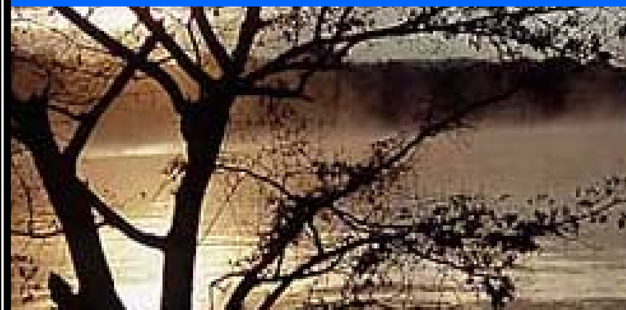
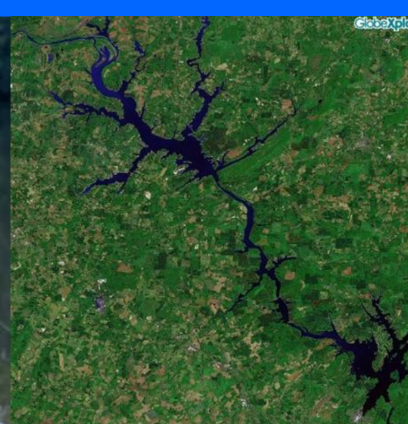



YADKIN HYDROELECTRIC PROJECT
FERC NO. 2197

APPLICATION FOR LICENSE
VOLUME I

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT – EXISTING DAM


ALCOA

ALCOA POWER GENERATING INC.
APRIL 2006

YADKIN HYDROELECTRIC PROJECT
FERC NO. 2197

APPLICATION FOR LICENSE

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Acronyms

ACHP	Advisory Council on Historic Preservation
ADA	Americans with Disabilities Act
AIWW	Atlantic Intracoastal Waterway
Alcoa	Alcoa Inc.
APGI	Alcoa Power Generating Inc. (Licensee)
BAOT	Boats at One Time
BEMP	Bald Eagle Management Plan
BMP	Best Management Practices
BOD	Biological Oxygen Demand
CCB	Center for Conservation Biology
CE IAG	County Economic Impacts Issue Advisory Group
CEII	Critical Energy Infrastructure Information
cfs	Cubic Feet per Second
CIN	Catawba Indian Nation
CPOHRL	Concerned Property Owners of High Rock Lake
CPUE	Catch per Unit Effort
CR IAG	Cultural Resources Issue Advisory Group
CWA	Clean Water Act
DLA	Yadkin Project (FERC No. 2197) Draft License Application
DO	Dissolved Oxygen
EAP	Emergency Action Plan
EBCI	Eastern Band of Cherokee Indians
EPRI	Electric Power Research Institute
F&A IAG	Fish and Aquatics Issue Advisory Group
FERC	Federal Energy Regulatory Commission
FLA	Final License Application
FPA	Federal Power Act
FPC	Federal Power Commission
ft	Feet
GIS	Geographic Information System
HPMEP	Hydro Project Maintenance and Emergency Protocol
HPMP	Historic Properties Management Plan
HRLA	High Rock Lake Association
HWB	Headwater Benefits
IAG	Issue Advisory Group
ICD	Initial Consultation Document
IFIM	Instream Flow Incremental Methodology
IEPP	Invasive Exotic Plant Pests
IMPLAN	U.S. Forest Service's IMpact Analysis for PLANning Model
KOPs	Key Observation Points
kV	Kilovolt
kW	Kilowatt
Legacy	Legacy Research Associates Inc.
Licensee	Alcoa Power Generating Inc. (APGI)

LIP	Low Inflow Protocol
LWCF	Land and Water Conservation Fund
MGD	Million Gallons per Day
MPDF	Multiple Property Documentation Form
MW	Megawatt
MWh	Megawatt Hour
NAI	Normandeau Associates, Inc.
NAICS	North American Industry Classification System
NCDCR	North Carolina Department of Cultural Resources
NCDENR	North Carolina Department of Environment and Natural Resources
NCDNRCD	North Carolina Department of Natural Resources and Community Development
NCDOT	North Carolina Department of Transportation
NCDWQ	North Carolina Division of Water Quality
NCDWR	North Carolina Division of Water Resources
NCSCORP	North Carolina Statewide Comprehensive Outdoor Recreation Plan
NCSHPO	North Carolina State Historic Preservation Office
NCSM	North Carolina State Museum
NCWRC	North Carolina Wildlife Resources Commission
NCWRP	North Carolina Wetlands Restoration Program
NERC	North American Electric Reliability Council
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places (National Register)
O&M	Operation and Maintenance
OM IAG	Operations Model Issue Advisory Group
PCC	Physical Carrying Capacity
PDRC	Pee Dee River Coalition
PE	Progress Energy
PFA	Public Fishing Access
PHABSIM	Physical Habitat Simulation Model
PIF	Partners in Flight Program
PME	Protection, Mitigation and Enhancement
PMF	Probable Maximum Flood
POR	Period of Record
Project (also Yadkin Project)	Yadkin Hydroelectric Project (FERC No. 2197)
PSD	Proportional Stock Density
QAPP	Quality Assurance Project Plan
RASM IAG	Recreation, Aesthetics, and Shoreline Management Issue Advisory Group
RSD-P	Relative Stock Density
RTE	Rare, Threatened and Endangered

SCADA	Supervisory Control and Data Acquisition
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SERC	Southeastern Electric Reliability Council
SHPO	State Historic Preservation Office
SHRLO	SaveHighRockLake.org
SMP	Shoreline Management Plan
TFHDPA	Trading Ford Historic District Preservation Association
THPO	Tribal Historic Preservation Office
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
UNF	Uwharrie National Forest
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UT	Unnamed Tributary
VQO	Visual Quality Objectives
WQ IAG	Water Quality Issue Advisory Group
WS	Water Supply Classification
WTP	Water Treatment Plant
WUA	Weighted Useable Area
WWB IAG	Wetlands, Wildlife, and Botanical Issue Advisory Group
WWTP	Wastewater Treatment Plant
Yadkin	Alcoa Power Generating Inc., Yadkin Division
Yadkin Project (also Project)	Yadkin Hydroelectric Project (FERC No. 2197)
YOY	Young-of-the-Year

Executive Summary

Executive Summary

Alcoa Power Generating Inc. (APGI) is the current licensee for the four-development Yadkin Hydroelectric Project (Yadkin Project, or Project), which is licensed with the Federal Energy Regulatory Commission (FERC) as Project No. 2197. The Yadkin Project is located in central North Carolina on the Yadkin-Pee Dee River. The Yadkin Project plays a central role in the ability of APGI to generate economical, flexible, and environmentally sound energy. Since 1917, APGI and its parent company, Alcoa Inc., have operated hydropower generation in the Yadkin River basin, which is part of the larger Yadkin-Pee Dee River basin. Project operations have been in full compliance with the requirements of the federal license issued in 1958. Relicensing provides the opportunity to evaluate the existing Project and its operations to ensure that continued existence and operation of the Project for a new license term will be best adapted to a comprehensive plan for the Yadkin-Pee Dee River as required by Section 10(a)(1) of the Federal Power Act. This Executive Summary provides a framework for understanding the proposals being put forward for the continued operation of the Yadkin Project. APGI believes that its successful operating compliance record and its continuing and proposed investments in the Project merit a new 50-year license.

The volumes that follow contain APGI's application for a new 50-year license for the Project. Central to the application are APGI's proposals for the continued operation of the Project, including numerous proposals for protection, mitigation and enhancement (PME) of Project resources. Many of the resource issues raised during the relicensing process by resource agencies and other participants were unresolved at the time this application was prepared. However, beginning in 2004, APGI initiated discussion with resource agencies, tribes, and other relicensing participants about the possibility of reaching a settlement agreement for the Project. These settlement negotiations are still underway, and APGI remains optimistic that many of the outstanding resource issues will be resolved through the development of comprehensive settlement agreement for the Yadkin Project.

Key Principles

Throughout the relicensing consultation process and the development of this License Application, APGI has been guided by certain key principles that reflect APGI's relicensing philosophy and are the basis for the proposals put forth in this application:

- Current resource conditions at the Project are the appropriate standard to utilize as the baseline from which to evaluate potential changes in Project operations and resource enhancement measures, consistent with FERC policy and practice.

- Existing hydroelectric storage and generating capacity is a clean, reliable and renewable source of energy that produces no air emissions or waste streams and directly offsets the use of non-renewable fossil fuels.

- Not all resources provided by the Project can be simultaneously optimized. Therefore, all interested parties must recognize the need to consider appropriate and balanced trade-offs among resources.

- A project must be evaluated in the context within which it exists and operates. The Yadkin Project contains the first storage reservoir in the watershed, and the Project is located just upstream of Progress Energy's two development Yadkin-Pee Dee River Project (FERC No. 2206). The hydrologic connection between these two projects and how each contributes to effects on resources in the river basin must be accounted for in the relicensing evaluation.

- Effective consultation involves continuous efforts to identify, involve and communicate with resource agencies, Indian tribes, municipalities, non-governmental organizations (NGOs) and the public interested in the relicensing of the Project.

- Identification of relevant resource issues and the design of resource studies and evaluations must involve known, interested parties.

- Resource studies executed in an open and cooperative manner, including utilization of key resource agency and technical experts in study planning, implementation and review, provide highly credible resource information.

- Sound science, directed at addressing issues raised during the consultation and study phases of the relicensing, provides a strong foundation for APGI's proposals for the continued operation of the Yadkin Project.

- APGI's proposals for the continued operation of the Yadkin Project include both operational and non-operational resource enhancement measures that APGI can implement alone, and those that should be implemented in cooperation with resource agencies, within a broader basin-wide context.

APGI has tried to consistently apply these principles throughout the relicensing process and believes that these principles are clearly reflected in its proposal for the continued operation of the Yadkin Project.

Yadkin Project Consultation Summary

APGI chose to comply with FERC's requirements for consultation by using a communications-enhanced version of the traditional three-stage consultation process. This process was initiated in 2002, with the preparation and issuance of an Initial Consultation Document (ICD). In conjunction with the ICD, Yadkin held a series of public meetings to introduce the public to the relicensing process, to review the ICD, and to gain additional input on relevant resource issues to be addressed during the relicensing. Since that time, APGI has carried out its relicensing consultation with resource agencies, tribes and other interested stakeholders through the formation of Issue Advisory Groups (IAGs).

Based on input provided by the agencies and other relicensing participants, a total of seven issue advisory groups were formed:

- Water Quality (WQ IAG)
- Fish and Aquatics (F&A IAG)

- Wetlands, Wildlife and Botanical (WWB IAG)
- Recreation, Aesthetics, and Shoreline Management (RASM IAG)
- Cultural Resources (CR IAG)
- County Economic Impacts (CE IAG)
- Operations Model (OM IAG)

The role of the IAGs was to identify resource issues to be addressed in the relicensing and to determine the information and studies needed to address the issues. Accordingly, the IAGs assisted APGI in identifying issues to be addressed and studied, preparing draft and final study plans, and reviewing and commenting on draft study reports. The IAGs met throughout the consultation and study phases of the relicensing process on an as needed basis. A summary of the meetings held by each of the IAGs is provided in Table ES-1.

Table ES-1: Summary of Issue Advisory Group Meetings and Other Consultation Meetings Held Throughout the Yadkin Project Relicensing Process

Date	Meeting
General Meetings	
November 6-7 and 13, 2002	Yadkin Project Public Meetings
February 28, 2003	Yadkin Project Issue Advisory Group Organizational Meeting
July 29-31, 2003	Yadkin Project Public Meetings
May 4, 2004	Yadkin Project Issue Advisory Groups
June 29-30 and July 1, 2004	Yadkin Project Public Meetings
County Economic Impacts IAG Meetings	
March 14, 2003	County Economic Impacts IAG Meeting
November 5, 2003	County Economic Impacts IAG Meeting
February 4, 2004	County Economic Impacts IAG Meeting
June 30, 2005	Joint RASM IAG and County Economic Impacts IAG Meeting
Cultural Resources IAG Meetings	
August 27, 2003	CR IAG Meeting
November 5, 2003	CR IAG Meeting
October 6, 2004	CR IAG Meeting
Fish & Aquatics IAG Meetings	
March 12, 2003	F&A IAG Meeting
April 9, 2003	F&A IAG Meeting
October 7, 2003	Joint Water Quality IAG and F&A IAG Meeting
February 3, 2004	Joint Water Quality IAG and F&A IAG Meeting
May 4, 2004	F&A IAG Meeting
April 5, 2005	F&A IAG Meeting
Operations Model IAG Meetings	
March 14, 2003	Operations Model IAG Meeting
July 7, 2003	Operations Model Informational Meeting
September 4, 2003	Operations Model Informational Meeting
November 6, 2003	Operations Model Informational Meeting
November 4, 2004	Operations Model IAG Meeting
Recreation, Aesthetics, and Shoreline Management IAG Meetings	
March 13, 2003	RASM IAG Meeting
April 10, 2003	RASM IAG Meeting
July 9, 2003	RASM IAG Meeting
October 8, 2003	RASM IAG Meeting
February 4, 2004	RASM IAG Meeting
May 5, 2004	RASM IAG Meeting
November 3, 2004	RASM IAG Meeting
February 2, 2005	RASM IAG Meeting
May 3, 2005	RASM IAG Meeting
June 30, 2005	Joint RASM IAG and County Economic Impacts IAG Meeting

Table ES-1: Summary of Issue Advisory Group Meetings and Other Consultation Meetings Held Throughout the Yadkin Project Relicensing Process (continued)

Date	Meeting
Water Quality IAG Meetings	
March 13, 2003	Water Quality IAG Meeting
May 20, 2003	Water Quality IAG Meeting
October 7, 2003	Joint Water Quality IAG and F&A IAG Meeting
February 3, 2004	Joint Water Quality IAG and F&A IAG Meeting
May 4, 2004	Water Quality IAG Meeting
April 6, 2005	Water Quality IAG Meeting
Wetlands, Wildlife and Botanical IAG Meetings	
March 13, 2003	WWB IAG Meeting
April 25, 2003	WWB IAG Meeting
October 8, 2003	WWB IAG Meeting
February 3, 2004	WWB IAG Meeting
March 2, 2005	WWB IAG Meeting

Comments on the Draft License Application

APGI prepared and distributed a Draft License Application (DLA) for the Yadkin Project in October 2005. In response to the DLA, APGI received written comments from resource agencies and other relicensing participants. The comments received on the DLA, along with APGI's response to the comments, are summarized in a table provided at the conclusion of this Executive Summary (Table ES-3). If a comment resulted in a change to the License Application, that too is noted in the table.

As the written comments received from resource agencies on the DLA indicated that there were some areas of "substantive disagreement," in accordance with 18 CFR § 4.38(c)(6)(i)), APGI held a Substantive Disagreement Meeting with resource agencies on February 7, 2006. Other relicensing participants and IAG members were invited to attend the meeting.

At that meeting, APGI reviewed with agencies and other stakeholders the areas of substantive disagreement. No disagreements were resolved at the meeting, but APGI, the resource agencies and other participants agreed to continue to discuss the areas of disagreement in the context of ongoing settlement discussions.

APGI's Proposals for the Continued Operation of the Yadkin Project

The License Application describes APGI's proposals for the continued operation of the Project including both operational and non-operational measures aimed at protecting, mitigating effects on, and enhancing Project resources and resource values. These proposed measures, which will cost a total of approximately $130,522,000 in capital investment (2005 dollars) and $1,467,000 in new annual costs[1], will significantly enhance Project resources and the surrounding environment. The proposals include changes to the operation of the Project, particularly the

[1] The totals for both capital and annual costs reported are long-term 30-year average costs, with no escalation.

