	1,771
Holidays	76	132	12	229	151	600
November 2021						

Table 4.2Estimated Recreation Days for Individual Project Recreation Sites

Month, Day Type	Stevens Creek	Fury's Ferry	Chota Drive	Riverside Park	Betty's Branch	Total
	Recreation Site	Recreation Site¹	Recreation Site	Parking Lot ²	Recreation Site	
Weekdays	500	698	67	2,016	627	3,908
Weekends	207	274	22	682	119	1,304
Holidays	83	108	14	152	167	524
December 2021						
Weekdays	488	721	62	1,554	606	3,431
Weekends	208	262	15	528	124	1,137
Holidays	125	195	14	296	92	722
January 2022						
Weekdays	374	681	60	1,321	848	3,284
Weekends	166	340	17	526	161	1,210
Holidays	124	193	33	355	125	830
February 2022						
Weekdays	502	384	71	1,167	1,095	3,219
Weekends	203	189	35	886	193	1,506
Holidays	114	85	14	372	113	698
March 2022						
Weekdays	571	579	42	1,391	1,935	4,518
Weekends	355	284	25	1,093	673	2,430
Holidays						
Total						
Weekdays	7,060	7,721	1,059	23,176	20,082	59,098
Weekends	3,663	3,860	410	20,027	4494	32,454
Holidays	1,001	1,232	129	4,890	1409	8,661
TOTAL	11,723	12,813	1,598	48,093	25,986	100,213

¹The traffic counter at Fury's Ferry Recreation Site malfunctioned between May 13-24, 2021, and was stolen on September 9, resulting in a loss of data from September 9 – September 30. Data presented in the table for May and September were extrapolated based on data collected during the remainder of these months.

²The Riverside Park parking lot traffic counter malfunctioned resulting in lost data from May 13-24, 2021; data were extrapolated based on data collected during the remainder of May.

³Numbers were extrapolated from October 6, 2021, to November 11, 2021, due maintenance of all counters.
4.3 Recreation Site Use Density

Stevens Creek Project recreation sites are well used throughout the year and generally used within their design capacities. For this study, sites were considered to be used within their design capacity if parking areas were regularly less than 75 percent full. Use was considered to be approaching capacity if parking areas were regularly between 75 and 99 percent full. Use was considered to be exceeding capacity if parking areas were regularly greater than 99 percent full. High levels of use typically experienced on holidays are regarded as special circumstances, as these use levels are experienced only a few times per year. Recreation capacity is considered for typical weekday and non-peak weekend use in management and site design decisions.

Recreation site use density was calculated using the data collected by traffic counters (Table 4.3). The length of stay was determined based on information collected via surveys at Stevens Creek recreation site and Betty's Branch recreation site. Length of stay was estimated to be 4 hours for Stevens Creek recreation site, Fury's Ferry recreation site, Chota Drive recreation site, and the Riverside Park parking lot. Length of stay at Betty's Branch was estimated to be 0.5 hours, because most vehicles entering the site were only there to unload kayaks, canoes, and motorboats. The vehicles using Betty's Branch typically park in the Riverside Park parking lot.

All sites were generally within their design capacity on weekdays and non-peak weekends. The only site to exceed capacity was Stevens Creek recreation site. At this site on weekends and holidays during May, the parking area was calculated to be 105 percent full. Stevens Creek recreation site also approached capacity on non-peak weekends in April and June. Most sites received their highest use on non-peak weekends during the spring (March, April, May, and June) except for Betty's Branch. Use was highest at Betty's Branch on weekdays. All sites generally received the least use during the fall and winter (September, October, November, December, January, and February).

Month, Day Type	Stevens Creek Recreation Site	Fury's Ferry Recreation Site ¹	Chota Drive Recreation Site	Betty's Branch Recreation Site	Riverside Park Parking Lot		
April 2021							
Weekdays	68%	33%	13%	48%	29%		
Weekends	77%	58%	42%	19%	40%		
Holidays							

Table 4.3Recreation Site Average Capacity by Month and Day Type

Month, Day Type	Stevens Creek Recreation Site	Fury's Ferry Recreation Site ¹	Chota Drive Recreation Site	Betty's Branch Recreation Site	Riverside Park Parking Lot			
May 2021								
Weekdays	60%	29%	33%	37%	29%			
Weekends	105%	51%	20%	27%	64%			
Holidays	105%	71%	25%	21%	71%			
June 2021								
Weekdays	46%	29%	23%	31%	33%			
Weekends	78%	50%	33%	25%	59%			
Holidays								
July 2021								
Weekdays	40%	25%	35%	28%	27%			
Weekends	60%	49%	20%	12%	43%			
Holidays	58%	51%	17%	24%	43%			
August 2021								
Weekdays	41%	51%	20%	19%	20%			
Weekends	55%	47%	16%	13%	41%			
Holidays								
September 2021	•							
Weekdays	32%	38%	17%	16%	18%			
Weekends	47%	51%	21%	9%	31%			
Holidays	47%	49%	17%	15%	37%			
October 2021				Γ				
Weekdays	35%	36%	17%	12%	18%			
Weekends	44%	46%	14%	6%	17%			
Holidays	37%	48%	17%	14%	15%			
November 2021				Γ	I			
Weekdays	34%	36%	14%	8%	15%			
Weekends	50%	49%	16%	5%	16%			
Holidays	40%	39%	19%	15%	12%			
December 2021		270/	1001	201	4.004			
Weekdays	33%	37%	13%	8%	12%			
Weekends	50%	47%	11%	6%	13%			
Holidays	45%	53%	15%	6%	11%			
January 2022								
Weekdays	27%	37%	13%	11%	13%			
Weekends	40%	61%	13%	7%	13%			
Holidays	36%	42%	28%	7%	11%			
February 2022	1				1			
Weekdays	38%	22%	16%	16%	14%			
Weekends	49%	34%	25%	9%	21%			
Holidays	55%	31%	19%	10%	19%			
March 2022	1			Γ	T			
Weekdays	36%	27%	8%	25%	17%			
Weekends	64%	38%	14%	23%	26%			

Month, Day Type	Stevens Creek Recreation Site	Fury's Ferry Recreation Site ¹	Chota Drive Recreation Site	Betty's Branch Recreation Site	Riverside Park Parking Lot
Holidays					
Total					
Average Capacity – Weekdays	41%	33%	18%	22%	20%
Average Capacity – Weekends	61%	48%	21%	14%	33%
Average Capacity – Holidays	51%	48%	20%	14%	26%

¹The traffic counter for the Fury's Ferry recreation site malfunctioned and data were lost from May 13-24, 2021 and from September 9-30, 2021

²The Riverside Park parking lot traffic counter malfunctioned resulting in lost data from May 13-24, 2021.

4.4 Estimated Future Recreation Use

Current population data were collected from the U.S. Census Bureau (2021) for the three counties and two states in which the Stevens Creek Project is located. Population projections through 2035 were also collected for these counties and states from the South Carolina Revenue and Fiscal Affairs Office (SCRFAO) and the Georgia Office of Planning and Budget (GAOPB) (Table 4.4). This information was used to determine estimated population growth for the Stevens Creek Project region. Populations are expected to increase in two of the three counties over the next 10 to 15 years, with a net growth when counties combined. However, the rate of growth is expected to slow over time. This mimics the population projections for Georgia and South Carolina.