High Rock Development. These operational changes will place new constraints on Project operations while still maintaining the fundamental value of the Project to APGI.

APGI's proposals represent the results of thorough scientific examination of Project resources and uses, the impacts of the Project and its operation on those resources, and measures that can be taken to mitigate Project impacts, or otherwise protect or enhance affected resources. A summary of APGI's proposals for the continued operation of the Project is provided in Table ES-2. Associated capital and operating costs and effects on Project generation are addressed in detail in Exhibits B, D, E and H.

Table ES-2: APGI's Proposals for the Continued Operation of the Yadkin Project

Resource Area	New Measures Proposed	Estimated Annual Cost	Estimated One-Time Cost
Unit Refurbishment *Exhibit B.2*	Refurbish/upgrade generation units at the four Project developments in accordance with proposed schedule.		$127,450,000
Reservoir Operations *Exhibit B.2.1.2*	Operate High Rock in accordance with a revised guide curve that maintains the reservoir within 6 ft of full pool 4/1-10/31 (with a "soft" Recreation Season Guide Curve) and within 12 ft of full 11/1-3/31, except as needed to meet minimum flow requirements, Low Inflow Protocol (LIP) or Hydro Project Maintenance and Emergency Protocol (HPMEP). Operate Narrows within 3.0 ft of full year round with the ability to go to 6.6 ft as needed to meet minimum flow requirements, LIP or HPMEP. Operate Tuckertown and Falls within 3.0 ft and 4.0 ft, respectively.	$440,000 (in conjunction with minimum flow)	
Minimum Flows *Exhibit B &* *Exhibit E.2.4*	Operate the Project so as to provide a weekly average minimum flow from the Falls Development of 900 cubic feet per second (cfs), year round.		
Low Inflow Protocol *Exhibit B*	Develop a LIP and operate the Project in accordance with the LIP.	Presently Unknown	
Flow Monitoring Plan *Exhibit B*	Develop and implement a Flow Monitoring Plan for the Project.	$50,000	$20,000
Dissolved Oxygen Enhancement *Exhibit E.2.7-2.8*	In conjunction with refurbishment/upgrade of generating units, install aeration technology at High Rock (aerating turbines) and Narrows (draft tube valves) to improve tailwater dissolved oxygen (DO) conditions. Operate units with aeration technology at Narrows and High Rock as needed during the period 5/1-11/30 each year.	$330,000	$2,550,000

Table ES-2: APGI's Proposals for the Continued Operation of the Yadkin Project (continued)

Resource Area	New Measures Proposed	Estimated Annual Cost	Estimated One-Time Cost
Dissolved Oxygen Monitoring *Exhibit E.2.7-2.8*	Prepare a Dissolved Oxygen Monitoring Plan that will include provisions to: • Operate four continuous DO/temperature monitors, one in each of the Project tailwaters. • Report DO data annually to the North Carolina Division of Water Quality (NCDWQ). • Conduct two 2-year studies of DO conditions below Falls and Tuckertown dams.	\$150,000	\$50,000
High Rock Water Quality *Exhibit E.2.8 & E.2.10*	Participate in NCDWQ High Rock Total Maximum Daily Load (TMDL) Process.	\$20,000	
Recreation Plan *Exhibit E.5.11*	Prepare a Recreation Plan for the Project and submit to FERC.		\$50,000
Recreation Facility Enhancements *Exhibit E.5.11 & E.5.14*	Undertake certain measures to enhance public recreation at the Project (to be outlined in the Recreation Plan) • Donation of land to Rowan County suitable for a new public recreation site with a swim beach. (\$10,000) • Americans with Disabilities Act (ADA) improvements at public recreation sites (\$90,000) • Addition of ADA compliant fishing piers to existing sites on High Rock and Tuckertown reservoirs (\$50,000) • Improvements to tailrace fishing access at High Rock and Tuckertown (\$235,000) • Addition of up to 10 hardened, dispersed camp sites (\$12,000) • Replacement of the Highway 49 Boat Access Area (when needed) (\$125,000) • Addition of portable toilets at several existing recreation areas (\$10,000 annually) • Additional operation and maintenance (O&M) associated with proposed new facilities/upgrades (\$40,000 annually) • Closure of the Rowan County Pump Station (for safety reasons), at the request of City of Salisbury	\$50,000	\$522,000
Shoreline Management *Exhibit E.6.8*	Revise/update the Yadkin Shoreline Management Plan (SMP).		\$100,000
Historic Properties Management Plan *Exhibit E.4.3*	Prepare and implement a Historic Properties Management Plan (HPMP) for the Project.		\$50,000

Table ES-2: APGI's Proposals for the Continued Operation of the Yadkin Project (continued)

Resource Area	New Measures Proposed	Estimated Annual Cost	Estimated One-Time Cost
Rare Species *Exhibit E.3.10 & E.3.6.2.2*	Prepare a Rare, Threatened and Endangered (RTE) Species Management Plan including provisions for certain RTE enhancement measures.	$12,000	$50,000
Transmission Line Management *Exhibit E.3.10 & E.3.6.1*	Prepare and implement a Transmission Line Corridor Management Plan for the Project transmission lines.	$10,000	$20,000
Mussel Monitoring *Exhibit E.3.10 & E.3.6.2.2*	Cooperative effort with the North Carolina Wildlife Resources Commission (NCWRC) to periodically monitor tailwater mussel populations ($50,000 every 5 years)	$10,000	
Invasive Exotics *Exhibit E.3.10 & E.3.6.2.2*	Work cooperatively with the North Carolina Division of Water Resources (NCDWR) and NCWRC to monitor and manage invasive, exotic aquatic species at the Project.	$25,000	
Diadromous Fish Passage *Exhibit E.3.10 & E.3.6.2.2*	In consultation with fishery agencies, develop and implement a cooperative Diadromous Fish Passage Plan for the Project.	$25,000	$50,000
New License Compliance	Additional APGI administrative costs associated with new compliance requirements.	$200,000	
	Continued Measures Proposed		
Shoreline Buffer *Exhibit E.6.8*	Continue to manage the reservoir shorelines through the policies and procedures in the SMP, including continued management of a 100-foot buffer		
Recreation Facility Maintenance *Exhibit E.5*	Continue to operate and maintain public recreation facilities and access areas located throughout the Project on all four Project reservoirs.		
Recreation Safety *Exhibit E.5.12*	Continue APGI's safety patrol assistance to the counties		
Reservoir Fish Spawning *Exhibit E.3.10 & E.3.6.1*	Continue voluntary operation of reservoirs during the fish spawning season (April 15-May 15) to try to maintain water levels within ± 1 foot of the elevation of the reservoir on April 15.		
Reservoir Fish Habitat *Exhibit E.3.10 & E.3.6.1*	Continue cooperative work with agencies and others to improve habitat at the Project (cut and cable trees, plant buttonbush, etc.)		

Hydropower Resource Preservation and Enhancement

APGI's proposal to refurbish generating units at the Yadkin Project will both extend the life of the generating units and increase unit efficiency. Under the proposed schedule, two units will be refurbished during the remaining term of the current license, with the remaining eleven units proposed to be refurbished during the first twelve (2009-2020) years of the new license term. In total, APGI estimates that it will invest approximately $130,000,000 (2005 dollars) during the new license term in long-term operating reliability and efficiency improvements to the Project. The energy provided by the Yadkin Project is very valuable. As compared to the next available alternative, the Project will continue to provide approximately $13,822,509 (2005 dollars) in value annually, as discussed in Exhibit D.

Continued Cooperation with Resource Agencies

APGI has a long history of working cooperatively with resource agencies. Examples include cooperating with North Carolina Wildlife Resources Commission (NCWRC) on the management of public recreation areas, voluntary stabilization of reservoir water levels during the spring spawning season as recommended by NCWRC, and cooperation on a lap-tree cut and cable program. APGI has also enjoyed long-term cooperation with the State of North Carolina on managing both Project and non-Project lands as gamelands that are available for public recreation use.

With the proposals put forth in this License Application, APGI anticipates a continuation of the excellent working relationship between APGI and the resource agencies. APGI is proposing the development of a number of resource management plans including a Flow Monitoring Plan, Recreation Plan, RTE Species Management Plan, Transmission Line Corridor Management Plan, Historic Properties Management Plan, and a revised Shoreline Management Plan that would involve APGI working in close consultation with the resource agencies on the contents and requirements of those plans. In addition, APGI expects to continue its ongoing and voluntary cooperative resource enhancement programs.

License Term

APGI requests that FERC issue a new 50-year license for the Yadkin Project. During the next license term, APGI proposes to continue to refurbish and upgrade the generating units at the Project to make better use of the available water. In conjunction with the unit refurbishments, APGI is also proposing a substantial investment in new aeration technology at the High Rock and Narrows developments which, when fully operational, is anticipated to allow the discharges from the four developments of the Project to meet state water quality standards for dissolved oxygen. These refurbishments and upgrades, including the addition of aeration technology, costing an estimated $130,000,000 (2005 dollars), will increase the efficiency of the units producing more kilowatt-hours with the same amount of water, although the increased efficiency will be somewhat offset when the installed aeration technology is operating.

APGI is also proposing an extensive package of operational and non-operational measures to further enhance Project resources. In total, APGI's resource enhancement proposal (including unit refurbishments and upgrades at all four Project developments and the installation of aeration technology at High Rock and Narrows) will require approximately $130,522,000 of capital investment (2005 dollars) early in the new license term, and $1,467,000 annually in foregone energy production and value and increased operation and maintenance costs.

The result of the proposed measures will be to significantly reduce the Project's impact on the environment. These proposals have been made with the intent of addressing known Project effects while minimizing any unnecessary reduction in hydropower generation. In total, the commitment of new resources to the Project combined with APGI's excellent operation and compliance record for the Yadkin Project fully merits the granting of a new 50-year license.

Settlement Negotiations

Beginning in 2004, APGI engaged resource agencies, tribes, municipalities and other interested parties in discussions and negotiations aimed at the development of a comprehensive relicensing settlement agreement for the Yadkin Project. While significant progress has been made, these negotiations remain ongoing as this final License Application is filed in April 2006. APGI is hopeful that agreement can be reached on numerous significant issues with many, if not all, interested parties. If negotiations prove successful, it is APGI's intent to file with FERC an Agreement in Principle, followed by a Relicensing Settlement Agreement, for the Yadkin Project within the next six months. APGI will keep FERC apprised of further developments with regard to these negotiations.

Table ES-3: Summary of Comments Received from Resource Agencies, Tribes and Other Relicensing Participants on the Draft License Application for the Yadkin Project

Agency/ Party Date	Comment	Response
	MINIMUM FLOW/FLOW REGIME	
NC Division of Water Resources, Steven Reed, 1/4/06	An annual flow duration curve is supposed to be included in Figures E-5a through E-5l, but only the monthly curves are provided. Also, these flow duration curves would be more useful if they all had a common vertical scale of zero to 10,000 cfs. This would allow closer, more consistent comparison of existing and proposed operations in the range of flows of most interest.	The License Application has been revised to include an annual as well as monthly flow duration curves. Flow duration curves have been revised to have a common vertical scale. See Exhibit E.2.4.1.
NC Division of Water Resources, Steven Reed, 1/4/06	NCDWR is currently engaged in discussions with Progress Energy (with APGI participation) regarding instream flow requirements that will be implemented downstream of their Tillery and Blewett Falls dams under terms of a new FERC license. The amount of these flow requirements for Progress Energy will directly affect the amount that the Yadkin project will need to contribute in order to meet downstream flow targets. NCDWR is hopeful that our discussions with APGI will lead to an Agreement in Principle (AIP) and settlement agreement that successfully resolves FERC relicensing issues between the NC Department of Environment and Natural Resources (NCDENR) and APGI. NCDWR is also hopeful that our discussions with Progress Energy will result in an instream flow regime that will allow NCDENR and Progress Energy – as well as other parties, including APGI – to sign an AIP and settlement agreement for the Progress Energy hydroelectric facilities.	Comment noted.
NC Division of Water Resources, Steven Reed, 1/4/06	Much effort has been expended in analyzing the results of the studies of instream flows and aquatic habitat downstream of the Tillery and Blewett Falls dams. However, we have not yet reached the point of being able to sign an AIP. In lieu of such an agreement on a total settlement package, NCDWR's analysis of the instream flow studies has determined the continuous minimum flows to be maintained downstream of each dam. The flows that would need to be released from the Yadkin Project (as measured at Falls dam) was determined by deducting the monthly median accretion flows between the Falls, Tillery, and Blewett Falls dams, as determined in the hydrologic models developed by both Progress Energy and APGI. In some months the release from the Yadkin Project is driven by instream flow needs below Tillery dam (overall Falls release for January is 761 cfs, July is 1,252 cfs, August is 1,215 cfs, November is 1,313 cfs , and December is 1,217 cfs), and in the others it is driven by instream flow needs below Blewett Falls dam (overall Falls release for February is 2,007 cfs, March is 2,439 cfs, April is 2,681cfs, May is 2,413 cfs, June is 2,070 cfs, September is 1,518 cfs, and October is 1,510 cfs). This instream flow regime was developed from the results of site-specific studies using the Instream Flow Incremental Methodology (IFIM), as well as studies of flows needed for navigation and freshwater mussel habitat. It should be noted that the flows recommended below Blewett falls dam are based on navigation in a downstream direction only. However, this assumes that any settlement agreement with Progress Energy will include provisions for improved boating access near the Blewett Falls dam. If this enhancement is not made, then flows will need to be increased to allow upstream navigation from the boating access at the highway 74 bridge.	APGI does not agree that the flows recommended by NCDWR are required in order to enhance and protect fish and aquatic habitat in the free-flowing river downstream of the Blewett Falls Development (FERC No. 2206). The flows recommended by NCDWR for release from the Falls Development are based on the agencies' recommended flows for release from Blewett Falls. In turn the Blewett Falls flows are being recommended by the NCDWR in order to achieve increased levels of aquatic habitat for certain critical aquatic habitat types (aka, "driver species"). NCDWR's policy is to recommend a minimum flow regime that will support 80 percent of the Index C habitat value that would be found under unregulated flow conditions. The flow recommendations made by NCDWR are based primarily on NCDWR's analysis of Index C conditions for certain "driver species" in the river reaches below Blewett Falls, as well as on consideration of needs for mussels and navigation. APGI believes that the "static flow" method NCDWR used to calculate Index C values for the driver species does not provide an accurate picture of habitat conditions in these river reaches under a given minimum flow regime. APGI has prepared an alternative analysis of habitat conditions, including calculation of Index C values, for the driver species which is discussed in detail in Exhibit E.3.1.2.4 of the final License Application. Based on the results of this analysis, APGI believes that its proposal to release a weekly average minimum flow of 900 cfs at Falls will produce excellent habitat conditions for most of the species/guilds of concern in the river below Blewett Falls.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project tailwaters: 1. APGI will implement the following instream flow regime: Water will be released on a daily average basis from Falls dam to provide the following flows (same as that recommended by NCDWR): January flow of 761 cfs, February 2,007 cfs, March 2,439 cfs, April 2,681 cfs, May	See above response.

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	2,413 cfs, June 2,070 cfs, July 1,252 cfs, August 1,215 cfs, September 1,518 cfs, October 1,510 cfs, November 1,313 cfs, and December 1,217 cfs.	
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	The Service is concerned about the instream flows released from the project and their affect upon fish and wildlife resources. Discussions are ongoing concerning the APGI proposal and the agencies recommended flow regime, including minimum flows. The Service is in agreement with NCDWR concerning provisions for instream flows. We will continue to coordinate with APGI, federal and state resource agencies and the public in the development of instream flow recommendations for the Yadkin Project.	See above response.
The Nature Conservancy, Eric Krueger, 1/3/06	The Nature Conservancy considers the minimum flow of 900 cfs weekly average from the Falls Development to be much too low to meet habitat needs in downstream riverine reaches. An instream flow study has been conducted for the Pee Dee River using the Instream Flow Incremental Methodology (IFIM), and APGI has fully participated in this study since its inception. Results from the instream flow study clearly demonstrate the need for substantial enhancement of minimum releases over current practices to even partially meet instream habitat needs. For example, the minimum flow schedule from Falls that would be needed to provide 80% of the available habitat in downstream riverine reaches under unregulated conditions is as follows: overall Falls release for January is 770 cfs, February is 2,030 cfs, March is 2,470 cfs, April is 2,700 cfs, May is 2,420 cfs, June is 2,080 cfs, July is 1,260 cfs, August is 1,220 cfs, September is 1,530 cfs, October is 1,510 cfs, November is 1,320 cfs, and December is 1,210 cfs.	See above response.
NC Division of Water Resources, Steven Reed, 1/4/06	Exhibits E.2.4 and E.2.7 (pages E-36 and E-46) refer to delivery of the required volume of water being released from the Yadkin project on a weekly average basis. Until hydrologic modeling can demonstrate that downstream flow targets and reservoir levels can be maintained with a particular delivery interval, NCDWR's recommendation would be that flows released from Falls dam be provided on a daily, rather than weekly, average. NCDWR recognizes that issue of the time interval for measuring flow delivery is important to both APGI and Progress Energy. From the standpoint of DWR, the resolution of flow delivery somewhere within the range of a daily to weekly average basis is of no direct consequence – as long as resource needs are met for reservoir levels and flows downstream of Tillery and Blewett Falls. However, NCDWR will be actively involved in model review and discussions of this issue, because it is an important part of achieving a successful settlement agreement.	APGI does not agree that the minimum flows recommended by NCDWR for release from Falls are necessary in order to significantly enhance aquatic habitat in the free-flowing river below the Tillery or Blewett Falls developments (see Exhibit E.3.1.2.4). Nor does APGI agree that flows need to be released from Falls on a daily average rather than a weekly average basis. The proposed 900 cfs weekly average release was modeled by APGI using the OASIS model to predict the availability of water to support a minimum flow of 1,500 cfs at the U.S. Geological Survey (USGS) gage at Rockingham. Under the proposed operating policy, the releases from Falls, when combined with the accretions and net evaporative losses at Tillery and Blewett Falls (with no contribution from Progress Energy's storage) would provide water to support an average daily flow at the Rockingham gage of greater than or equal to 1,500 cfs, more than 85 percent of the time. With the exception of periods of extended low inflow when it is likely that the Low Inflow Protocol would be implemented, APGI estimates the maximum multiple-day deficit to be approximately 6,200 acre-ft. Thus, it appears that the combined storage capacity available at the Tillery and Blewett Falls reservoirs is sufficient for Progress Energy to reregulate flows from Falls delivered under typical Project operations on a weekly average basis in order to release a continuous minimum flow downstream of Blewett Falls Dam of 1,200 to 1,500 cfs (see Exhibit B.6.1).
Environmental Protection Agency, Heinz Mueller, 1/4/06	The U.S. Environmental Protection Agency (USEPA) is concerned that the operation schedule proposed (under normal flow conditions, APGI is proposing to operate the Project with a weekly average minimum release for Falls of 900 cfs) will not provide adequate downstream flows for Progress Energy to release sufficient flow for instream needs below Tillery and Blewett Falls. USEPA supports flow recommendations of the NCDWR and South Carolina Department of Natural Resources. Based on these recommendations, it appears that higher releases from Falls Dam with greater frequency than weekly average will be required. Until hydrologic modeling can demonstrate that downstream flow targets and reservoir levels can be maintained with a	See above response.

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	particular delivery interval, USEPA's recommendation would be that flows released from Falls be delivered on a daily average. Additional evaluation utilizing the OASIS and/or CHEOPS models is needed to ensure sufficient water is delivered in such a manner that resource needs are met for reservoir levels and flows downstream of Tillery and Blewett Falls.	
The Nature Conservancy, Eric Krueger, 1/3/06	The Nature Conservancy (TNC) does not believe that a weekly average delivery from the Falls Development will be compatible for maintaining instantaneous releases from the downstream Progress Energy projects that meet habitat needs defined by the IFIM / PHABSIM model. TNC views re-regulation of Falls releases into instantaneous releases at Progress Energy projects as critical to restoration and enhancement of downstream riverine reaches. It seems unlikely that weekly average releases can sustain instantaneous releases downstream without damaging the economic viability of the downstream Progress Energy projects. TNC is open to any solution that produces the desired minimum flow results downstream.	See above response.
NC Division of Water Resources, Steven Reed, 1/4/06	The flows proposed in the DLA (Exhibits E.2.4 and E.2.7, pages E-36 and E-46) are based on a target flow at the Rockingham gage downstream of Blewett Falls dam, pro-rated by a factor of 60%. A factor of 60% was selected because of the relative drainage area upstream of the Yadkin project. NCDWR's analysis of intervening accretion inflows between Falls, Tillery and Blewett Falls dams indicates that a drainage area ratio does not adequately reflect the contribution of the watershed above Falls dam to the total hydrology of the Yadkin-Pee Dee system. The Rocky and Uwharrie Rivers are the major tributaries between Falls, Tillery and Blewett Falls dams. The Rocky River, in particular, is quite flashy and has a low yield during dry periods of the year. Therefore, using a simple drainage area ratio of a downstream flow target tends to overestimate the release needed from Falls dam during December through March, and underestimate the contribution needed from the Yadkin project during other months. Rather than drainage area ratio, NCDWR will be relying on the OASIS and CHEOPS models, and analysis of intervening inflows, to determine what portion of the flow targets below Tillery and Blewett Falls needs to be provided from the Yadkin Project.	APGI has revised Exhibit B to reflect the results of modeling the proposed operation with OASIS relative to the total flow that would be available downstream of Progress Energy's Blewett Falls Development. Based on this work, APGI continues to propose a weekly average minimum flow from the Falls development of 900 cfs. Under proposed Project operations, and based on regulated discharge from the Falls Development, plus accretions and net evaporation between Falls and Blewett Falls dams, this minimum flow would be expected to support a target minimum flow at Rockingham of between 1,200 and 1,500 cfs.
Progress Energy, Phillip Lucas, 1/3/06	Page E-36 of the DLA indicates that this minimum flow (900 cfs) represents 60% of a target flow at the Rockingham USGS gage of 1,500 cfs. Progress Energy has not been party to any agreement regarding a 1,500 cfs "target flow" at the Rockingham gage nor has Progress Energy been notified by the State of North Carolina that a target flow has been established for the Yadkin River below Progress Energy's Yadkin-Pee Dee River Project. It should be noted that the upper reaches of the Yadkin River watershed, where APGI's Yadkin Project is located, exhibits different base flow characteristics than the lower portion of the Yadkin-Pee Dee watershed. The upper watershed clearly has the ability to produce higher levels of runoff per square mile than the lower watershed. APGI's statement that the flow from the basin exiting their Project represents 60% of the watershed capacity assumes that the entire watershed exhibits equal base flow production rates. The productivity of the drainage areas should not be calculated using only the mainstem streamflow gages. Given the higher production rates of the upper watershed, Progress Energy disagrees with the proposed APGI contribution to the downstream release from their Project. An additional point that should be incorporated into the consideration of base flow differences throughout the watershed is the measurement in mean versus median flow rates. Due to the wide variation of flow rates inherent in the watershed, the comparison of flow rates will be more meaningful if they are measured by using median flows instead of mean flows. The averages of the monthly and annual flows are highly skewed by peak flow values and are not meaningful for use in the comparison of basin productivity or base flows. If median values are utilized, the large peak and flood flow values will not influence the values and the watershed characteristics will be more accurately defined for this purpose for the watershed.	See above response.

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SC Department of Natural Resources, Robert Duncan, 1/3/06	A number of methods are being used to determine the levels of instream flows needed to protect South Carolina's interests. The Instream Flow Incremental Methodology (IFIM), as well as guidance from the South Carolina Water Plan (2004), Instream Flow Study-Phase II (1988) and South Carolina Instream Flow Studies (1989), are being employed to identify suitable flows for aquatic habitat for resident and migratory species. Navigation flow needs are being determined through use of the method and criteria described in the South Carolina Water Plan and Instream Flow Study-Phase II. Flows needed to meet water supply and wastewater assimilation requirements are determined through studies conducted by the Pee Dee River Coalition. Salinity intrusion prevention flows are being identified through use of a salinity intrusion model developed by the USGS, with funding provided by the Pee Dee River Coalition, Progress Energy, APGI and the South Carolina Department of Natural Resources (SCDNR). It was determined by SCDNR that flows needed to protect aquatic habitat and navigation would also be sufficient to protect the integrity of the Pee Dee State Scenic River and the Great Pee Dee River Heritage Preserve.	Comment noted.
SC Department of Natural Resources, Robert Duncan, 1/3/06	An instantaneous flow of at least 1,200 cubic feet per second (cfs) released from Progress Energy's Blewett Falls facility would be needed to protect navigation, water supply and wastewater assimilation uses in the South Carolina portion of the Pee Dee River. We have also determined that a minimum release of 900 cfs from Blewett Falls is needed to prevent detrimental salinity intrusion in the lower Pee Dee River and the Atlantic Intracoastal Waterway (AIWW). Analyses are in progress to identify appropriate instream flows for aquatic habitat and diadromous fish migration in South Carolina. Minimum flow releases and the Low Inflow Protocol are addressed in Exhibits B.6.6.1, B.6.6.3, E.2.4 and E.3.13.3 of the APGI DLA. These Exhibits indicate that APGI is proposing to operate the Yadkin Project with a year round weekly average minimum release from Falls Reservoir of 900 cfs. SCDNR's primary concern with this proposal is whether the 900 cfs weekly average release from Falls Reservoir would be sufficient to allow Progress Energy to release flows from their Blewett Falls facility to meet South Carolina's needs. This concern can be addressed by completing the ongoing analyses to determine all instream flow requirements and utilizing the OASIS and CHEOPS Operations Models to evaluate the amount and periodicity of releases from APGI needed to allow Progress Energy to meet these requirements.	APGI believes that its proposal for a year round 900 cfs weekly average minimum flow to be released at Falls Dam is sufficient to support a target minimum flow of 1,200 to 1,500 cfs at Rockingham. See Exhibit B.6.1.
SC Department of Health and Environmental Control, M. Rheta Geddings, 1/4/06	A number of methods have been used by various agencies to evaluate the instream flows needed to protect South Carolina's varied interests (as described in detail in comments being submitted by SCDNR. SCDNR has determined that a minimum instantaneous flow below Blewett Falls Dam of 1,200 cubic feet per second (cfs) is needed under normal conditions to protect for designated navigational uses in the Pee Dee River in South Carolina. Initial South Carolina Department of Health and Environmental Control (SCDHEC) review indicates that a flow of 1,200 cfs would protect domestic and industrial water withdrawals in South Carolina. Modeling conducted by the USGS indicates that a minimum release of 900 cfs from Blewett Falls is needed to minimize salinity intrusion in the lower Pee Dee River and AIWW to protect, to the extent feasible, surface water withdrawals in the lower Pee Dee system. The DLA indicates that, under normal flow conditions, APGI is proposing to operate the Yadkin Project with a year round weekly average minimum release for Falls Reservoir of 900 cfs. The Department is concerned that this operation schedule will not provide adequate amount of water to allow Progress Energy to release sufficient flow for South Carolina needs. Additional evaluation utilizing the OASIS and/or CHEOPS Operations Models is needed to ensure sufficient water is delivered in such a manner that Progress Energy can meet downstream requirements.	See above response.

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SC Department of Health and Environmental Control, M. Rheta Geddings, 1/4/06	Operations of APGI's Yadkin Project and Progress Energy's Yadkin-Pee Dee River Project have significant control of flow in the Pee Dee River as it enters South Carolina. While Progress Energy has direct control over flows entering South Carolina through operation of its Tillery and Blewett Falls developments, APGI's Yadkin Project has the potential to significantly impact instream flows in South Carolina through the quantity and timing of delivery of flow to Progress Energy's projects. Current operation of these projects under existing FERC licenses results in flows in the South Carolina portion of the Pee Dee River that are much more variable and, at times, much less than would be expected under natural, unregulated conditions. SCDHEC's goal in the relicensing of both the APGI and Progress Energy projects is to restore more natural flow in the South Carolina portion of the Pee Dee River in order to protect water supply, water quality and wastewater assimilation, navigation, aquatic habitat for fish and other biota, diadromous fish migration, and the integrity of the designated Pee Dee State Scenic River and Great Pee Dee River Heritage Preserve. SCDHEC also seeks to prevent detrimental salinity intrusion in the lower Pee Dee River and the AIWW through adoption of an appropriate flow regime.	Comment noted.
Pee Dee River Coalition, Frank Willis, 12/28/05	Exhibit B.6.6.1 & E.2.4 Minimum Flow: The Pee Dee River Coalition (PDRC) agrees with and supports the State of South Carolina's stated position that a minimum instantaneous flow of 1,200 cfs is required from Progress Energy's Blewett Falls dam to meet a number of uses and needs in South Carolina. To the extent that the 900 cfs weekly average flow released from the Falls dam can support the 1,200 cfs instantaneous Blewett Falls flow, then the PDRC would be supportive of APGI's proposed flow. However, additional modeling work using both the OASIS and CHEOPS models, as well as additional discussions, are necessary to ensure a supportive and positive relationship between APGI and Progress Energy. The relationship between Progress Energy and APGI, with respect to managing water supply, is paramount to meeting the 1,200 cfs instantaneous flow goal at Blewett Falls Dam.	See above response.
Progress Energy, Phillip Lucas, 1/3/06	On pages B-46 and E-36, APGI proposes that the Yadkin Project supply a year-round weekly average minimum flow of 900 cfs as measured at the Falls Development. Progress Energy is concerned that a weekly average will allow periods of little to no flow to be averaged with periods of very high flows to achieve a weekly average. Progress Energy requests that flow levels exiting APGI's Yadkin Project be subject to daily average and instantaneous minimum flow standards to assure that there will be a continuous flow from the APGI Yadkin Project into the Yadkin Pee Dee River Project. Progress Energy also requests that APGI install a real time flow monitoring device to document the flow from the Falls Development.	Regarding the proposed weekly average minimum flow of 900 cfs, see above response. Regarding flow monitoring, APGI has revised its proposal to include the preparation of a Flow Monitoring Plan to be developed in consultation with resource agencies and Progress Energy and to be filed with FERC.
SaveHighRock Lake.org, Robert Petree, 1/4/06	Over 95 percent of [the SHRL.org] members making comments were concerned primarily with the proposed Operational guidelines included for each of the impoundments. These include: 4) the inclusion of minimum discharges from High Rock Lake (1,500 cfs) at a rate of 167% of the proposed total project discharge of 900 cfs when High Rock Lake falls below the proposed operating guide curve.	Comment noted – see above responses.
SaveHighRock Lake.org, Robert Petree, 1/4/06	The 8,000+ members of SaveHighRockLake.org feel that the operational proposals presented by the High Rock Lake Coalition would address these concerns. SRHL.org feels that any proposal must: 1. Not specify discharges from any single impoundment in excess of the proposed total project discharges.	APGI's minimum flow proposal considers both the desire to maintain High Rock reservoir water levels and to use available storage to augment downstream river flows during periods of lower river flow. APGI's proposal for a "soft" recreation season guide curve is designed to provide higher water levels in the reservoir, when water is available. The proposal to reduce outflow from High Rock to a maximum weekly average of 1,500 cfs when High Rock falls below the soft guide was designed to slow the water level descent during periods when river flows may be dropping. Once the elevation of High Rock reaches the hard guide, outflow from High Rock would be reduced to the proposed minimum flow of 900 cfs (weekly average), until such time as the reservoir returns to the guide curve.