		_		
County	2020 Census	2025 Projection	2030 Projection	2035 Projection
Columbia (GA)	156,010	176,146	192,137	207,330
Edgefield (SC)	25,657	27,370	27,475	27,425
McCormick (SC)	9,526	8,565	7,905	7,135
Three-County	191.193	212.081	227.517	241.890
Subtotal		, • • ·		,
Percent Change	0.00%	10.93%	7.28%	6.32%
Georgia	10,711,908	11,335,283	11,979,787	12,496,324

Table 4.4Population Projections for the Counties and States in which the
Stevens Creek Project is Located1

County	2020 Census	2025 Projection	2030 Projection	2035 Projection
Percent Change	0.00%	5.82%	5.69%	4.31%
South Carolina	5,118,425	5,542,140	5,881,710	6,223,085
Percent Change	0.00%	8.28%	6.13%	5.80%

Source: GAOPB 2020, SCRFAO 2019, U.S. Census 2021

¹ Population projections are only available for South Carolina through 2035.

The population projections for the three-county region was applied to the estimated recreation days for the recreation sites and the project and the average non-peak weekend capacity for each recreation site. By 2035, the Stevens Creek Project is estimated to accumulate nearly 127,000 annual recreation days (Table 4.5). Estimated future average non-peak weekend capacities for all recreation sites are shown in Table 4.6. All sites are projected to remain below full capacity on non-peak weekends.

Year	Population Growth Rates (3-County Subtotal)	Stevens Creek Recreation Site	Fury's Ferry Recreation Site	Chota Drive Recreation Site	Riverside Park Parking Lot	Betty's Branch Recreation Site	Recreation Days (All Project Recreation Sites)
2021		11,723	12,813	1,598	48,093	25,986	100,213
2025	10.93%	13,004	14,213	1,773	53,350	28,826	111,166
2030	7.28%	13,951	15,248	1,902	57,233	30,925	119,259
2035	6.32%	14,833	16,212	2,022	60,851	32,879	126,796

Table 4.5 Estimated Future Recreation Days for the Stevens Creek Project, 2025-2035¹

¹ Current population projections for South Carolina counties are only available through 2035.

Table 4.6 Estimated Future Average Non-Peak Weekend Capacity at the Stevens Creek Project Recreation Sites

Year	Population Growth Rates (3-County Subtotal)	Stevens Creek Recreation Site	Fury's Ferry Recreation Site	Chota Drive Recreation Site	Riverside Park Parking Lot	Betty's Branch Recreation Site
2021		61%	48%	21%	14%	33%
2025	10.93%	68%	54%	23%	16%	37%
2030	7.28%	73%	58%	25%	17%	40%
2035	6.32%	78%	61%	26%	18%	42%

4.5 User Surveys

DESC collected 295 surveys on 30 days at Stevens Creek recreation site and the Betty's Branch recreation site between April and early September 2021 (Table 4.7). Field staff attempted to collect surveys at Fury's Ferry recreation site and Chota Drive recreation site when on site to download traffic counter data; however, no surveys were completed due to low site use and unwillingness by recreators to complete surveys at these sites.

Recreation Site	# of Surveys
Stevens Creek Recreation Site	81
Betty's Branch Recreation Site	214
Total	295

4.5.1 User Demographics and Characteristics

The average age of visitors at Stevens Creek recreation site was 52 and the average age of visitors at Betty's Branch was 40. Most visitors approached to complete a survey were over 18 years of age except for one visitor at Betty's Branch and two visitors at Stevens Creek recreation site. Visitors at Stevens Creek recreation site were primarily male (89 percent) while visitors at Betty's Branch were mixed between male (60 percent) and female (40 percent). Most visitors indicated their primary language was English; however, one visitor identified Japanese as their primary language and one visitor identified Spanish as their primary language.

Visitors to the Stevens Creek Project primarily listed Evans and Augusta, Georgia, and North Augusta, South Carolina as their hometowns (Table 4.8). While most visitors to the Stevens Creek Project were local, some visitors' hometowns were in North Carolina, Ohio, Illinois, Texas, Colorado, and Utah.

ZIP Code	City	Percentage
30809	Evans, GA	21.60%
30907	Augusta, GA	15.30%
29841	North Augusta, SC	10.20%
30813	Grovetown, GA	8.90%
29860	North Augusta, SC	7.20%
30904	Augusta, GA	4.70%
30909	Augusta, GA	4.70%

Table 4.8 Home ZIP Codes of Recreationists at the Stevens Creek Recreation Sites

ZIP Code	City	Percentage
29801	Aiken, SC	3.00%
29803	Aiken, SC	2.50%
29829	Graniteville, SC	1.70%
30815	Hephzibah, GA	1.70%
30906	Augusta, GA	1.70%
29847	Trenton, SC	1.30%
29842	Beech Island, SC	0.80%
30802	Appling, GA	0.80%
30830	Waynesboro, GA	0.80%
28088	Landis, NC	0.40%
28213	Charlotte, NC	0.40%
29072	Lexington, SC	0.40%
29078	Lugoff, SC	0.40%
29210	Columbia, SC	0.40%
29229	Columbia, SC	0.40%
29330	Cowpens, SC	0.40%
29615	Greenville, SC	0.40%
29824	Edgefield, SC	0.40%
29835	McCormick, SC	0.40%
29838	Modoc, SC	0.40%
30041	Cumming, GA	0.40%
30043	Lawrenceville, GA	0.40%
30052	Loganville, GA	0.40%
30107	Ball Ground, GA	0.40%
30135	Douglasville, GA	0.40%
30214	Fayetteville, GA	0.40%
30248	Locust Grove, GA	0.40%
30277	Sharpsburg, GA	0.40%
30305	Atlanta, GA	0.40%
30805	Blythe, GA	0.40%
30814	Harlem, GA	0.40%
30817	Lincolnton, GA	0.40%
31069	Perry, GA	0.40%
31901	Columbus, GA	0.40%
45206	Cincinnati, OH	0.40%
60608	Chicago, IL	0.40%
79912	El Paso, TX	0.40%
80203	Denver, CO	0.40%
84093	Sandy, UT	0.40%

When asked how many people were in their party, most visitors at Stevens Creek recreation site indicated they were recreating alone or with one other person. At Betty's Branch, party size was typically larger. Party size at Betty's Branch was most frequently reported as two, although parties of one, three, and four were also common. The average party size at Stevens Creek recreation site was 1.8 and the average party size at Betty's Branch was 3.0.

Visitors were asked if they were at the Stevens Creek Project more, less, or about the same than the previous year. At Stevens Creek recreation site and Betty's Branch combined, 53 percent of visitors indicated they had visited the Stevens Creek Project more often over the past year. Thirty-two percent and 15 percent of visitors indicated they frequented the Stevens Creek Project about the same or less over the past year, respectively.

Visitors were also asked what other lakes they commonly recreate in addition to Stevens Creek Reservoir. Lake Thurmond, also referred to as Clarks Hill, was the most noted lake. Other lakes commonly identified included Lake Murray, Lake Olmstead, Lake Oconee, Lake Hartwell, and Lake Greenwood. Visitors also noted other local recreation areas including Savannah Rapids Pavilion, the Augusta Canal, Phinizy Swamp, New Savannah Bluff Lock and Dam, and the Savannah River.