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	RESERVOIR WATER LEVELS	
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project reservoirs: 1. APGI will implement a rule curve for High Rock and Narrows with an operating band (drawdown) of 3 ft below full pool in the spring, summer and fall; and an operating band of 6 ft below full pool in the winter. See the REC trial balloon for details. This will inundate the majority of the high quality littoral aquatic habitat in both reservoirs (see pages E-66 and E-67). This will also benefit wetland habitat types on both reservoirs. The operating curves for Tuckertown and Falls should be same as the current.	APGI believes that its proposal to operate High Rock reservoir in accordance with a new guide curve that includes a hard guide that maintains water levels within 6 ft of full 4/1-10/31 and within 12 ft of full 11/1-3/31, with transition periods for fill and drawdown during March and November, will protect existing aquatic resources and wetlands in the reservoir. The proposed guide curve will also provide some enhancement to aquatic habitats and wetlands by extending the season during which the reservoir is operated within 6 ft of full and by reducing the magnitude of the winter drawdown. Further restrictions on reservoir water levels, such as recommended by NCWRC, will significantly reduce the value of High Rock as a storage and flow regulation facility. The ability to store water and regulate flow from High Rock is valuable both for hydropower production and for downstream flow regulation and augmentation, for purposes of enhancing water quality, aquatic habitats and recreation.
Environmental Protection Agency, Heinz Mueller, 1/4/06	USEPA is concerned that the operation schedule proposed in the DLA (proposed operating guide) will negatively impact important littoral aquatic habitat, particularly in High Rock and Narrows. USEPA supports a drawdown plan proposed by a number of state and federal agencies that includes a rule curve for High Rock and Narrows with an operating band (drawdown) of 3 ft below full pool in the spring, summer, and fall; and an operating band of 6 ft below full pool in winter. This will inundate the majority of high quality littoral aquatic habitat in both reservoirs found within the first 2-4 ft of the reservoir. This will benefit wetland habitat. Significant drawdowns of High Rock can drastically decrease the amount of year round aquatic habitat, lead to erosion of the drawdown zone due to raindrop impact forces on bare soils, and erosion of the shorelines at winter pool elevation which may erode bare unvegetated shorelines.	Regarding the High Rock rule curve, see above response. Regarding erosion potential, under current operations High Rock Reservoir may draw down as much as 30 ft in the winter (though 12-15 ft is more typical). APGI believes that its proposal to restrict the winter drawdown at High Rock Reservoir to 12 ft will significantly reduce the potential for erosion of exposed soils in the drawdown zone.
Duke Power, E. D. Bruce, 12/20/05	Duke recommends that the proposed operation of High Rock in Exhibit B.2.1.2 be revised to have the “Hard Guide” at 10 ft drawdown limits (613.9 ft msl) for December, January and February and 5 ft drawdown limits (618.9 msl) for April-October. March and November should be transition months between the 10 and 5 ft drawdown limits. These drawdown limits would ensure normal operations at Buck Steam Station during normal inflow conditions. If the High Rock Reservoir level is down 12 ft in February just before the drier summer/ fall period, the reservoir may not recover to higher levels if a severe drought occurs.	Regarding the High Rock guide curve, see above response. Regarding the concern about APGI’s ability to refill High Rock under the proposed hard guide that will allow up to 12 ft drawdown in winter, APGI would note that under the existing operating guides, which allow a winter drawdown of up to 30 ft, APGI has been successful in refilling the reservoir to within 3 ft of full pool 23 of the 26 years since January 1980, and to within 5 ft of full every year since 1980. Based on this experience and the additional water level enhancement that will be provided by a Low Inflow Protocol, APGI believes that its proposal to restrict the winter drawdown at High Rock to 12 ft will enhance APGI’s ability to refill the reservoir each spring.
High Rock Lake Association, Larry Jones, 1/3/06	HRLA is dismayed that APGI is proposing future operations of the Project, especially High Rock Reservoir, in a manner that virtually mirrors operations of the past 75 years. The studies conducted by various consulting firms retained by Alcoa have documented the negative effects of past operations at High Rock on every parameter studied, including water quality, fish and wildlife habitat, wetlands, aesthetics, sedimentation, bank erosion, conservation, recreation, and economics. In contrast, the same studies have documented the positive effects of past operations in all the same parameters at Tuckertown and Badin Lakes. When proposals were submitted to Alcoa in August 2005 the negotiating parties (excepting Alcoa) were virtually unanimous in their opinion that the most import change needed for High Rock Lake is a mode of operation that would result in relatively stable water levels on a year round basis.	APGI does not agree that its proposed guide curve for High Rock mirrors operations of the past 75 years. The existing operating guides for High Rock reservoir provide APGI with the ability to draw High Rock Reservoir down much lower than what is now being proposed. Under the proposed guide curve, for the first time, High Rock will be operated in accordance with a hard guide, below which the reservoir level cannot go, except as needed to meet required downstream minimum flows or in accordance with the proposed LIP or HPMEP. This is a significant change from past operation, where depending on water level and river flow conditions, High Rock could be drawn down below 6 ft during the period 4/1-10/31, and below 12 ft during the winter. The proposed guide curve will also result in a three-month

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		extension of the season during which the reservoir will be maintained within 6 ft of full and will thereby enhance recreational opportunities during the spring and fall. Finally, APGI is proposing to operate High Rock with two additional water level guides, a soft curve and a summer recreation season curve. These additional guide curves will help to ensure that during periods of normal and high flows, the reservoir will be maintained at higher elevations that will further enhance conditions for aquatic habitat and recreation. In making its proposal for the future operation of High Rock Reservoir, APGI considered fully the results of the various scientific studies which are discussed throughout Exhibit E of this License Application. APGI acknowledges that its proposed operation of High Rock Reservoir may not produce optimum conditions for wetlands, fish and wildlife, but there will be enhancement of these resources under the proposed new guide curve. Further restrictions on reservoir water levels at High Rock will significantly reduce the value of High Rock as a storage and flow regulation facility. The ability to store water and regulate flow from High Rock is valuable both for hydropower production and for downstream flow regulation and augmentation for purposes of enhancing water quality, aquatic habitats and recreation.
SaveHighRock Lake.org, Robert Petree, 1/4/06	Over 95 percent of [the SHRL.org] members making comments were concerned primarily with the proposed Operational guidelines included for each of the impoundments. These include: 1) the specific inclusion of allowable drawdowns of High Rock Lake amounting to approximately 66 percent of the average depth of High Rock, 2) the specific exclusion of allowable drawdowns at Badin lake in excess of 15 percent of the average depth of Badin Lake, 3) the proposal to operate High Rock Lake almost identically to the way it has been operated for many decades.	See above response.
SaveHighRock Lake.org, Robert Petree, 1/4/06	The 8000+ members of SaveHighRockLake.org feel that the operational proposals presented by the High Rock Lake Coalition would address these concerns. We feel that any proposal must: 1. Include reasonable allowable fluctuations at each impoundment based solely on the physical and environmental characteristics of that impoundment.	See above response.
High Rock Lake Association, Larry Jones, 11/14/05	Figure B-2 “Hard Curve” shows 12’ drawdown limit December 1 - February 28 (3 months) while the text in B.2.1.1 describes the 12’ limit November 1-March 31 (5 months). Same wording appears in Table E.2-7. What is APGI’s intent on the duration of a maximum 12-foot drawdown at High Rock?	The text in Exhibit B has been revised to clarify that the reservoir would not be drawn down below the Hard Guide (within 6 ft of full April 1 through October 31 and within 12 ft of full December 1 through February 28) with transition periods for fill and draw down during March and November, in accordance with the Hard Guide (Figure B-2), except as needed to meet required downstream minimum flows or as outlined in the proposed Low Inflow Protocol or in the HPMEP. Table E.2-7 has been deleted.
Progress Energy, Phillip Lucas, 1/3/06	On page E-16, APGI states that "Because High Rock Reservoir serves as a primary storage facility on the Yadkin Pee Dee River, its operation is also important to downstream users who rely on releases from storage to augment river flows during the low flow summer period." Progress Energy agrees with this statement.	APGI agrees.

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The Nature Conservancy, Eric Krueger, 1/3/06	TNC is encouraged by APGI's proposal to institute a hard guide curve High Rock Lake which limits drawdowns to -12 ft during winter months. Store-and-release operations, reduced flooding, and artificially enhanced summer flows reduce this dynamic nature and the attendant biodiversity. Limits on storage operations will serve to reintroduce some lost stochasticity in river behavior.	Comment noted.
Environmental Protection Agency, Heinz Mueller, 1/4/06	The operating curve for Falls and Tuckertown should be the same as current.	Comment noted.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project reservoirs: 3. APGI will stabilize reservoir levels during the spring spawning season, 1 April through 15 May.	APGI is proposing to continue its voluntary efforts to stabilize water levels at the four Project reservoirs to enhance spring spawning. Generally, APGI proposes to endeavor to maintain the reservoirs within +/- 1 ft of the reservoir level achieved on April 15 through May 15. APGI will make a report annually to NCWRC on the water levels during this spawning period, and will provide an explanation of any conditions encountered during that period that prevented APGI from maintaining the target water levels. APGI opposes the concept of mandatory restrictions on reservoir water levels during the spring spawning period because of the potential adverse effects on Project operations. Spring flows can be highly variable, and any additional restrictions on reservoir water level fluctuations during this period could significantly hinder APGI's ability to make necessary store-and-release adjustments to avoid significant spills and control river flows.
Environmental Protection Agency, Heinz Mueller, 1/4/06	Based on recent conversations with the NCWRC, USEPA supports expansion of the operating protocol designed to enhance fish spawning at the reservoirs for the period March 1 through May 31 (rather than the April 15 to May 15 described in the DLA), with a stronger implementation commitment than "voluntary." This expansion would maximize spawning success in the shallow water portions of the reservoirs.	See above response. Regarding the spawning period timeframe, historically APGI has maintained stable water levels in the reservoir generally between April 15 and May 15.
	LOW INFLOW PROTOCOL	
SC Department of Health and Environmental Control, M. Rheta Geddings, 1/4/06	The DLA also indicates APGI plans to operate in accordance with a low inflow protocol (LIP) that has not yet been completed. The development of a LIP is needed to quantify the magnitude, frequency and duration of low flow events to determine a critical low flow for evaluation of NPDES permits. Additional work is needed to complete this important part of the licensing effort.	APGI is proposing the development of a Low Inflow Protocol (LIP) for the Yadkin Project. The LIP will be developed in consultation with resource agencies, municipalities, Progress Energy and industrial river users and will be filed with FERC. Until such time as an LIP has been developed, signed, and implemented, APGI will continue to operate the Yadkin Project in accordance with the existing Drought Contingency Plan (see Exhibit B).
Environmental Protection Agency, Heinz Mueller, 1/4/06	USEPA supports the development of a Low Instream Flow Protocol in consultation with state and federal agencies, non-governmental organizations, and other water users.	Comment noted – see above response
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project tailwaters: 2. APGI will implement an LIP as developed in consultation with state and federal agencies, NGOs and water users within the basin.	Comment noted – see above response

Agency/ Party Date	Comment	Response
Duke Power, E. D. Bruce, 12/20/05	Duke is in agreement that a LIFP is needed for this Project and is encouraged that a section for the LIFP is included in the DLA. Since there is not any detailed information concerning the LIFP contained in Exhibit B.6.6.3, it is not possible to provide substantive comments on the LIFP. Duke Power strongly encourages APGI to finish the development of the LIFP and include it in the Final License Application. The LIFP should include the appropriate hydrologic and other trigger points necessary to provide additional time to allow precipitation to restore streamflow, reservoir, and groundwater levels to normal ranges.	Comment noted – see above response.
SaveHighRock Lake.org, Robert Petree, 1/4/06	Over 95 percent of [the SHRL.org] members making comments were concerned primarily with the proposed Operational guidelines included for each of the impoundments. These include: 5) the lack of any specific Low Inflow Protocol terms and conditions.	Comment noted – see above response.
Pee Dee River Coalition, Frank Willis, 12/28/05	Exhibits B.6.6.3 & E.3.13.3 Low Instream Flow Protocol The PDRC supports the development of a mutually agreeable LIP to balance economic and other needs during periods of low flow. At this early juncture, discussions are centered on a low critical instantaneous flow of 900 cfs released from the Blewett Falls facility. The PDRC believes that the 900 cfs flow is the minimum needed to provide a measure of protection against salt water intrusion impacts on coastal water supply systems.	Comment noted – see above response.
SC Department of Natural Resources, Robert Duncan, 1/3/06	SCDNR is interested in the development of a Low Inflow Protocol that will specify how available water will be managed during periods when inflow is insufficient to fully meet all needs.	Comment noted – see above response
The Nature Conservancy, Eric Krueger, 1/3/06	TNC has an abiding interest in the development of the Low Instream Flow Protocol (LIP), as the flow reductions during drought conditions will likely have significant impacts on aquatic biota. We support an LIP concept that incrementally reduces minimum flow, lake levels, and power generation in an equitable manner as drought severity progresses.	Comment noted – see above response.
SaveHighRock Lake.org, Robert Petree, 1/4/06	The 8000+ members of SaveHighRockLake.org feel that the operational proposals presented by the High Rock Lake Coalition would address these concerns. We feel that any proposal must: 4. Include specific Low Inflow Protocol terms and conditions designed to protect the environment at each impoundment, share the burden of low inflows equitably and provide realistic minimum/maximum discharges from the project.	Comment noted.
	HEADWATER BENEFITS	
Progress Energy, Phillip Lucas, 1/3/06	Headwater Benefits: Progress Energy believes that further discussion regarding this topic may be necessary; but, discussion on this topic is premature at this time.	Comment noted.
	FLOODING	
The Nature Conservancy, Eric Krueger, 1/3/06	The Nature Conservancy has inventoried floodplain forests along the Great Pee Dee River in South Carolina, and has documented nearly 200,000 acres of such habitat along the mainstem. TNC has documented reductions in flood frequency in the Great Pee Dee River by processing regulated versus unregulated flow records through the Indicators of Hydrologic Alteration statistical package. Reduction of flood frequency in floodplain forests changes their plant composition and the usability of the habitat to wildlife, and encourages increased human activity that compromises the natural value of the forest. Reductions in flood frequency in the Pee Dee River under current regulated conditions are, in our opinion, not of a magnitude to cause measurable biological impacts. TNC discourages any use or operation of the Yadkin Project toward the end of flood control but encourages working towards flow regimes which restore the flooding that has been lost.	Comment noted.

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City of Salisbury, David Treme, 1/4/06	The DLA statements regarding flood events should be revised to accurately reflect readily available information that identifies and analyzes project effects on Salisbury's municipal water supply and wastewater systems. The DLA presents little of the available relevant information regarding the effects of the Project operation on flooding and the limited information is presented in an uninformative manner. For example, Exhibit E.6.5 of the DLA states that "the effects of the Project operation on flooding were discussed earlier in Exhibit E.l.l.7." Exhibit E.1.1.7 ignores the presence of Salisbury's critical water and wastewater infrastructure and does not include a discussion or even identification of the "hydraulic controls", which include the sediment that has accumulated in the upper end of High Rock Reservoir (see Salisbury Sediment-Flooding Report). At the very minimum, the DLA Exhibit E.l.l.7.1 should be amended to state the following: "Project flooding effects in the floodplains located along and immediately above the upper end of High Rock Reservoir are especially important because critical municipal water and wastewater infrastructure are located there. This area includes an especially sensitive site that is protected by North Carolina water quality standards and classifications as a WS-IV Critical Area. A dominant hydraulic control that causes flooding in this area is the sediment delta created by the operation of High Rock Dam and Reservoir."	APGI has reviewed all relevant information and studies regarding the effect of Project operations on upstream flooding, including documents recently submitted by the City of Salisbury (and Salisbury-Rowan Utilities, or SRU), in response to the Draft License Application. APGI has updated the discussion of upstream flooding and flood potential in Exhibit E.1.8 to consider the new studies and information provided by Salisbury. APGI does not agree with Salisbury's conclusions regarding the effects of the Project on upstream flooding. APGI's analysis demonstrates that periodic flooding that occurs in the vicinity of the South Yadkin River confluence is primarily a result of downstream channel geometry, the downstream bends in the river, and the South Yadkin River flow merging with the mainstem Yadkin River flow at the location of the pump station. Information provided by Salisbury, including its Technical Report (Appendix E-25), presents no basis for indicating impact on the wastewater treatment facilities on Grants Creek (see Appendix E-3). The sediment delta is not caused by the operation of High Rock Dam. Moreover, a previous study conducted by FERC determined that the flooding in this area is not caused by the operation of High Rock Dam.
City of Salisbury, David Treme, 1/4/06	The DLA's discussion of flooding effects should fully incorporate the Salisbury Sediment-Flooding Report. When all of the available information is considered, it is clear that when Salisbury constructed its pump station at the confluence of the Yadkin and South Yadkin in 1917, the river's heavy sediment load passed by and moved downstream. However, since 1927, when Alcoa built High Rock dam approximately 19 miles downstream of the pump station, High Rock has been trapping most of the Yadkin's heavy sediment load, primarily in and above the upper reaches of High Rock Lake, where Salisbury's pump station and Salisbury-Rowan Wastewater Treatment Plant are located. The High Rock sediment deposition zone causes: • Increased frequency and severity of flooding at the Salisbury Water Pump Station and the Salisbury-Rowan Wastewater Treatment Plant • Increased probability of loss of water and wastewater systems due to floods • Violation of Salisbury's property rights by causing flooding of the Salisbury Water Pump Station, where Alcoa has no flood rights • Sediment deposits that block the Salisbury Water Pump Station intakes unless continuously removed • Increased amount of sediment to enter and cause mechanical damage to pumps and lines of the water system	Regarding flooding, see above response. Regarding sedimentation and effects of sediment, see response to similar comments in the water quality section of this summary.
	WATER USE	
City of Salisbury, David Treme, 1/4/06	The DLA at p. E-13 needs to be revised to clarify that although Salisbury's water use has historically included substantial consumptive use, in the last several years nearly all of the water withdrawn by Salisbury is returned to the Yadkin River. Further, the point at which Salisbury returns water to the river is upstream of Grant Creek, more than 16 miles upstream of High Rock Dam.	APGI has modified the License Application (Exhibit E.2.1 and Table E.2-1) to reflect this comment, with one exception. APGI is aware of data (provided by Salisbury) that the quantities of water withdrawn and returned by Salisbury in any one month period are largely equal. However, APGI questions whether the equal quantities are due to the return by Salisbury of all of the water it has withdrawn. APGI believes that the comparability of withdrawals and returns is due, at least in part, to other sources of municipal wastewater treated by Salisbury, stormwater runoff and groundwater infiltration collected by Salisbury and discharged into the Yadkin River.

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City of Salisbury, David Treme, 1/4/06	The DLA at p. E-15 states that the Salisbury-Rowan Wastewater Treatment Plant (WWTP) permitted flow is 20 MGD. The WWTP is actually currently permitted for a flow of 12.5 MGD.	APGI consulted with NCDWQ National Pollutant Discharge Elimination System (NPDES) program staff, which maintains that the current permitted flow for this facility is 20 MGD based upon NPDES Permit Modification dated 2/13/04 for expansion of the facility beyond 12.5 MGD. A footnote has been added to Table E.2-2 to clarify that the 20 MGD reported is based upon this modification for future expansion.
City of Salisbury, David Treme, 1/4/06	The DLA should be revised to state that High Rock Reservoir does not serve as a water supply reservoir for the City of Salisbury. The DLA states at E-12 that Salisbury is among the municipalities that "withdraw water from the Project reservoirs for use as the local water supply, including drinking water." However, this statement is misleading. Salisbury's intakes pre-date the reservoir by a decade and do not benefit from or rely on the reservoir. This fact is reflected in the classification of the Yadkin River at the intakes. The river is classified WS-IV Critical Area. The Critical Area extends upstream approximately one-half mile from the intakes. This upstream Critical Area reflects the North Carolina approach to protecting of an intake located in a river, not an intake located in a reservoir. The EMC Report of Proceedings on the Final Adopted Surface Water Supply Protection Reclassifications Pursuant to the Water Supply Watershed Protection Act(1992) ("1992 Proceedings Report") observes that "[t]he water supply intake for Salisbury is located in the Yadkin River in an area which is within the defined normal pool elevation of High Rock Lake," but goes on to reach the following conclusion: Past environmental studies have substantiated that 1-85 essentially marks the upstream ecological boundary of the lake. Staff agree with the assessments presented during the public hearing process that the Salisbury intake is actually located outside the reservoir and would be more appropriately protected as a run of-river intake (1992 Proceedings Report at p. 46). The DLA fails to identify the WS-IV Critical Area at the City of Salisbury's intakes in its discussion of WS-IV Critical Areas at pp. E-32 to E-34. The WS-IV Critical Area is in the High Rock Reservoir sediment deposition zone, as discussed in these comments. The DLA discussion at p. E-12, p. E-13, pp. E-32 to E-34, and at any other pages where the issue is discussed, should be revised to reflect that the Salisbury intakes, although located within the project boundary, are run-of-river intakes and are not reservoir intakes.	The City of Salisbury's water supply intake is located on the Yadkin River within the licensed project boundary for the Yadkin Project (FERC No. 2197). In accordance with FERC's regulation 18 CFR§4.51(f)(2)(i), APGI is required to include in its License Application a description (including specified volume over time) of existing and proposed uses of Project waters for irrigation, domestic water supply, steam-electric plant, industrial, and other consumptive purposes. Regarding the classification of Project waters in the vicinity of Salisbury's intakes, APGI has consulted with NCDWQ on the classification of these waters and has revised Exhibit E.2.3.2 to reflect that the correct classification of waters in the vicinity of the Salisbury's intakes is WS-IV Critical Area.
	WATER QUALITY	
NC Division of Water Quality, Darlene Kucken, 1/4/06	NCDWQ finds the language to be in agreement with the final water quality study plan of August 2005. This study plan was also reviewed by NCDWQ and comments were provided to APGI's consultant. While there are still many details to discuss and resolve NCDWQ is in general agreement with the concepts put forward to date. A review of the draft AIP in January will allow NCDWQ to further review the proposal put forward by APGI and make further refinements on these concepts.	Comment noted.
NC Division of Water Quality, Darlene Kucken, 1/4/06	There remain some potential areas of discrepancy between APGI's concept [for tailwater DO enhancement] and NCDWQ's concept. Further discussions are needed surrounding timing issues of enhancements and total length of time for enhancement completion, as well as potential upgrades to Tuckertown and Falls developments. It is anticipated that these remaining discussions will take place after the draft AIP is discussed in January 2006 or during the issuance of the 401 Certification.	Comment noted.
Environmental Protection Agency, Heinz Mueller, 1/4/06	USEPA supports the overall approach for the DO enhancement program but recommends an expedited improvement schedule that would include the installation of aeration technology at High Rock and Narrows by 2011, with continued monitoring below Tuckertown and Falls. If it is determined that additional DO enhancements are needed at Tuckertown and Falls, these should be completed by 2014. Water quality DO standards should be met at all developments by 2014.	APGI is proposing to make significant technological modifications to the Yadkin Project developments in order to improve tailwater dissolved oxygen (DO) conditions. As discussed in detail in Exhibit B and Exhibit E, the installation of the aeration technology proposed by APGI to enhance tailwater DO is a key element of a comprehensive unit refurbishment and upgrade program that is proposed for the Yadkin Project developments. Performed in

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		conjunction with unit refurbishment and upgrade, the installation of proposed aeration technology at the Narrows and High Rock developments will cost significantly less than if the aeration equipment were installed separately. APGI's proposed schedule for unit refurbishment/upgrade is very aggressive and will essentially result in the refurbishment/upgrade of one unit each year, following license issuance, and the installation of aeration technology at each of the High Rock and Narrows units within four years of the effective date of a new license. Therefore, APGI believes that its proposed timeframes for the proposed DO enhancements at the Yadkin Project developments is the most efficient and cost-effective schedule for completing these enhancements.
Environmental Protection Agency, Heinz Mueller, 1/4/06	The proposed future operation of the aeration technology at High Rock and Narrows is unclear. Exhibit B suggests it will be operated May 1 through November 30 of each year, as needed. What is meant by "as needed?" USEPA concurs with the proposal in Exhibit E that suggests APGI will continue to operate Narrows Unit 4 with both valves open between May 1 and November 30 of each year. USEPA recommends a stronger commitment than "endeavor to use as practicable" Unit 4 on a "first on-last off" basis. This should become a regular part of the operations plan described in Exhibit B, including the operation of similar aeration technology as they are installed. This inconsistency should be addressed in both exhibits in the Final License Application (FLA).	Regarding the proposed timeframe for operation of aeration technology, APGI is proposing to operate the aeration technology at High Rock and Narrows May 1 through November 30 of each year. During that period APGI will also be monitoring tailwater DO conditions in accordance with an NCDWQ-approved DO Monitoring Plan. Currently, tailwater DO conditions are such that it is anticipated that the aeration technology will need to be operated throughout the May 1-Nov 30 period. If, over time, there is an improvement in DO conditions observed in the tailwaters, it may no longer be necessary to operate the aeration technology throughout this entire period. The words "as needed" are intended to convey this potential.
Environmental Protection Agency, Heinz Mueller, 1/4/06	USEPA recommends that APGI develop and implement an approved Quality Assurance Project Plan as part of the overall long-term water quality monitoring plan. This should hopefully ensure that the data can be used in basinwide assessments and TMDL development by North Carolina.	APGI plans to file a Quality Assurance Project Plan (QAPP) with NCDWQ for the review and approval, as part of the proposed Dissolved Oxygen Monitoring Plan.
Environmental Protection Agency, Heinz Mueller, 1/4/06	USEPA recommends inclusion of summary tables in Exhibit E.2.3.1.1 to show monitoring results of water quality parameters (similar to those presented in the study report). A summary table should be included that identifies the number and percentage of samples and days that violated state water quality standards, particularly related to DO in the tailraces.	Exhibit E.2.3.1.1 has been revised to include a summary of tailwater DO conditions in the form of DO duration curves. These curves demonstrate the percent of time when the observed DO concentration in each of the four Project tailwaters fell below the instantaneous DO standard of 4 mg/l during the monitoring period (May through November).
U.S. Environmental Protection Agency, Heinz Mueller, 1/4/06	There is no mention of any specific timeframes for DO improvements at Tuckertown or Falls, other than on an as needed basis, depending on the outcome of monitoring. USEPA assumes that those improvements would occur in accordance with the proposed refurbishment and upgrade schedule included in Exhibit C (Tuckertown and Falls upgrades before the end of 2020). There is no information in the DLA that suggests how this schedule was developed. This should be included in the FLA, including the capital costs of the planned upgrades.	Exhibit E has been updated to reflect a proposed schedule for DO enhancements at the Yadkin Project developments (see Exhibit B). Under the proposed schedule, following a period of monitoring, a decision will be made, in consultation with NCDWQ and other agencies, as to whether additional DO enhancement is required for the Tuckertown and Falls tailwaters no later than 12/31/2013, and 12/31/2015, respectively.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.2.5 Agency Recommendations: The NCWRC recommends the following: 1. APGI will meet state water quality numeric standards for all tailwaters within XX years of a new license. NCWRC will defer to the NCDWQ for the specific timeframe regarding compliance. 2. APGI will implement a dissolved oxygen monitoring program on all tailwaters within XX years of a new license. NCWRC will defer to the NCDWQ for the specific timeframe regarding monitoring.	Comments noted.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.2.9: The NCWRC is concerned about the way the wording in the sentence dealing with implementing aeration technology. It says APGI "may" add aeration technology at Falls and Tuckertown. We suggest that APGI change the word "may" to "will" because the sentence already clarifies that it is dependant on need.	See above response.

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U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	Currently many of the project waters do not meet state water quality standards for portions of the year. Water quality studies have been conducted and the NCDWQ has recommended measures to improve these conditions. The Service will coordinate with the NCDWQ and adopt recommendations made by the NCDWQ in determining mitigative measures that need to be taken.	Comment noted.
The Nature Conservancy, Eric Krueger, 1/3/06	TNC supports the conceptual proposal contained in the DLA to increase dissolved oxygen levels below the High Rock and Narrows facilities through installation of aerating turbines and aeration valves, respectively. TNC supports the concept of subsequent installations at Tuckertown and Falls facilities only if prior improvements fail to produce desirable results throughout the system. APGI is to be commended for its aggressive approach to this issue.	Comment noted.
The Nature Conservancy, Eric Krueger, 1/3//06	The DLA suggests that improved water quality will be realized also through the institution of the 900 cfs weekly average minimum flow. Currently, no water quality modeling has been performed to demonstrate flow versus DO relationships for the Yadkin Projects. TNC requests that any linkage between flow schedules and water quality in the Final License Application be supported by robust water quality modeling.	APGI has not conducted any water quality modeling that would allow a clear demonstration of water quality improvements associated with the 900 cfs weekly average minimum flow proposal for Falls. Exhibit E has been revised to clarify this.
High Rock Lake Association, Larry Jones, 1/3/06	The issue of water quality is an example of Alcoa completely ignoring many positive benefits that could result from a change in operations at High Rock. Alcoa has elected to promise future modifications to the turbines, just focusing on tailwater quality rather than make changes in operation to stabilize High Rock Lake water levels to improve lake water quality. Considering High Rock's state of impairment; fish, wildlife, and humans need all the help possible that could be obtained from changing the mode of operation. But instead of stable water levels, the DLA Guide Curve presents a constantly changing lake level, except for the extreme drawdown period proposed for December through February.	APGI has not ignored the potential impact to water quality associated with its proposed operation of High Rock Reservoir. The water quality problems that High Rock Reservoir currently faces are a result of upstream loadings of nutrients and sediment, and are not a result of Project operations. Reservoir water quality studies conducted by APGI found no significant correlations between fluctuating reservoir water levels and water quality parameters (see Exhibit E.2.3.1.1, and Appendix E-1). In short, there is no evidence that changing reservoir water levels adversely impact the water quality of High Rock Reservoir.
	SEDIMENT/SEDIMENTATION	
City of Salisbury, David Treme, 1/4/06	The DLA should incorporate and rely on the Salisbury Sediment-Flooding Report and The Salisbury Proposal. The DLA should incorporate and rely on additional available studies that are necessary to allow a license decision to be based on an adequate understanding of the present and future effects of the Yadkin Project on Salisbury's water and wastewater systems. Most of the Project's adverse effects on Salisbury's municipal water supply and on its wastewater treatment plant fall into two categories: • The flooding, burying, and damaging of critical infrastructure caused by the Project's alteration of the Yadkin River's flow and its sediment transport and deposition patterns; and • The un-neighborly management of the Project and the Federal license. The additional necessary studies include at a minimum the following (these studies were attached to the comments): (1) City of Salisbury Technical Report: High Rock Dam and High Rock Lake Sedimentation Flooding Effects as Estimated Using HEC-RAS Modeling (January 2006) ("Salisbury Sediment-Flooding Report"); (2) City of Salisbury's Proposed Supplement for Alcoa Proposals and Stakeholder Counterproposals (September 2005) ("Salisbury Proposal") is necessary to provide a general understanding of the adverse effects of the un-neighborly management of the Project and the Federal license.; and (3) City of Salisbury Technical Report: Corrections Needed in Exhibit K to FERC License for Yadkin Project (January 2006) is needed to understand the need for correction of Exhibit K to the FERC license for the Yadkin Project.	APGI has reviewed the additional studies provided by the City of Salisbury and has updated its discussion of sedimentation in Exhibit E and in a separate Appendix (Appendix E-3) to address this information. However, it should be noted that the Technical Report provided by Salisbury was conducted outside of the relicensing process. The Salisbury study was not scoped by any of the Yadkin relicensing IAGs and none of the resource agencies or other relicensing stakeholders were given an opportunity to review or comment on the resulting study report prior to its being submitted to APGI for consideration in the relicensing process.