4.5.2 Recreation Activities

Visitors were asked to list the primary recreation activity that they participated in on the day of the survey (Table 4.9). At Betty's Branch recreation site, the most popular activity was canoeing/kayaking (71 percent) followed by boat fishing (12 percent) and paddleboarding (7 percent). At Stevens Creek recreation site, the most popular activity was boat fishing (77 percent) followed by canoeing/kayaking (9 percent).

Activity	Betty's Branch Recreation Site	Stevens Creek Recreation Site
Canoeing/Kayaking	71%	9%
Boat Fishing	12%	77%
Paddleboarding	7%	2%
Pier/Dock Fishing	4%	0%
Bank Fishing	1%	7%
Motor Boating	2%	0%
Walking/Hiking/Backpacking	2%	0%

Table 4.9Primary Activities at Project Recreation Sites

	Betty's Branch	Stevens Creek
Activity	Recreation Site	Recreation Site
Nature Study/Wildlife	1%	4%
Viewing/Photography		
Picnicking	1%	2%
Sightseeing	1%	0%
Other	1%	0%
Total	100%	100%

Visitors were also asked to list the other activities in which they participated, in addition to their primary activity, while at the Stevens Creek Project. At Betty's Branch, the most common secondary activities listed included canoeing/kayaking (25 percent), swimming (20 percent), paddleboarding (18 percent) and picnicking (11 percent). At Stevens Creek recreation site, the most common secondary activities listed included canoeing/kayaking (57 percent) and nature study/wildlife viewing/photography, sightseeing, and boat fishing (14 percent each).

If they were at the Stevens Creek Project to hunt or fish, visitors were asked to list their target species. No visitors indicated they were at the project to hunt. Fishermen most often listed their target species as largemouth bass, smallmouth bass, black crappie, bluegill, redear sunfish (also known as shellcracker), and other species of sunfish (also known as bream or brim). Other species mentioned include yellow perch, and other species of black basses, catfishes, and pickerel.

Visitors were asked if they spent any time on the water when at the Stevens Creek Project. Nearly all visitors (92 percent) at both recreation sites indicated they did spent time on the water. Visitors were also asked if they recreated on or near any of the islands in the Stevens Creek reservoir. Most visitors indicated they did not recreate on an island (84 percent), although some did (16 percent). Island recreation was most common when the island was accessed via Betty's Branch. Nineteen percent of visitors at Betty's Branch recreated on or near an island versus 8 percent at Stevens Creek recreation site. Common activities visitors participated in while on or near islands include picnicking, sightseeing, swimming, walking/hiking, sunbathing, nature study/wildlife viewing/photography, and bank fishing.

4.5.3 Recreation User Perceptions

Visitors to the Stevens Creek Project were asked to rate their perception of the crowdedness at the recreation site they were visiting (Table 4.10). Betty's Branch and Stevens Creek were both rated as being lightly crowded by 50 percent of visitors. Conversely, 5 percent of visitors at Betty's Branch and 18 percent of visitors at Stevens Creek rated the sites as being heavily crowded. The average crowdedness rating at Betty's Branch was 2.0, or light/moderate, and the average crowdedness rating at Stevens Creek was 2.43, or light/moderate to moderate.

Crowdedness Rating	Betty's Branch	Stevens Creek	
	Recreation Site	Recreation Site	
1 – Light	50%	50%	
2 – Light/Moderate	16%	2%	
3 – Moderate	23%	21%	
4 – Moderate/Heavy	6%	9%	
5 – Heavy	5%	18%	

 Table 4.10
 Crowdedness Ratings for Stevens Creek Project Recreation Sites

Visitors to the Stevens Creek Project were asked to rate their perception of the condition of the recreation site they were visiting (Table 4.11). Most visitors rated the condition of Betty's Branch as excellent (64 percent), followed by good (29 percent). Visitors at Stevens Creek recreation site equally rated the site as excellent (36 percent) and good (36 percent). The average condition rating at Betty's Branch was 4.55, or good to excellent, and the average condition rating at Stevens Creek was 4.00, or good.

Condition Rating	Betty's Branch Recreation Site	Stevens Creek Recreation Site
1 – Poor	0%	2%
2 – Poor/Fair	1%	4%
3 – Fair	7%	23%
4 – Good	29%	36%
5 – Excellent	64%	36%

 Table 4.11
 Condition Ratings for the Stevens Creek Project Recreation Sites

4.5.4 Recreation Site Improvements

Visitors were asked if there were any additional facilities or improvements needed at the recreation sites. At Betty's Branch, 67 percent of visitors indicated that no improvements were needed. Of the remaining 33 percent, most indicated improvements were needed to restrooms, the boat launch, the parking lot, the boat dock, and the picnic tables/shelter. At Stevens Creek, 18 percent of visitors indicated that no improvements were needed. The remaining 82 percent indicated that the boat launch, trash cans, and the restroom were most in need of improvements. Other frequently recommended improvements at Stevens Creek include parking lot, fishing pier/dock, picnic tables/shelter, and lighting.

In addition to the improvements listed in the survey, visitors had the opportunity to list any additional improvements they thought were necessary. Respondents indicated 57 areas for improvement (Table 4.12).

No.	Additional Improvements
1	ADA compliant kayak launch
2	air compressor
3	better boat launch for kayaks
4	bigger kayak launch
5	closer bathroom
6	closer parking to the water
7	cut grass
8	fix floating pier
9	grills
10	kayak and canoe launch
11	kayak launch that is not gravel
12	kayak launch with soft bedding
13	Make shoreline have less rocks for kayaks
14	make smaller watercraft launch easier on bare feet
15	Make something to guide you down the ramp
16	more grass
17	more parking
18	more places to stop along water
19	paper towels in the bathroom
20	partner with someone for a food truck here
21	porta potty by the rope swing
22	ramp needs to be extended
23	remove vegetation/weeds/logs in the water

Table 4.12	Additional Improvements Suggested at the Stevens Creek Project
	Recreation Sites

No.	Additional Improvements
24	rinse hose
25	rope needs to be longer
26	soap dispenser in women's bathroom is broken
27	the water is too low, kayak launch
28	there needs to be dredging
29	water fountain
30	bathroom near water
31	build a shoot for kayaks
32	clear trees so that kayaks can launch away from boats
33	dock needs work
34	extend and widen the ramp
35	extend boat ramp
36	extend the boat ramp, trash cans
37	fix the road, more parking
38	improve the boat launch
39	improve the kayak ramp
40	Increase the water flow. They want some grills.
41	it was upstream both ways and they didn't like it
42	Kayak launch
43	Kayak launch, boat dock
44	Keep people off the boat dock
45	Make boat ramp longer, channel buoys to avoid the stumps,
46	make floating pier longer
47	More launching area
48	more non handicapped parking
49	more parking
50	open the bathroom
51	open the bathroom, trash cans
52	paint the parking lot lines darker, put a security camera down here, put a boat dock
53	provide bait and ice
54	raise water levels
55	remove trees that have fallen into the water
56	trim hedges for bank fishing, trash can
57	wider boat ramp, boat launch only for kayaks

Visitors were also asked if they wanted to provide any additional comments on the recreation site they were visiting. All comments received are listed in Table 4.13.

No.	Additional Comments
1	add another boat ramp and extend the existing one. The boat dock needs fixing
2	appreciate you taking care of it
3	bring the water level up sooner in the day
4	continue the public access to the water tables
5	don't change anything
6	if it were possible to find out how low the water is before coming out, he would want that
7	it can get crowded with motorboats and kayaks putting in and taking out in the same place
8	it was great
9	it was really clean
10	keep the water flow down
11	keep the water level higher and reduce the amount of seaweed
12	likes Steven's creek
13	make sure that there are plenty of life jackets
14	needs a kayak launch with rollers and handles
15	paint the parking lot lines
16	people speed through the water on motorboats
17	thanks for having another public park
18	the boat ramp needs to be longer or the water needs to be higher.
19	the kayak launch needs more sand
20	the site needs traffic control
21	the stumps make it difficult to go out on the water
22	there needs to be a shuttle from downtown to the river. Do something similar to the passports
	where you get a stamp at
23	there needs to be access for canoes and kayaks at the dam and here
24	there needs to be more access to the other side of the dam
25	there needs to be more dnr presence and pfd checks
26	there needs to be more information about the current on the website or signs
27	there needs to be more policing on the water to keep people from littering at the sand bar
28	there needs to be more ramps and kayak launches. There needs to be a loop for cars to drive on
	while they wait to load a
29	they like that Outdoor Augusta is here
30	they want a 1pm cut off time for hunting
31	they want have free kayaks
32	they want someone to trim back the trees near the fishing dock
33	this is a camp. There are 17 kids and 5 counselors.

Table 4.13 Additional Comments on Stevens Creek Project Recreation Sites

4.5.5 Fury's Ferry and Chota Drive Recreation Sites

In anticipation of low survey response at Fury's Ferry and Chota Drive recreation sites, questions regarding these sites were incorporated into the surveys administered at Stevens Creek and Betty's Branch. Visitors were asked if they ever recreate at Fury's Ferry or Chota Drive recreation sites. Most that were interviewed at Betty's Branch indicated they never recreate at Fury's Ferry or Chota Drive (93 percent). Those that indicated they did recreate at these sites most often participated in boat fishing (33 percent) and kayaking/canoeing (27 percent) (Table 4.14). More often than those at Betty's Branch, visitors interviewed at Stevens Creek recreation sites. The most common activity noted by these visitors was boat fishing (54 percent) (Table 4.14).

Activity	Respondents interviewed at the Betty's Branch Recreation Site	Respondents interviewed at the Stevens Creek Recreation Site
Boat fishing	33%	54%
Kayaking/canoeing	27%	14%
Motor boating	7%	0%
Bank fishing	7%	14%
Walking/hiking	7%	0%
Hunting	7%	4%
Picnicking	7%	4%
Biking	7%	0%
Sightseeing	0%	7%
Nature study/wildlife viewing/photography	0%	4%
Total	100%	100%

Table 4.14Activities Participated in at Fury's Ferry and Chota Drive RecreationSites as Noted by Betty's Branch and Stevens Creek Recreation SiteVisitors

Visitors that indicated they recreated at Fury's Ferry and/or Chota Drive were asked if they thought any additional facilities or improvements were needed at these sites. Forty-three percent of Fury's Ferry and/or Chota Drive recreators indicated they did want additional facilities or improvements (Table 4.15). The most common suggestions were for a bathroom and increased security.

Table 4.15Suggested Facilities or Improvements for Fury's Ferry and Chota DriveRecreation Sites

Suggested Facility/Improvement	Percent
Improved Security	29%
Bathroom	18%
New Pavement/Improved Access Road	12%
Improve Boat Ramp at Fury's Ferry	6%
Kayak Launch	6%
Lights	6%
More Picnic Tables	6%
Fix Bump in Boat Ramp	6%
Parking	6%
Trash Cans	6%
Total	100%

4.5.6 Boating Access

Visitors were asked if there were any additional recreation facilities or boating access provisions needed at the Stevens Creek Project. Seventy percent of visitors indicated they did not think additional facilities or boating access provisions were needed at the project. The remaining 30 percent identified a variety of additional facilities and boating access provisions (Table 4.16). Several visitors suggested additional access near Sportsman's Corner on Stevens Creek.

Table 4.16Suggested Additional Facilities or Boating Access Provisions at the
Stevens Creek Project

Recommended Facilities/Boating Access	
a dock	4.5%
finish the dam	4.5%
more places just for canoes and kayaks	13.5%
near the dam	9.0%
near sportsman's corner	9.0%
on the Carolina side of Steven's creek	4.5%
near the dam. Somewhere that provides fuel for boats	4.5%
not in the main river	4.5%
on Georgia side near the dam	4.5%
a checkpoint	4.5%
above the bridge by sportsman's corner	4.5%

Recommended Facilities/Boating Access	
between here (Stevens Creek recreation site) and sportsman's corner	4.5%
more piers	9.0%
one at deep step road (Hopewell Baptist church road)	4.5%
something similar outdoor augusta or remote water coolers along the waterway	4.5%
there are too many people here (Betty's Branch)	4.5%
less mud	4.5%
Total	100.0%

Visitors were asked how likely they would be to portage around Stevens Creek dam if it were possible (Table 4.17). At Betty's Branch, 45 percent of visitors indicated they would be very likely to portage around Stevens Creek dam and 23 percent would be very unlikely to portage. At Stevens Creek recreation site, 42 percent of visitors indicated they would be very likely to portage around Stevens Creek dam and 38 percent would be very unlikely to portage. Overall, visitors to the Stevens Creek Project indicated they would be very likely to portage around Stevens Creek dam if possible (44 percent).

Rating	Betty's Branch	Stevens Creek	Total
	Recreation Site	Recreation Site	
1 – Very Unlikely	23%	38%	26%
2 – Somewhat Likely	6%	2%	5%
3 – Likely	10%	11%	11%
4 – Between Likely and Very Likely	16%	7%	14%
5 – Very Likely	45%	42%	44%
Total	100%	100%	100%

 Table 4.17
 Likelihood of Visitors to Portage Around Stevens Creek Dam

4.6 Spot Counts

During spot counts, field staff noted the types of activities they observed at the recreation sites. At Betty's Branch, the most frequently observed activities were canoeing/kayaking and boat fishing, followed by pier fishing and paddleboarding. At Stevens Creek recreation site, the most frequently observed activities were boat fishing and canoeing/kayaking followed by bank fishing. At Fury's Ferry, the only activities observed were boat fishing and canoeing/kayaking. No activities were observed at Chota Drive recreation site.

Field staff also noted the number of vehicles with boat trailers, vehicles with canoe or kayak trailers, and vehicles without trailers in the recreation sites parking areas (Table 4.18). Overall, vehicles without trailers were most common at all sites except Stevens Creek recreation site, where vehicles with boat trailers were most common.