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City of Salisbury, David Treme, 1/4/06	The recently published Alcoa Sediment Fate and Transport Report, standing alone, does not satisfy the study objectives related to project effects on sediment deposition patterns and resulting sediment and flooding impacts on Salisbury's municipal water supply intakes. The DLA should be revised to take into account the Salisbury Sediment-Flooding Report and the Salisbury Proposal, both of which are necessary to better identify patterns of sedimentation within High Rock Reservoir, evaluate how sediment deposition patterns in High Rock are impacting and will impact Salisbury's municipal water supply intakes (and related water and wastewater critical infrastructure), and to better evaluate sediment fate and transport qualitatively under existing and potential future operating scenarios. The DLA provisions related to sedimentation impacts should also take into account a separate Alcoa study that reveals that the Yadkin Project's store-and-release mode of operation tends to make the impoundment-induced sediment deposits (and resulting flooding effects) in upper High Rock Lake more permanent by promoting the establishment of tree seedlings (Avian Inventory Report Yadkin Project, FERC NO. 2197, Alcoa (December 2005) page 4).	Regarding the comment to consider the Salisbury Technical Report, and the Salisbury proposal, see the above response. Regarding the Avian Inventory, comment noted.
City of Salisbury, David Treme, 1/4/06	Although the DLA avoids discussion of adverse flooding effects of High Rock sediment deposition, it does discuss the High Rock sediment deposition in terms of habitat benefits (see DLA at p. E-4 (discussing the "delta area in the upper reaches of High Rock Reservoir") and DLA at p E-86 (discussing "deltas and islands formed by sediment deposits" and "large areas of sediment deposition which has created a complex of islands, deltas and sand bars" in the upper end of High Rock Reservoir).	Comment noted.
City of Salisbury, David Treme, 1/4/06	The DLA should be revised to provide for appropriate mitigation of adverse sedimentation and sediment-flooding project effects on Salisbury's municipal water supply and wastewater systems. Hydropower impoundments cause the formation of upstream sediment deltas in rivers where there would otherwise be none which intensifies flooding and flood impacts. We understand that the standard provisions to be used in the license for the Yadkin Project will include general language related to sedimentation, however, where specific adverse sedimentation effects caused by a project are identified the license should include requirements for specific mitigation measures. Appropriate mitigation would include at a minimum the following: 1. Flood-proofing of pump station area and WWTP 2. Immediate removal of sediment that jeopardizes the original water pump station intake 3. Annual sediment monitoring and sediment removal within 1,000 ft of original intake 4. Compensation of Salisbury for Alcoa's fair share of past and future sediment damage. Additional details on options for mitigation of adverse project sediment and sediment-flooding effects are summarized in Attachment 4 to Salisbury's comments (Sedimentation and Sediment-Flooding Mitigation Options).	APGI does not agree that it should be required to mitigate for effects on Salisbury facilities from flooding or sediment. As discussed in Exhibit E.1.8, APGI believes that the flooding that occurs in the vicinity of the Salisbury intakes is due to a number of hydraulic controls (see Appendix E-3). In addition, the Salisbury Technical Report provides no basis for determination of the impact of flooding at Grants Creek. APGI believes that sedimentation that occurs in the vicinity of the Salisbury facilities is due to upstream loadings of sediment, and is not a result of Project operations. For these reasons, APGI does not believe that it should be required to undertake specific remediation or to compensate Salisbury for the effects of flooding and sediment on its facilities.
City of Salisbury, David Treme, 1/4/06	The DLA should be revised to provide mitigation of the adverse effects on Salisbury's municipal water supply and wastewater systems of the un-neighborly management of the Yadkin Project and federal license): As discussed in the Salisbury Proposal (Attachment 2 to Salisbury's comments), Alcoa's approach to resource and license management has caused unnecessary costs and problems for Salisbury. The DLA should include provisions that will prevent or reduce the likelihood of these costs and problems recurring under the new license, as presented in the Salisbury Proposal. For example, the DLA should be revised to: 1. Provide for the collection and sharing of appropriate data and information. (see DLA at p. H-13 (no plans to change monitoring devices at High Rock dam). Inadequate Alcoa data collection and data sharing hinder Salisbury's efforts to minimize the adverse effects of the Yadkin Project on Salisbury's water and wastewater systems. Alcoa should also explain why the partial historical lake level data that Alcoa has shared with Salisbury includes many observations at precisely 655	APGI's approach to resource and license management has been and will continue to be entirely appropriate and consistent with all FERC requirements. However, APGI recognizes that Salisbury has a number of concerns related to flooding and sedimentation in and around the City's water intakes upstream of High Rock Reservoir. APGI has made numerous efforts both within and outside of the relicensing process to address these issues. Some are the subject of current negotiations with Salisbury while others are not the responsibility of the holder of a FERC license to generate hydropower. APGI notes that the revised Exhibit E and Appendix E-3 provides new and revised information concerning the flooding and sedimentation issues raised by Salisbury. In response to the specific points raised herein, APGI notes that:

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	Yadkin Datum, some at 654.99, but never any observation at 655.01 or above. 2. Provide for the correction of Exhibit K to the FERC license for the Yadkin Project, which incorrectly depicts Salisbury's Water Pump Station facilities and property boundary, as discussed in Attachment 3 to Salisbury's comments. 3. Provide for the sale to the City of Salisbury at fair market value (or donation) of two Alcoa property in-holdings that interfere with water and sewer planning. 4. Provide for the establishment of two utility corridors (with advance approval of utility work within corridors). 5. Provide for stream-lined approvals of utility work outside utility corridors. 6. Include a statement of the conditions that would prompt Alcoa to initiate litigation to resolve water rights issues. The statement will allow Salisbury to include time/cost for litigation in its municipal water supply planning. Salisbury has had to bear the costs of defending against Alcoa demands for Salisbury to pay Alcoa for water withdrawals even though (1) Salisbury owns its own water rights under North Carolina law, (2) the Pump Station pre-dates (and does not benefit from) High Rock Lake, and (3) Alcoa has never acquired any of Salisbury's water rights. 7. Include a provision that expressly states that Alcoa shall exercise care to ensure accuracy when communicating license requirements to third parties. Salisbury experienced project delay, cost, and lost man-hours obtaining FERC corrections of incorrect license interpretations by Alcoa. 8. Provide for the relocation of an access area that adjoins the Water Pump Station. (see DLA p. E-132). Pump station damage and on-going security problems are caused by a poorly sited boat ramp and parking area that Alcoa includes in its inventory of public access areas.	1. APGI and Salisbury are in current discussions about improved collection and sharing of appropriate data by both parties. 2. APGI will provide an Exhibit G (formerly Exh. K) to FERC that meets all regulatory requirements. 3. APGI is currently in discussions with Salisbury about the disposition of certain Alcoa property in-holdings in the vicinity of its intakes. 4. APGI is currently in discussions with Salisbury about the establishment of two utility corridors. 5. APGI is currently in discussions with Salisbury about streamlined approvals of utility work outside utility corridors. 6. APGI is currently in discussions with Salisbury about the conditions that would prompt Alcoa to initiate litigation to resolve water rights issues. 7. APGI has consistently exercised care and accuracy when communicating license requirements to third parties. Any assertion to the contrary is unsupported by the record. 8. APGI is willing to advocate the relocation of the public access area that adjoins the Salisbury Water Pump Station to the current owners of the land (see further response, below).
	SHORELINE EROSION	
Environmental Protection Agency, Heinz Mueller, 1/4/06	The Reservoir Fish and Aquatic Habitat Assessment Final Report included field mapping efforts to identify areas of significant erosion throughout the Project. The report identified nearly 11 miles of areas of significant shoreline erosion, 85 percent of which was identified around High Rock (which has 65 percent of the total Project shoreline). This suggests that the historical (and proposed future) operations at High Rock are likely a contributing factor to the excessive shoreline erosion found throughout the reservoir. This information was not included in the DLA and should be summarized in the FLA, including new measures to mitigate these Project-related impacts. USEPA suggests mitigation for this operational effect by enhancing the shoreline stewardship program or creating a habitat enhancement program designed to restore some of these degraded shoreline areas.	APGI believes that erosion of the reservoir shoreline is a naturally occurring phenomenon resulting from wave action upon the land. All owners of property adjoining the reservoir have to expect some amount of shoreline erosion over time. Prevention of severe erosion is the responsibility of the owner of the property adjoining the reservoir. To the extent that particular circumstances demonstrate the need for shoreline stabilization, APGI allows the installation of shoreline stabilization measures, as outlined in the Yadkin SMP.
	FISH, WILDLIFE, BOTANICAL	
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	State and federal agencies are currently engaged in developing a Diadromous Fish Restoration Implementation Plan that will include provisions for instream flows and evaluations of upstream habitats which may benefit diadromous fish if upstream access is provided. The implementation plan will follow a sequential approach, with simultaneous restoration steps, as outlined in the federal and state agency Restoration Plan for the Diadromous Fish of the Yadkin and Pee Dee Rivers, North and South Carolina. Our hope is that we could reach a settlement agreement in which APGI would contribute to a basinwide restoration effort guided by both the basin plan and the agency implementation plan for restoring migratory fishery resources in the Yadkin-Pee Dee River Basin.	APGI has revised Exhibit E to update its discussion of the Diadromous Fish Restoration Implementation Plan. APGI is proposing to work in consultation with the USFWS and other fishery agencies to develop a Diadromous Fish Passage Plan for the Yadkin Project which is consistent with the goals of the Diadromous Fish Restoration Plan, and which will be filed with FERC.

Agency/ Party Date	Comment	Response
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	The Service is concerned about the potential for significant loses of fishery resources through the operation of the four hydroelectric facilities and the potential for subsequent entrainment and mortality of all life stages of fish found in the project reservoirs. We did not find in Exhibit E of the DLA, a reference to entrainment and mortality of fishery resources, and recommend that the issue be discussed in detail in the final application to FERC.	Exhibit E.3.1.2.3 discusses the potential for fish entrainment and mortality at the Yadkin Project.
The Nature Conservancy, Eric Krueger, 1/3/06	Exhibit E.3 contains a great deal of excellent information on the natural resources of the Yadkin Project, and The Nature Conservancy is in general agreement with its conclusions.	Comment noted.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.1.1.5: NCWRC is awaiting the results of the Habitat Fragmentation study before making any specific comments or recommendations. Should habitat fragmentation be shown to adversely affecting any species then NCWRC would expect APGI to contribute to the monitoring and restoration of that species.	The Habitat Fragmentation Study results have been added to Exhibit E.3.1.1.5. Although factors exist that could have fragmentation effects on certain populations of aquatic species, the study was unable to discern any specific patterns of fragmentation among species, nor to attribute fragmentation to any particular cause.
SaveHighRock Lake.org, Robert Petree, 1/4/06	Member concerns also included the apparent misrepresentation of available high quality aquatic habitat at High Rock under the proposed operating guide. If only 21% of the habitat in the top 12 ft of High Rock was considered high quality, it is inconceivable that 19% of that habitat would be available at a 10 ft drawdown.	Exhibit E.3.13 has been revised to reflect correct percentages.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.2.5 Agency Recommendations: The NCWRC recommends the following: 3. APGI will provide a continuous minimum flow below Falls dam. Several mussel species are found in this area, however the NCWRC is concerned about the lack of evidence showing reproduction is occurring in these mussel populations. Together, these actions along with providing a continuous minimum instream flow below Falls Dam will protect and improve conditions for aquatic life. In addition to problems with the mussels, the fish community data in the DLA indicate the lack of minnow, darter and sucker species in the tailwaters.	Regarding the recommendation that APGI provide a continuous minimum flow below Falls Dam to enhance mussel reproduction, APGI does not agree. There is no evidence in any of the studies conducted by the licensees (APGI or Progress Energy) that the lack of a continuous minimum flow at Falls Dam is adversely impacting mussels or mussel reproduction. Nor has NCWRC provided any information or data that suggest that either 1) mussel reproduction is not occurring in the Falls tailwater, or 2) that providing a continuous minimum flow at the dam will enhance mussel reproduction.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project tailwaters: 5. APGI will restore mussels in all tailwaters after the flow regime and water quality improvements are made. If this is not successful, APGI will restore mussels in suitable tributary streams in the Yadkin – Pee Dee basin in North Carolina.	APGI proposes to work with NCWRC to periodically monitor mussel populations and reproduction in the four Project tailwaters. The focus of the monitoring effort will be to examine mussel population response to anticipated improvements to tailwater DO conditions. Exhibit E.3.6.2.2 has been revised to reflect this proposal.
The Nature Conservancy, Eric Krueger, 1/3/06	Pages E71-72 Effects on freshwater mussels: While fair to note mussel habitat differences among tailwaters, TNC asserts that APGI is more correct in assigning the differences in mussel diversity among tailwaters to differences in DO conditions. A large body of peer-reviewed research supports strong links between reduced DO and losses in mussel diversity. Habitat use by mussels varies considerably among species. Assuming DO and other requirements aside from physical habitat are satisfied, one would expect *different species* among different habitats, but not necessarily fewer species. A more likely secondary cause of mussel absence below the High Rock and Tuckertown facilities are the occasionally high ammonia (NH_3) levels observed in the tailwater water quality data. These ammonia spikes appear relatively absent from Narrows and Falls tailwater data (note: TNC did not exhaustively review all water quality data for this parameter). Peer-reviewed research on mussel tolerances to ammonia produce LC_{50} results at .010 to .050 mg/L levels; levels in the project tailwaters are occasionally well over 0.100 mg/L.	Comment noted. Exhibit E.3.1.2.2 has been revised to reflect the information provided by TNC.

Agency/ Party Date	Comment	Response
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project reservoirs: 2. APGI will monitor and mange hydrilla, other aquatic invasive plant species, and exotic invasive animal species such as the Chinese mystery snail in consultation with the NCWRC and others.	Comment noted. APGI is proposing to work in cooperation with resource agencies to monitor invasive, exotic aquatic species in the Yadkin Project reservoirs.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project tailwaters: 4. APGI will prepare management plans for RTE aquatic species within 2 years of a new license.	Comment noted. APGI is proposing to prepare an RTE Species Management Plan in consultation with the resource agencies.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.2 Agency Recommendations for Wildlife: The NCWRC recommends the following: 1. APGI will manage the project transmission line corridors for quail and other early successional species. This can be accomplished by planting native, warm-season food plants. 2. APGI will protect the wetlands, streams and ponds located on the transmission line corridors and elsewhere within the project boundary. 3. APGI will continue the bald eagle and heron nesting surveys.	Comments noted. Regarding bald eagles, APGI is proposing to continue its annual bald eagle and great blue heron nesting surveys. Regarding management of wildlife and habitat on the Yadkin Project transmission lines, APGI is proposing to develop a Transmission Line Corridor Management Plan in consultation with NCWRC and other resource agencies.
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	Some protection mechanism and maintenance protocols should be developed for maintaining the transmission line corridors, and should exclude the use of pesticides or other detrimental practices.	Comment noted – see above response.
The Nature Conservancy, Eric Krueger, 1/3/06	Table E.3-15 misidentifies the federal status of two listed plant species, *Helianthus schweinitzii* and *Solidago plumosa*. In both cases, the protective status of the species is greater than what is shown in the table.	Exhibit E.3.4 has been revised to reflect the correct federal status of these species.
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	The federally threatened bald eagle, *Haliaeetus leucocephalus*, is known to utilize the project reservoirs and tributaries for roosting, feeding, and nesting. The Service has expressed concern about the potential for the bald eagle to be impacted by continued shoreline development around project reservoirs and the subsequent increase in human disturbance. APGI, in coordination with the Service, has developed a Bald Eagle Management Plan (BMP), and a Shoreline Management Plan (SMP) that addresses these issues. Both of these plans are designed to protect, to the extent practicable, the quality of the undeveloped portions of the reservoirs while allowing for controlled development in other, less critical, areas of the reservoirs. Transmission line corridors on project lands have been identified as providing important habitat and they provide openings preferred by some protected plant species. The management of these areas is important for their continued protection. The Service recommends that both the BMP and the SMP as are currently utilized, be incorporated into the final license application so that they can continue through the next license term.	APGI is proposing to make modifications to the existing Shoreline Management Plan to address many issues that were brought forward through the relicensing process. APGI will work in close consultation with the U.S. Fish and Wildlife Service (USFWS) and other wildlife agencies to ensure that relevant provisions of the Bald Eagle Management Plan are carried forward in the revised Shoreline Management Plan that will be filed with FERC.
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	In addition to the bald eagle, there are many migratory birds that utilize both project waters and lands. These species include herons, waterfowl, resident and neo-tropical migratory song birds. Many of the project lands provide ideal habitats for these species and the Service is interested in the enhancement, protection and preservation of these areas through the relicensing process. APGI has completed an Avian Inventory for the project as we requested and the results of the study will be used as we move forward through the negotiated settlement process and the FERC three stage traditional relicensing process.	Comment noted.

Agency/ Party Date	Comment	Response
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project tailwaters: 6. APGI will contribute to the restoration of robust redhorse and Carolina redhorse in the Yadkin – Pee Dee basin in North Carolina. If this is not successful, APGI will contribute to the removal of unnecessary dams in the Yadkin basin in North Carolina.	APGI does not agree with this recommendation. Neither the robust redhorse or Carolina redhorse occur in Yadkin Project waters, nor is there any significant habitat within the Project that is suitable for these fish. Most of the occurrences of these species are in the free-flowing Yadkin-Pee Dee River downstream of the Blewett Falls development. APGI believes that with its proposal for a 900 cfs year round, weekly average minimum flow, it will be supplying sufficient volume of water on a weekly basis for flow releases from Blewett Falls to support habitat for the redhorse species (see Exhibit E.3.1.2.4). Such flows will significantly enhance habitat conditions for the redhorse species, and no additional restoration efforts should be necessary.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	Exhibit E.3.5.1 Agency Recommendations for Fish and Aquatics: The NCWRC recommends the following for project reservoirs: 4. APGI will establish and fund a Habitat Enhancement Program to improve fish and aquatic habitat conditions in the reservoirs. The fund would be used to install things like fish friendly piers, large woody debris, aquatics vegetation, etc.	APGI is proposing a comprehensive package of protection, mitigation and enhancement measures designed to address ongoing Project impacts to Project resources including fish and aquatic habitat. APGI does not agree that additional mitigation, in the form of an enhancement fund, is necessary.
	RECREATION	
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.5.1.1 – Agency Recommendations Public Recreational Facilities The NCWRC recommends the following: 1. An ADA compliant public fishing access (PFA) be constructed on the Rowan County side of High Rock Lake. 2. An ADA compliant PFA be constructed on Tuckertown Reservoir. 3. In the likely event that the Highway 49 boating access is lost due to road widening, APGI should construct a new boating access area on the southern end of Tuckertown Reservoir.	APGI has revised its proposal for the upgrade or addition of public recreation facilities to be made at the Yadkin Project over the term of the new license. Specific descriptions of the facilities to be added and/or upgraded, along with a schedule for completion of this work, will be detailed in a Recreation Plan for the Yadkin Project, which will be developed by APGI in consultation with resource agencies and municipalities and filed with FERC.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.5.2- Agency Recommendations Opportunities for the Handicapped The NCWRC recommends all boating access areas maintained by APGI become ADA compliant.	APGI is proposing to upgrade several public recreation access areas located throughout the Yadkin Project to make them ADA compliant. However, due to specific site conditions, not all facilities can reasonably be made ADA compliant. As part of its proposed Recreation Plan, APGI will consult with resource agencies on which facilities can and will be made ADA compliant.
NC Division of Water Resources, Steven Reed, 1/4/06	NCDWR encourages APGI to consider additional recreational enhancements as the final license application is developed. Providing additional opportunities for non-motorized boating, swimming, picnicking, primitive camping, and reservoir related trails would strengthen the application. NCDWR feels that the lands NCDENR has identified for the expansion of Morrow Mountain State Park along the west side of Falls Reservoir could provide many of these types of recreational opportunities for a wide range of users. The conservation of these lands is a high priority for NCDENR and would provide significant public benefits.	Regarding recreational enhancements, APGI believes that its proposals for adding new recreation facilities and upgrading existing facilities will provide considerable public recreation enhancement at the Project. Because public recreation needs are and will continue to be met at the Yadkin Project, there is no need to consider additional recreational facilities on non-Project lands.
U.S. Forest Service, Raymond Johns, 12/20/05	Throughout Exhibit E.5, Kings Mountain Point Day Use Area is referred to as the Uwharrie National Forest (UNF) Walk-in Fishing Pier and UNF King's Mountain Point Walk-in Fishing Pier. As the recreation area is scheduled to open this summer, it should be consistently named throughout the DLA and the facilities (Table E.5-1, Table E.5-6, Table E.5-7 and Table E.5-27) reflect the following attributes: 3 fishing piers, 1 swimming area, 1 picnic area, condition: new, and fully ADA accessible to include trail system, picnic tables, fishing piers, toilets, and pavilion.	Comment noted. Exhibit E has been revised to reference the UNF Kings Mountain Point Day Use Area consistently. The inventory of facilities at the access area has also been revised to reflect the new facilities.
U.S. Forest Service, Raymond Johns, 12/20/05	Email from Dave Wright dated December 16, 2005, noted specific facilities that should be included in the final recreation study, including Kings Mountain Point Day Use Area, Badin Lake Campground, and Deep Water Trail access area. Including the proper descriptions of each area in the FLA will ensure that FERC has the most recent information.	Comment noted. Exhibit E has been revised to include updated facility descriptions.

Agency/ Party Date	Comment	Response
U.S. Forest Service, Raymond Johns, 12/20/05	Table E.5-13 should be updated to reflect that Badin Lake Campground has been reconstructed and was opened to the public this year. The toilets have been replaced and meet ADA standards.	Comment noted. Exhibit E has been revised to reflect these recent changes.
U.S. Forest Service, Raymond Johns, 12/20/05	Exhibit E.5.9 Agency Recommendations: The U.S. Forest Service (USFS) has brought forward a proposal regarding operation and maintenance of recreation facilities on National Forest System lands that provide direct access to the Project (this proposal is attached to comments). The USFS proposal should be considered a formal request and included in this section of the DLA. Specific items from this proposal include: 1) USFS facilities that have been improved or will be improved prior to expiration of current FERC license (therefore no further improvements will be needed) include Holts Cabin, Badin Lake Group Campground, Kings Mountain Point, Badin Lake Campground, Cove Boat Ramp, Arrowhead Campground and Badin Lake Trail System; 2) USFS proposes that APGI reevaluate facilities to determine condition and compliance with USFS standards when facility reaches 20 years of age. Upon determining that the facility does not meet USFS standards, the USFS proposes that APGI fund 50 percent of all construction costs including design, environmental reviews, and compliance and construction costs on a cost-share basis with the USFS. 3) The USFS proposes that APGI evaluate the Deep Water Camp Access Area and fund 50 percent of all construction costs on a cost-share basis with the USFS (Deep Water Camp Reconstruction costs - $171,000). 4) Nothing shall preclude the use of established mechanisms for monitoring growth in recreation facility demands such as the FERC Form 80, NCSCORP, and USFS recreation use monitoring to establish recreation facility needs. The USFS proposes that APGI fund 50 percent of these needs on a cost-share basis with the USFS. 5) USFS proposes that APGI provide 50 percent funding for direct O&M costs of recreation areas providing direct access to the Project (Holts Cabin, Badin Lake Group Campground, Kings Mountain Point, Badin Lake Campground, Cove Boat Ramp, Arrowhead Campground, Deep Creek Access, and Badin Lake Trail System (O&M Costs for Narrow Reservoir Sites - $107,936). 6) USFS proposes APGI committing to fund 100 percent of a shoreline stabilization program within the first 5 years of license issuance.	APGI does not agree with all of these USFS recommendations. Of the recreation facilities located in Uwharrie National Forest that provide direct access to the Yadkin Project (Holt's Cabin, Badin Lake Campground, Cove Boat Ramp, Kings Mountain Point, the Badin Lake Hiking Trail, and Deep Water Trail), nearly all have been significantly upgraded and improved by the USFS within the last few years. APGI will monitor these facilities and their use throughout the term of the new license through the FERC Form 80 process. At such time that periodic use monitoring indicates that recreational use needs at facilities in Uwharrie National Forest are not being met, APGI will work with the USFS and other resource agencies to determine how those needs can be met. The Arrowhead Campground and Badin Lake Group Campground do not provide direct access to Project lands and/or waters. Regarding the Deep Water Camp Access Area (aka, Deep Water Trail), APGI does not agree that all of the improvements recommended by USFS are needed. Nor does APGI feel that it is responsible for these improvements (see Exhibit E.5.16). Regarding facility O&M, APGI does not agree that it is responsible for 50 percent of the cost of UNF facility operation and maintenance. Regarding USFS concerns about erosion impacts to UNF recreation facilities, APGI believes that erosion of the reservoir shoreline is a naturally occurring phenomenon resulting from wave action upon the land. All owners of property adjoining the reservoir, including the USFS, have to expect some amount of shoreline erosion over time. Prevention of severe erosion is the responsibility of the owner of the property adjoining the reservoir. To the extent that particular circumstances demonstrate the need for shoreline stabilization, APGI allows the installation of shoreline stabilization measures, as outlined in the Yadkin SMP.
U.S. Fish and Wildlife Service, Pete Benjamin, 1/27/06	The Service is concerned that bank fishing access to tailwater areas is becoming unnecessarily restricted. These areas have traditionally provided access to prime recreational fishing of the tailwaters, particularly during the Spring when striped bass, and white bass congregate below the dams. While we understand the need to provide security at the dam structures, we believe that both a high level of security and recreational fishing can be achieved in the new license for the project. Riverine recreation has been severely limited by the construction of the reservoirs and bank access to project waters is limited. The Service recommends that APGI maintain the traditional tailwater access that the public has enjoyed in the past, especially, the access at High Rock Dam and Tuckertown Dam. We would like to see enhancements and more access provided for tailwater access as well as facilities that are in compliance with the Americans with Disabilities Act (ADA).	APGI is proposing improvements to the existing tailwater fishing areas at High Rock and Tuckertown Dams. Exhibit E.5.11.1 has been updated to reflect this proposal.

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City of Salisbury, David Treme, 1/4/06	The DLA should also be corrected to reflect that Mr. and Mrs. Milton Crowther own the access area adjoining the Water Pump Station, not Rowan County. DLA p. E-162.	Exhibits E.5.10, E.5.11, and E.5.12 have been updated to reflect private ownership of this access area.
NC Wildlife Resources Commission, Todd Ewing, 1/4/06	E.5.3- Agency Recommendations Public Safety Measures The NCWRC recommends that APGI construct a boat house/boat ramp for use by emergency and law enforcement personnel on High Rock and Narrows Reservoir. This would allow for rapid response on these high-use reservoirs.	APGI does not agree that such a facility is needed. APGI provides funding to local governments to support additional law enforcement patrols at the recreation areas and local swimming safety programs. Over the past several years, APGI has donated patrol boats to Stanly, Montgomery, and Davidson counties. Yadkin has also provided throw bags to county law enforcement departments available for use in their boats. APGI has also provided funds to the US Coast Guard Auxiliary sites on High Rock and Narrows. As a result of these efforts, APGI does not believe that additional enforcement facilities such as those recommended by NCWRC are necessary.
SaveHighRock Lake.org, Robert Petree, 1/4/06	Over 95 percent of [the SHRL.org] members making comments were concerned primarily with the proposed Operational guidelines included for each of the impoundments. These include: 6) the apparent disregard of recreational safety concerns associated with excessive water level fluctuations,	Recreational safety at the Yadkin Project is very important to APGI. APGI has an active “Play it Safe on the Lakes” campaign, which focuses on boating and swimming safety at the Project reservoirs. In addition to the warning signs, “no wake” and “no boat” signs, and buoy lines, and lights included in APGI’s Public Safety Plan, APGI also provides safety equipment (rescue throw bags, signs, telephones, etc.) at all of its swimming areas. As stated above, APGI provides funding to local governments to support additional law enforcement patrols at the recreation areas and on the reservoirs. Finally, the NCWRC is responsible for marking boating hazards within the Project reservoirs, and requests for additional buoys or “no wake” zones should be directed to the NCWRC.
	NON-PROJECT LANDS	
U.S. Forest Service, Raymond Johns, 12/20/05	Exhibit E.5.9 Agency Recommendations: The Forest Service has brought forward a proposal regarding operation and maintenance of recreation facilities on National Forest System lands that provide direct access to the Project (this proposal is attached to comments). The USFS proposal should be considered a formal request and included in this Exhibit of the DLA. Specific items from this proposal include: 7) Should there be a need to include a tract of land for direct Project-impacts, the USFS would be interested in acquiring by donation the small island located directly west of USFS recreation areas on Narrows Reservoir 8) USFS proposes that APGI either petition FERC to modify the Project boundary to include a non-Project strip of land that lies between the Project and USFS lands or that APGI donates in fee-simple to the USFS this strip of non-Project lands.	APGI is proposing a comprehensive package of protection, mitigation and enhancement (PME) measures that are designed to directly and indirectly address ongoing Project impacts to natural, recreational and cultural resources. APGI does not agree that additional protection of non-Project lands is necessary for the purposes of operating the Project or as an additional PME measure.
The Land Trust for Central North Carolina, Jason Walser, 1/3/06	Alcoa owns nearly 15,000 acres in and around the Project Area. The Land Trust feels strongly that the land conservation issue must be addressed by Alcoa if it is serious about helping solve water quality problems and continuing to foster thriving ecological systems in the Yadkin River Basin. Alcoa has contributed to healthy wildlife habitat and improved water quality by the historical use and management of these lands. The Land Trust requests that Alcoa address conservation of both Project and non-Project Lands in its final application for the new license. As reflected in the DLA, the Project Area is rich in aquatic and terrestrial wildlife thanks to the undeveloped areas outside of the Project Area owned by Alcoa that provide ample breeding,	See above response.