	Sites			
Recreation Site	Vehicles with Boat Trailers	Vehicles with Canoe or Kayak Trailers	Vehicles without Trailers	Total
Betty's Branch	137	93	746	976
Chota Drive	0	0	0	0
Fury's Ferry	2	1	7	10
Riverside Park Parking Lot	0	0	13	13
Stevens Creek	123	14	62	199
Total	262	108	828	1,198

Table 4.18Trailered and Non-Trailered Vehicles at Stevens Creek RecreationSites



5.0 CONCLUSIONS

The objective of this study was to estimate current and future recreational use and identify recreational opportunities and needs at the Stevens Creek Project. This was accomplished by identifying and inventorying existing recreation facilities, identifying patterns of recreation use and user needs and preferences at each site, and estimating future recreational use and needs at the Stevens Creek Project. Study results are summarized in the following sections in the context of the overall study objectives and are intended to facilitate recreation planning and management discussions during relicensing.

5.1 Characterization of Existing Use

The Stevens Creek Project supported 100,213 recreation days between April 2021 and March 2022. The most visited recreation site was Betty's Branch, when combined with use of the Riverside Park parking lot. Stevens Creek recreation site had the highest average capacity during the study season on all three day types. Correspondingly, Stevens Creek recreation site exceeded capacity on non-peak weekends and holidays in May 2021 and approached capacity on non-peak weekends in April and June 2021.

In addition to the Stevens Creek Project recreation sites, the public can access the Stevens Creek reservoir via the two USACE-owned tailrace access areas in the Lake Thurmond tailrace. These sites combined received 62,752 visitors between October 2020 and September 2021. Many of these visitors likely recreated in the Stevens Creek reservoir.

Visitors indicated their primary reason for visiting the Stevens Creek Project was to participate in boat fishing, canoeing, and kayaking. As such, most visitors indicated they spent time on the water. A small portion of visitors recreated on or near the islands in Stevens Creek reservoir. Nearly half of all visitors indicated they would be very likely to portage around Stevens Creek dam if it were possible.

Most visitors viewed the recreation sites as being lightly to moderately crowded. Most visitors rated the condition of the recreation sites as excellent or good. Some visitors suggested additional facilities or improvements at the recreation sites, including restrooms, boat launches, and trash cans.

Few visitors indicated they used the Fury's Ferry and Chota Drive recreation sites. The most frequently reported activity when visitors were at these sites was boat fishing. Visitors suggested increased security and improved access for these recreation sites.

5.2 Characterization of Future Use

As described by Cordell et al. (2004), population growth in surrounding counties is a primary contributing factor to future use of recreation facilities. Zip code data indicates that most visitors to the Stevens Creek Project are local to the area. It is projected that the population of the surrounding counties will increase between 2021 and 2035, resulting in increased use of Stevens Creek Project recreation resources. However, site use density information and user perceptions of crowdedness indicate there is capacity for recreation use to increase at the recreation sites. In addition, the region offers many non-Project recreation opportunities that could offset increased recreation demand.

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APPENDIX A

STEVENS CREEK RECREATION STUDY PLAN AND DATA COLLECTION FORMS

STEVENS CREEK HYDROELECTRIC PROJECT (FERC NO. 2535)

Prepared for:

Dominion Energy South Carolina, Inc. Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina www.KleinschmidtGroup.com

February 2021

STEVENS CREEK HYDROELECTRIC PROJECT (FERC No. 2535)

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February 2021

STEVENS CREEK HYDROELECTRIC PROJECT (FERC No. 2535)

DOMINION ENERGY SOUTH CAROLINA, INC.

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STEVENS CREEK HYDROELECTRIC PROJECT (FERC No. 2535)

DOMINION ENERGY SOUTH CAROLINA, INC.

1.0 INTRODUCTION

Dominion Energy South Carolina, Inc. (DESC) is the licensee of the Stevens Creek Hydroelectric Project (FERC No. 2535) (Project). The Project, which has an installed capacity of 17.28 megawatts (MW), is located in Edgefield and McCormick counties, South Carolina and Columbia County, Georgia, at the confluence of Stevens Creek and the Savannah River. The Project's dam is located approximately one mile upstream of the Augusta Diversion Dam, and approximately 13 miles downstream of the J. Strom Thurmond Dam. The Project occupies approximately 104 acres of federal lands within the Sumter National Forest, with three existing Project recreation sites located on federal land and managed through agreement with the U.S. Forest Service (Forest Service).

2.0 PURPOSE OF THE STUDY

On November 22, 1995, FERC issued a 30-year license which is scheduled to expire on October 31, 2025. DESC intends to file an application for a new license with FERC on or before October 31, 2023. The Project is currently involved in a relicensing process which involves cooperation and collaboration between DESC, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. DESC established a Recreation and Land Management Resource Conservation Group (RCG), with interested stakeholders to address Project issues related to recreation and land management. The RCG determined there was a need for a recreation study at the Project.

DESC is proposing to perform an assessment of existing and future recreational use, opportunities, and needs for the Project. The assessment is designed to provide information pertinent to the current and future availability and adequacy of DESC-owned and managed recreation sites, Forest Service owned and managed recreation sites, and Columbia County, Georgia owned and managed recreation sites at the Project. The overall study plan objective is to identify current and potential recreation opportunities, use, and needs at the Project by addressing the specific goals and objectives listed below. Results from the study will be used to develop a new Recreation Management Plan (RMP) for the Project.

<u>Goal 1</u>: Characterize the existing use of recreation sites at the Project. This will be accomplished by meeting the following objectives:

- i. Identify recreation sites; inventory the services and facilities offered; and assess the general condition of each site (including whether the site provides barrier free access).
- ii. Identify patterns of use at each site (type, volume, and daily patterns of use).
- iii. Assess existing recreation sites located on federal land for consistency with Forest Service Sustainable Recreation Strategy.

<u>Goal 2</u>: Identify future needs relating to public recreation sites at the Project. This will be accomplished by meeting the following objectives:

- i. Identify existing user needs and preferences, including perceptions of crowding at recreation sites.
- ii. Estimate future recreation use of existing recreation sites.
- iii. Identify future needs for new recreation sites and facilities.

3.0 STUDY AREA

Recreation sites at the Project that will be included in this study are listed in Table 3-1 and shown in Figure 3-1.

RECREATION SITE NAME	RECREATION SITE NAME AS LISTED IN 2014 RECREATION PLAN	RECREATION SITE NAME AS LISTED IN 1995 PROJECT LICENSE/EXHIBIT G DRAWINGS	RECREATION SITE OWNER/ MANAGER
Stevens Creek	SC Recreation Site #1	Stevens Creek Recreation Site	DESC
Recreation Site			
Fury's Ferry	SC Recreation Site #2	Fury's Ferry Recreation Site	Forest Service
Recreation Site			
Chota Drive	SC Recreation Site #4	Recreation Site #2	Forest Service
Recreation Site			
Betty's Branch/	SC Recreation Site #5	GA Recreation Site	Columbia
Riverside Park			County, GA

 TABLE 3-1
 EXISTING PROJECT RECREATION SITES AT THE STEVENS CREEK PROJECT¹

Source: SCE&G 2014

¹ The 2014 Recreation Management Plan (RMP) includes an additional recreation site – Stevens Creek Recreation Site #3 (also known as Recreation Site #1 or the Mims Recreation Site). This site is located on Forest Service property and is maintained by the Forest Service. The Forest Service has decided that this recreation site is not in line with their Sustainable Recreation Strategy and will no longer be supported by the Forest Service. The Forest Service has asked that this site be removed from the RMP and therefore not be studied during relicensing.





FIGURE 3-1 STEVENS CREEK PROJECT RECREATION SITES

4.0 STUDY SEASON

Generally, the study season will last for one year, beginning on April 1, 2021 and ending on March 31, 2022. During this time, traffic counters will be deployed at all four recreation sites, collecting continuous data for one full year. Within this general study season, recreation user surveys and spot counts will be collected during the peak recreation season, from April 1, 2021 through Labor Day weekend or September 6, 2021.

5.0 DATA COLLECTION METHODS

A variety of data collection techniques will be used to obtain the information necessary to meet the study objectives and goals listed in Section 2.0. Both primary and secondary data will be collected. Primary data will entail site inventories, spot counts, traffic counter data, and recreation user surveys. Primary data will be collected at each site as shown in Table 5-1.

	DATA COLLECTION METHOD			
RECREATION	SITE	Spot	TRAFFIC	RECREATION
SITE	INVENTORY	COUNT ²	COUNTER	USER
			D ATA	SURVEYS ³
Stevens Creek	*	*	*	*
Recreation Site				·
Fury's Ferry	*	Daviadia	*	Daviadia
Recreation Site		Teriouic		<i>T eriouic</i>
Chota Drive	*	Daviadia	*	Daviadia
Recreation Site		reriouic		rerioaic
Betty's				
Branch/	*	*	*	*
Riverside Park				

 TABLE 5-1
 DATA COLLECTION METHODS AT STEVENS CREEK RECREATION SITES

Secondary data will include U.S. Bureau of Census data, the South Carolina Statewide Comprehensive Outdoor Recreation Plan (SCORP), SC Recreation Participation & Preference Study, US Army Corps of Engineers (USACE) existing recreation data collected at the J. Strom



² Spot counts will be administered at Fury's Ferry and Chota Drive during traffic counter data download events.

³ Recreation user surveys will be administered at Fury's Ferry and Chota Drive if recreation users are present during traffic counter data download events.

Thurmond (Thurmond) Project, and other relevant, readily available literature. Additional input will be solicited from the RCG, Columbia County, and Forest Service. Table 5-2 summarizes the study objectives, information needed to meet these objectives, and sources for information. Sections 5.1 through 5.4 summarize the primary data collection methods.

OBJECTIVES	INFORMATION NEEDED	SOURCE		
Goal 1: Characterize existing recreational use of Project recreation sites				
Goal 1a: Identify formal recreation sites, inventory the services and facilities offered at each, and assess the general condition and ADA compliance of each site Goal 1b: Identify the patterns of use at each site (type, volume, and daily patterns of use)	 Physical inventory of all facilities at each recreation site General assessment of site condition to include maintenance, basic rehabilitation needs, etc. Visitors' assessment of site conditions Identification of activities that occur at each site Barrier free/ADA compliance assessment Utilize vehicle counts as an estimation of people Estimate of # people/vehicle Estimate of # vehicles/site Parking capacity 	 Recreation Site Inventory Recreation User Surveys Traffic Counter Data Spot Count Data Recreation User Surveys - # of people per vehicle and length of visit Recreation Site Inventory - # of parking spaces 		
		Columbia County/Forest Service data, if available		
Goal 1c: Assess existing recreation sites located on federal land for consistency with Forest Service Sustainable Recreation Strategy.	• Results from Goal 1a and Goal 1b for recreation sites located on federal land	 Forest Service input Forest Service Sustainable Recreation Strategy 		

TABLE 5-2 Recreation Use and Needs Study Plan Objectives and Efforts

OBJECTIVES	INFORMATION NEEDED	SOURCE
Goal 2: Identify future recreational needs at the Project		
Goal 2a: Identify existing user needs and preferences, including perceptions of crowding at Project recreation sites	 User preferences and opinions of needs and crowding at sites Condition assessment 	Recreation User SurveysRecreation Site Inventory

OBJECTIVES	INFORMATION NEEDED	SOURCE
Goal 2b: Estimate future recreation use of existing Project recreation sites	 Inventory and use data Population projections for the project area Recreational use trends 	 Results of Goal 1 U.S. Bureau of Census Data SC Division of Research & Statistics (Budget and Control Board) SCORP, SC Recreation Participation & Preference Study, or other readily available literature USACE recreation data from Thurmond Project
Goal 2c: Identify future needs for new recreation sites and/or facilities	 Estimate of future recreation use at the Project Parking capacity at recreation sites vs. existing and projected use density Condition/perception assessment 	 Results of Goal 1a, 1b, 2a, 2b, Columbia County, USFS, and RCG input on future needs

5.1 **RECREATION SITE INVENTORY**

Prior to completion of a recreation site inventory, GPS points and land area of each recreation site will be collected and recorded. Then a recreation site inventory will be completed for each recreation site included in Table 3-1. A site visit will be made to collect data on the type, number, and size of facilities (restrooms, parking areas, boat ramps, picnic shelters and tables, etc.) located at each site. The general condition of all recreation facilities will be noted during the inventory. In addition, any facilities that qualify as barrier free will be identified as such. A copy of the inventory form is provided in Appendix A.

Upon completion of the inventory, all data will be uploaded into an Excel database. The database will be structured so that it can be used in a variety of formats (brochure, maps, web pages, etc.) and can be updated as recreation sites are modified, added, or changed in any way.

5.2 TRAFFIC COUNTS

Traffic counters will be installed at all recreation sites included in Table 3-1 to record the number of vehicles that enter and exit the public recreation areas. Traffic count data will be collected for one year in order to capture use during the various seasons. Counters will be installed by April 1, 2021 and will collect data through March 31, 2022. Traffic counter data will be downloaded from the counter at a minimum of twice per month to ensure the counter is working properly and to minimize the potential for lost data.

5.3 **RECREATION USER SURVEYS**

The preferences and perceptions of people using Project recreation sites weigh heavily into the determination of need for recreation site improvements and/or new recreation sites. Information from recreation site users will be collected through on-site surveys. Surveys will be conducted at recreation sites as shown in Table 5-1. Surveys may be collected at Chota Drive Recreation Site and Fury's Ferry Recreation Site when traffic counter data is downloaded. However, a recreation clerk will not be stationed at these sites.

Surveys will be administered to recreation site users at the close of their recreation day⁴. Data collected will include user demographics, group size, the type of land-based and water-based recreation activities individuals are participating in, length of stay, and perceptions of crowdedness and condition of recreation facilities at the Project. The data collected will be used to identify recreation use patterns and use estimates at the recreation sites. The data will also characterize user perceptions on crowdedness, which will be considered during the future needs analysis. Due to a large Hispanic population in the Project area, surveys will also be available in Spanish, and administered to those recreators that indicate Spanish as their primary language.

The survey will be pre-tested in the field prior to implementation and revisions will be incorporated, as necessary. If any significant revisions to the survey or study protocol are deemed necessary following field pre-testing, the RCG will be notified. A copy of the survey is provided in Appendix B.

Surveys will be administered during the peak recreation season from April 1 through Labor Day weekend, 2021. Each recreation site will be sampled according to a sampling plan that will be prepared in consultation with the RCG. Sampling days will include weekdays, weekends and peak use weekends⁵. The sampling plan will be developed using a stratified random sampling method, with weekends being sampled at a greater rate than weekdays to account for the heavier use that typically occurs on these days. During each sampling day, survey clerks will be on-site for a four-hour shift, collecting as many complete surveys as possible. The shifts will occur randomly throughout the day within the window of 7:00 AM to 8:00 PM. Shift start times will be listed in the sampling plan.

All survey clerks will be trained thoroughly as a means of quality control. Survey clerks will be provided with detailed information on the study schedule, appropriate materials to aid in data collection, and direction on appropriate interviewing techniques and attire. Interviewers will also be provided with an incentive for survey respondents to complete the survey.

⁴ FERC defines a recreation day as a visit by a person to a development for recreational purposes during any portion of a 24-hour period.

⁵ FERC defined peak use weekends as weekends when recreation use is at its peak for the season (typically Memorial Day, Independence Day and Labor Day). All three days in a holiday weekend should be included.

5.4 SPOT COUNTS

Spot counts will be conducted at the recreation sites listed in Table 3-1 once per sampling day, prior to the start of survey collection. Spot counts will document the number of vehicles present at a recreation site at one moment in time. Information recorded during spot counts will include: date, time, and weather; number of vehicles and vehicles with trailer at recreation site; type of activities observed at the site; and state license plate data (Appendix C). Spot count data will be used in parallel with traffic counter data. Spot counts will only be collected at Chota Drive Recreation Site and Fury's Ferry Recreation Site when traffic counter data is downloaded. However, a recreation clerk will not be stationed at these sites.

6.0 ANALYSIS

The following sections provide a description of the approach for estimating existing and future recreational use, recreation site capacity and use density percentages, and future recreation needs.

6.1 CURRENT RECREATION USE ESTIMATES

The reported estimates of recreation will be presented in "recreation days". The FERC defines a recreation day as one visit by a person to a development for purposes of recreation during any 24-hour period. The weekday, weekend, and peak weekend average recreation days will be calculated for each recreation site utilizing the traffic counters and recreation site survey data. The average number of people at each site within the morning and afternoon periods will be estimated within each day type and converted to a daily estimate. Daily estimates for each day type will be expanded to represent the study period and summed for a total estimate for each recreation site.

6.2 FUTURE RECREATION USE ESTIMATES

Estimated projections of future recreation use at the Project will be developed using the average annual increase in population growth over the past 10 years, as reported by the Census Bureau or the State Division of Research and Statistics, for Edgefield and McCormick counties, SC and
Columbia County, GA. The estimates will be augmented with discussion of trends reported in the SCORP (2014) and the SC Recreation Participation & Preference Study (2005). Estimated projections will be provided in 5-year intervals for the anticipated term of the license up to 50 years into the future (through year 2075).

While it is acknowledged that future changes in the supply of recreation resources, either in their quantity, accessibility, and/or quality may influence future demand and use, the demand analysis undertaken for this study does not attempt to predict what these future changes might consist of or how they might specifically affect levels of use at Project facilities. Therefore, the demand analysis results should be viewed as a general guide of potential future recreation pressure developed for planning purposes only.

6.3 **RECREATION SITE CAPACITY**

For purposes of this study, the carrying capacity for a recreation site is defined as the number of vehicles and boat trailers that can be parked at a recreation site at one time, based on the number of available parking spaces associated with each site. For paved parking areas, this will be achieved by counting the number of designated parking spaces available at the recreation site. For gravel parking areas, the number of available parking spaces for each recreation site will be estimated by measuring the area (sq ft) available for parking and estimating the number of vehicles that could be parked at the location, if optimal space were utilized. These estimates will be based on parking capacity standards for vehicle length, width, and available turn around space.

6.4 RECREATION SITE USE DENSITY

The use density of recreation sites will be estimated by comparing the average observed number of vehicles at the sites on sampled weekday, weekend, and peak weekend days with the available parking capacity for each recreation site. The average observed number of vehicles divided by the parking capacity will provide an estimated use density for each site. The average number of vehicles at the site will be determined using spot count and traffic counter data.

6.5 RECREATION NEEDS ASSESSMENT

The need for recreation and site development or modification of existing recreation resources will be assessed based on the inventory, condition assessment results, parking capacity and use density assessment results, user survey results, and Forest Service consultation. The needs assessment will focus on the existing condition and user opinions of recreation sites, the presence of "barrier free" facilities at recreation sites, and the ability of sites to meet current and anticipated future recreation demand. Consideration will also be given to site opportunities and constraints, as well as support facilities such as signage and maintenance. The need for new recreation sites and/or facilities will be determined through assessment of the information collected and the input of stakeholders through the RCG and the Forest Service.

7.0 SCHEDULE

The proposed schedule for completion of the Recreation Use and Needs Study is as follows:

TASK	DATE
Mobilization for field work (includes field clerk hiring, training, etc.)	March 2021
User survey pre-testing	March 2021
Installation of traffic counters	April 1, 2021
Traffic counter data collection	April 1, 2021 – March 31, 2022
User survey collection	April 1 - September 6, 2021
Preliminary data entry, cleaning, and processing	October 2021
Conduct analyses	April-May 2022
Submit draft report	July 2022
Determine if additional data collection is needed	July 20226
Finalize report	August 2022

8.0 **REFERENCES**

- Federal Energy Regulatory Commission (FERC). 2018. 18 CFR Parts 8 and 141: Elimination of Form 80 and Revision of Regulations on Recreational Opportunities and Development at Licensed Hydropower Projects. Issued December 20, 2018.
- South Carolina Electric & Gas Company (SCE&G). 2014. Revised Recreation Plan: Stevens Creek Hydroelectric Project, FERC Project No. 2535. January 2014.

⁶ If additional data collection is required, data collection methods, results and analyses will be developed and assessed in cooperation with the RCG and will be provided in an addendum to the report.

APPENDIX A

SITE INVENTORY FORM

DOMINION ENERGY SOUTH CAROLINA, INC.

RECREATION STUDY

STEVENS CREEK HYDROELECTRIC PROJECT

(FERC NO. 2535)

Recreation Site Inventory Form

Inspector:			
Date:			
Site Name:			
Site Address:			
City:	State:	Zip Code:	

Road Access:

	Paved	Unpaved/Gravel
Road Access		

Parking:

	Paved	Unpaved/Gravel
Vehicle Spaces		
Vehicle with Trailer Spaces		
ADA/Barrier Free Spaces		

Restrooms:

	Flush Toilets	Vault Toilets	Portable Toilets	ADA/Barrier Free
Women				
Men				
Unisex				

Boat Launches (# of lanes):

	Hard Surface (concrete/paved)	Gravel	Informal
Trailer Launch			
Carry-In			

Docks:

	# of Docks	ADA/Barrier Free
Courtesy Dock		
Fishing Dock/Pier		

Camping:

	# of Sites	ADA/Barrier Free
RV Sites		
Cabins		
Tent Sites		
Primitive Sites		

Operations (circle the one that applies):

Manning	Manned	Unmanned
Availability	Seasonal	Year Round
Fees	Yes	No

Amenities:

	Yes	No	Additional Information
Marina			
Whitewater Boating			
Portage			
Tailwater Fishing			
Reservoir Fishing			
Swim Area			
Trails			
Active Recreation Area			
Picnic Area			
Overlook/Vista			

	Yes	No	Additional Information
Interpretive Display			
(Signage/Kiosk/Billboard)			
Hunting Area			
Trash Cans			
Other			

APPENDIX B

RECREATION USER SURVEY

Recreation User Survey Stevens Creek Hydroelectric Project (FERC No. 2535)

Clerk:	Site:	Date:	Time:	am/pm
Weather: 🛛 Sunny	□ Partly Cloudy	□ Cloudy	Light Rain	🛛 Heavy Rain
RESPONDENT GENDER:	🗆 Male 🛛 Female	RESPONDEN	REFUSED INTERVI	EW : 🗆
NUMBER OF PEOPLE IN			T DOES NOT SPEAK	
		RESPONDEN ENGLISH):	I'S PRIMARY LANGU	JAGE (IF NOT
VEHICLE HAS A BOAT TRAILER: RESPONDENT IS NOT 18 YEARS OR OLDER:				
RESPONDENT HAS BEEN	I INTERVIEWED AT THIS	SITE PREVIOUS	LY: 🗆	

THE FIRST FEW QUESTIONS ASK ABOUT YOUR EXPERIENCE HERE TODAY

1. Including yourself, how many people are in your party today? (Fill in blank.)

_____ people in party

2. What time did you arrive at this recreation site today? (Fill in blank.)

_____ am / pm

3. Have you visited Stevens Creek Reservoir more, less or about the same over the last year? (Circle one)

MORE ABOUT THE SAME LESS

4. What is the primary recreation activity that you participated in today at this recreation site? (*Please read the list to respondents. Check only one main activity in the first column.*)

What other activities did you participate in today at this recreation site? (Check all that apply in the second column.)

Check only one main	Check all other	
activity	activities	Types of Activities
		FISHING:
		boat fishing
		pier/dock fishing
		bank fishing
		bow fishing/spear fishing
		BOATING:
		motor boating
		pontoon/party boating
		canoeing/kayaking
		paddle-boarding
		Jet-skiing
		OTHER:

Check only	Check all	
<u>one</u> main	other	
activity	activities	Types of Activities
		bicycling
		diving/SCUBA
		tent or vehicle camping
		horseback riding
		walking/hiking/backpacking
		sightseeing
		hunting
		nature study/wildlife viewing/photography
		swimming
		picnicking
		sunbathing
		other:
		None

5. If you are hunting or fishing today, what is/are your target species? (List all that are stated.)

6. Did you spend any time on the water today? (Check one box.)

- ☐ YES☐ NO (If no, skip to Question 8.)
- 7A. Did you recreate on or near any of the islands today?
 - □ YES
 □ NO (If no, skip to Question 8.)
- 7B. What activities did you participate in *while on/near the island(s)*? (Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)

□ sunbathing	bank fishing		hunting
□ camping	walking/hiking		sightseeing
nature study/wildlife viewing/photography	swimming		picnicking
□ other (please specify:		_	
)	

8. On a scale from 1 to 5, with 1 being light, 3 being moderate, and 5 being heavy, how would you rate the crowdedness *at this recreation site* today? (*Circle one number.*)



9A. On a scale from 1 to 5, with 1 being poor and 5 being excellent, how would you rate the overall condition *of this recreation site* today? (*Circle one number.*)

Po	or			Exce	llent
1	2	3	4	5	

- 9B. Are there any additional facilities/improvements needed **at this recreation site**? (Check one box.)
 - □ YES□ NO (If no, skip to Question 9.)
- 9C. What do you recommend? (Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)

access road		bank fishing area		boat dock
boat launch		camping area		fish cleaning station
fishing pier/dock		lighting		parking lot
picnic tables/shelter		restrooms		signs & information
swimming area		trails		trash cans
RV camping		tent camping	□ infor	bilingual signs & mation
other (please specify:			\ \	
 	· · · · · · ·		.)	

- 9D. Are there any other improvements that you would recommend for this site?
 - □ YES □ NO
 - NO (If no, skip to Question 10.)
- 9E. What improvements do you recommend? (Fill in the blank.)

- 10A. Do you ever recreate **at Fury's Ferry or Chota Drive** recreation sites? (*Check one box.*)
 - □ YES
 □ NO (If no, skip to Question 11.)

10B. What activities have you participated in *while at Fury's Ferry or Chota Drive*? (Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)

□ sunbathing	bank fishing		hunting
□ camping	walking/hiking		sightseeing
nature study/wildlife viewing/photography	swimming		picnicking
□ motor-boating	kayaking/canoeing		boat fishing
□ other (please specify:)	
	 •)	

- 10C. Are there any additional facilities/improvements needed *at Fury's Ferry and/or Chota Drive*? (*Check one box.*)
 - □ YES
 □ NO (If no, skip to Question 11.)
- 10D. What improvements do you recommend **at Fury's Ferry and/or Chota Drive**? (Fill in the blank.)

- 11. Are there any additional **recreation facilities and/or boating access provisions** needed at the Stevens Creek Project?
- 12. On a scale from 1 to 5, with 1 being very unlikely and 5 being very likely, how likely would you be to portage Stevens Creek Dam, if it were possible?

Very	y Unlikely	/		Ver	y Likely
1	2	3	4	5	

13. What other lakes do you recreate at? (Fill in blank.)

14. What is your zip code?

15. In what year were you born?

16. Do you have any additional comments about this recreation site, including comments on existing or needed recreation facilities? (*Please fill in blank and be as specific as possible*.)

THANK YOU FOR YOUR HELP! WE APPRECIATE YOUR TIME TODAY!

APPENDIX C

SPOT COUNT FORM

Spot Count Form Dominion Energy South Carolina, Inc. Stevens Creek Hydroelectric Project							
MONITOR:			DATE: / / Date (month) (day) (year)			Day Type: 1 weekday 2 weekend 3 holiday	
WEATHER AT START1. SUNNY(PLEASE CIRCLE AS2. PARTLY SUNNYMANY DESCRIPTORS3. CLOUDYAS APPLY)4. LIGHT SHOWERS5. HEAVY RAIN6. WINDY							
SPOT COUNT							
RECREATION SITE	TIME		TOTAL VEHICLES W/O TRAILERS	TOTAL VEHIC TRAILERS	LES W BOAT	TOTAL VEHICLES W KAYAK/CANOE TRAILERS	
		AM/PM					
			-				
Types of Activities		Check all	STATE LICENS	SE PLATES	# F	# FROM EACH STATE	
FISHING			South Carolina				
Boat Fishing			Georgia				
Pier/dock Fishing			North Carolina				
Bank Fishing			Other:				
BOATING							
Motor Boating							
Pontoon/party Boating							
Sailing							
Canoeing/Kayaking							
Windsurfing							
Paddle-boarding							
OTHER							
Bicycling							
Tent or Vehicle Campin	ng						
Walking/Hiking/Backpa	acking						
Sightseeing							
Hunting							
Nature Study/Wildlife							
Swimming							
Picnicking							
Sunbathing							
Other:							
TOTAL:							

APPENDIX B

STAKEHOLDER CONSULTATION RECORD

(CONSULTATION WILL BE ADDED SUBSEQUENT TO STAKEHOLDER REVIEW)