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	feeding, and buffering areas for such wildlife to flourish. If these important natural areas were to be turned into golf course communities after receipt of the new license, almost every aspect of this DLA would be affected.	
The Land Trust for Central North Carolina, Jason Walser, 1/3/06	Although given some mention in the DLA, the Land Trust does not think that the varied requests for conservation were given adequate consideration or explanation in the DLA. For instance, Davidson County's unanimous resolution of its Board of Commissioners to seek permanent conservation of Alcoa's lands to continue water quality, aesthetic, and recreational benefits to the county was barely mentioned. Similarly is Rowan County's formal request for additional recreational opportunities on some of APGI's Non-Project Land, or the Division of Water Quality's strong recommendation in its Basin Wide Management Plan for permanent conservation on large undeveloped tracts along the Yadkin and South Yadkin Rivers such as those owned by Alcoa.	See above response.
	CULTURAL RESOURCES	
Trading Ford Historic District Preservation Association, Ann Brownlee, 1/3/06	While APGI made a pretense of identifying all historic properties eligible for, or listed on, the National Register of Historic Places within its project area, the fact is that APGI's National Register of Historic Places Eligibility (NRHP) Study Final Report was not nearly comprehensive enough to accomplish that. Regarding cultural landscapes, the APGI NRHP Study was a "reconnaissance level" survey from the Trading Ford area to the south end of the APGI project area. No survey was done at all from the Trading Ford area to the north end of the project area, and the survey which was done was superficial. Most of the potentially or possibly eligible cultural landscapes were not examined or evaluated for National Register eligibility.	APGI does not agree with comments that suggest that its cultural resource studies were inadequate. APGI developed the NRHP Eligibility Study Plan in consultation with the Cultural Resources IAG. Members of the CRIAG included the North Carolina State Historic Preservation Office (North Carolina Department of Cultural Resources), the USFS and the Trading Ford Historic District Preservation Association (TFHDPA). The study was carried out in accordance with the agreed-upon study plan. The study included a survey of all historic elements within the Project area, including the Trading Ford area. Moreover, in conducting its evaluation of the Trading Ford area, APGI's consultant met several times with Ms. Ann Brownlee of the TFHDPA to review documents, materials, and reports and to visit numerous sites in the field.
Trading Ford Historic District Preservation Association, Ann Brownlee, 1/3/06	The Cultural Resources Probability Model was developed solely to predict the likelihood of the presence of Native American archaeological sites. It made no attempt to predict the probability of historic archaeology or cultural landscapes. The Shoreline Management Plan also focuses solely on protecting Native American archaeological resources, not historic archaeological resources or cultural landscapes.	Comment noted. APGI is proposing to revise the Cultural Resource Probability Zones that are referenced and used in the Yadkin Shoreline Management Plan to include any cultural landscapes determined to be eligible or potentially eligible for listing on the National Register of Historic Places (see Exhibit E.4.3).
Trading Ford Historic District Preservation Association, Ann Brownlee, 1/3/06	APGI did not solicit information on historic resources from the general public, and made participation in its licensing process restrictive and prohibitive. The Cultural Resources IAG met only a few times, with APGI calling the meetings and setting the agendas. Consequently, participation by IAG members, or the general public, was extremely limited. APGI needs to glean information on historic features from the people who live around the Yadkin Project area.	APGI believes that it has fulfilled its Section 106 consultation obligations, as they apply in the FERC relicensing process. At the outset of the relicensing process, APGI established the Cultural Resources IAG. As with all the IAGs, agencies and other organizations that had an interest in cultural issues were allowed to join the IAG, as was the Trading Ford Historic District Preservation Association. The Cultural Resources IAG met three times (8/27/03, 11/5/03, and 10/6/04) to discuss cultural resources issues, scope relicensing studies and review study reports.
Trading Ford Historic District Preservation Association, Ann Brownlee, 1/3/06	The inadequacy of APGI's NRHP Eligibility Study and DLA to address the effects of its undertaking on historic properties can reasonably be predicted to adversely impact cultural resources during the license period: • When Section 106 surveys are done for other projects within or near the project area. As was the case with the Linwood Yard, where a Section 106 survey was required because of the involvement of project lands, the failure to previously identify historic events in the area led to the perpetuation of the previous omissions. There are already two such examples in the Trading Ford area. o APGI and NCDOT share jurisdiction over historic properties. APGI's failure to	Many of the issues raised by TFHDPA are outside of the FERC relicensing process and are a result of concerns about the potential effects of the Interstate 85 bridge reconstruction project being considered by the North Carolina Department of Transportation (NCDOT). Outside of FERC relicensing, under the Yadkin Shoreline Management Plan, APGI has a rigorous process in place to consider potential impacts to cultural resources that may be affected by shoreline construction or other activities proposed within the Project boundary (e.g., dredging, pier construction, etc.) and 100' inland from any reservoir shoreline. As stated above, APGI is proposing to

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<tr><td></td><td>protect, or even evaluate, historic properties within the project area has allowed NCDOT sole discretion in the case, and left the door open for possible abuse of the Section 106 process.
o Since the APGI NRHP study was completed, Duke Power has announced plans to build a new power plant at the Trading Ford. APGI's failure to recognize, or even evaluate, the historic properties there has left the door open for possible abuse of the Section 106 process.
• When private development adjacent to the project area occurs. There are plans to build a housing development on the land between North and South Potts Creeks, south of the Linwood Yard in Davidson County. The proposed Trading Ford Historic District goes across this peninsula, following the Cape Fear and Trading Path historic roads. These historic roads are extremely significant, both in terms of their historic importance, and in terms of the impressive roadbeds which are extant. They are the Davidson county equivalent of the "Road to the Trading Ford" in Rowan County which APGI did recommend to be eligible for the National Register. The only difference between the Rowan county road which was recommended to be eligible and the Davidson county road which was not is that the APGI consultant looked at the Rowan road and not the Davidson one. The shoreline of the peninsula is rated "high" on the APGI Cultural Resources Probability Model, and an EA would be required. However, without these roads being recognized, and without provision for cultural landscapes in the SMP, there's no predictable or reliable protection for these historic roads. Surely other historic resources within the project area would be similarly vulnerable.
• Flooding of historic properties in the Trading Ford area occurs when High Rock Lake is within the range of full pool to two ft (2') below full pool. While this has occurred only occasionally historically, in a departure from historic practice, it has occurred much more frequently within the past three years. The historic roads in these areas have not been evaluated by APGI for National Register eligibility, and are in danger of being lost to erosion. An incredible percentage of the proposed Trading Ford District is composed of APGI project lands (map is attached to comments).
• There has been discussion of dredging High Rock Lake. Should this be done without adequate guidance to the locations of all archaeological resources, historic as well as pre-historic, the results could be disastrous. While the Office of State Archaeology feels confident about their knowledge of pre-historic sites, certainly battlefields, fords, ferries, underwater raised rock roadbeds (one has been reported just downriver from the Trading Ford area) should also be included.
• APGI maintains the recreational York Hill Boat Access within the Battle at the Yadkin River Bridge (Civil War) battlefield, and within the Trading Ford District. Further, two historic roads are located within this property. The topography has not been significantly altered, but this does have some impact on the setting and feeling of these historic lands. There has been no consideration of the effects of APGI's recreational use of this historic property, nor was it evaluated for National Register eligibility.</td><td>revise the Cultural Resource Probability Zones that are referenced and used in the SMP to include any cultural landscapes determined to be eligible or potentially eligible for listing on the NRHP. The issue with NCDOT's plans to widen Interstate 85 where it crosses the Yadkin River in the vicinity of the Trading Ford area is an SMP permitting issue and not a FERC relicensing issue. Once NCDOT has successfully completed the requirements of APGI's SMP Industrial Permitting Procedures, APGI will give FERC a 45-day notice of the proposal, as typically done.

In response to concerns about the impact of High Rock reservoir elevations and flooding on historic properties, APGI has operated High Rock Reservoir in a consistent manner and in full compliance with its FERC license (a letter dated July 26, 2006, and filed with FERC provides additional detail).

Finally, the potential impact of recreational use at the York Hill Boat Access Area was identified as an issue late in the relicensing process. The potential for recreational impacts to historic properties at this site will be considered during APGI's development of a Historic Properties Management Plan.</td></tr>
<tr><td>Trading Ford Historic District Preservation Association, Ann Brownlee, 1/3/06</td><td>The following needs to be accomplished as part of APGI's relicensing:
1. Cultural landscapes and historic archaeological sites within and adjacent to the APGI project area and managed buffer need more thorough study, evaluation, and protection under APGI's license. This could be accomplished by carrying out a more complete NRHP study and/or setting up a continuing method for reporting, evaluating, documenting, and recording cultural landscapes in or affected by the project area (this should be flexible, and have the ability for information to be added and updated along with actively soliciting information from local</td><td>A point-by-point response to these comments is provided below:

1. APGI believes that it has fulfilled its Section 106 consultation obligations, as they apply in the FERC relicensing process, and no additional surveys or studies are planned.
2. As stated above, APGI is proposing to revise the Cultural Resource Probability Zones that are referenced and used in the SMP to include any</td></tr>
</table>

Agency/ Party Date	Comment	Response
	historic organizations and individuals). 2. Inclusion of historic sites and cultural landscapes in the Cultural Resources Probability Model. 3. Inclusion of protective and mitigative measures for historic sites and cultural landscapes in APGI's Shoreline Management Plan. 4. Evaluation of the National Register eligibility of the area where the York Hill Boat Access is located, and the effect of APGI's recreational use of this facility on the historic property. 5. Revise Exhibit "B.2.1.2 Proposed Operations" to avoid High Rock Lake levels which would be damaging to cultural landscapes, i.e., avoid High Rock Lake levels higher than two ft (2') below full pond. Should avoiding this flooding completely not be possible, other methods to protect these historic properties should be investigated and adopted.	cultural landscapes determined to be eligible or potentially eligible for listing on the NRHP. 3. APGI's SMP has a rigorous process in place to consider potential impacts to cultural resources that may be affected by shoreline construction or other activities proposed within the Project boundary and up to 100' inland from any reservoir shoreline. 4. Regarding the potential impact of recreational use at the York Hill Boat Access Area, see above response. 5. Regarding the potential impact of Project reservoir operations on historic properties, see above response.
	COMPREHENSIVE PLANS	
City of Salisbury, David Treme, 1/4/06	The DLA should add the North Carolina State Water Supply Plan to the list of North Carolina comprehensive plans.	Exhibit E.7 has been revised to include the North Carolina State Water Supply Plan.
SC Department of Natural Resources, Robert Duncan, 1/3/06	A number of methods are being used to determine the levels of instream flows needed to protect South Carolina's interests. The Instream Flow Incremental Methodology (IFIM), as well as guidance from the South Carolina Water Plan (2004), Instream Flow Study-Phase II (1988) and South Carolina Instream Flow Studies (1989), are being employed to identify suitable flows for aquatic habitat for resident and migratory species. Navigation flow needs are being determined through use of the method and criteria described in the South Carolina Water Plan and Instream Flow Study-Phase II. Flows needed to meet water supply and wastewater assimilation requirements are determined through studies conducted by the Pee Dee River Coalition. Salinity intrusion prevention flows are being identified through use of a salinity intrusion model developed by the U.S. Geological Survey, with funding provided by the Pee Dee River Coalition, Progress Energy, APGI and SCDNR. It was determined by SCDNR that flows needed to protect aquatic habitat and navigation would also be sufficient to protect the integrity of the Pee Dee State Scenic River and the Great Pee Dee River Heritage Preserve.	Comment noted. APGI further notes that the instream flow study work on the Yadkin/Pee Dee River was initiated and managed by Progress Energy (PE) in the relicensing of the Yadkin Pee-Dee River Project (FERC No. 2206). PE's License Application for Project No. 2206 will include significant information on the purposes and findings of the instream flow study.
	CONSULTATION RECORD	
City of Salisbury, David Treme, 1/4/06	The DLA should make the consultation record more complete by incorporating Salisbury's actual written comments rather than summarizing and characterizing the comments. The DLA consultation record related to Salisbury's written comments is incomplete and also labels some comments "miscellaneous." Attachment 5 to Salisbury's comments provides a set of representative examples of Salisbury written comments provided to Alcoa (to augment Alcoa consultation record) and is incorporated in and made a part of these comments.	The entire consultation record, including all written comments (letters and emails), is appended to this License Application (Appendix E-25).
	EQUAL CONSIDERATION	
High Rock Lake Association, Larry Jones, 1/3/06	The DLA seems to indicate Alcoa never intended to compromise, in the least, its ability to maximize revenues from hydropower generation. The generation models made public to date show operation per Alcoa's DLA mode would limit revenues annually by about $260,000.00 compared to a theoretical "base case." By way of contrast, a model of the HRLA proposed operating mode limited revenues by $1,150,000.00 annually. It seems Alcoa believes all the positive befits derived from stabilization of High Rock waters are not worth $890,000.00 average annual limitation on revenues. Limiting revenues from $41,000,000 to about $40,100,000.00 (approximately 2%) seems a very reasonable compromise, when economic studies show a huge benefit to the region which would result from changing the mode of operation of High Rock. There is simply no justification on a regional basis for Alcoa to continue its habit of "Store and Release" operations.	APGI notes that it has proposed a number of significant PMEs in the FLA that will reduce its ability to generate hydropower and that do not correlate to an intent to maximize generation revenues. APGI further notes that the Federal Power Act does not predicate licensing decisions on gains or losses in revenues but rather on the quantity and quality of PME investments made based on demonstrated, study-based need. APGI further notes that the cost figures for the FLA proposal have changed significantly from the DLA and are provided in the revised Exhibits D and E.

Agency/ Party Date	Comment	Response
SaveHighRock Lake.org, Robert Petree, 1/4/06	Over 95 percent of [the SHRL.org] members making comments were concerned primarily with the proposed Operational guidelines included for each of the impoundments. These include: 7) the apparent disregard of the conclusions of the scientific studies concerning Fish and Aquatics, Wetlands, Water Quality, Recreational opportunities and safety, Economic impacts and Visual Quality that are supposed to be the basis for licensing decisions, 8) the unequal considerations given to power generation verses recreation, fish and wildlife and environmental concerns as prescribed in the Electric Consumers Protection Act of 1986.	APGI did not disregard the results of the studies. Throughout the Application, and particularly in Exhibit E, study results and the impact of continued Project operations on resources are discussed at length. Moreover, in making its proposals for the continued operation of the Project, APGI has carefully considered the results of the resource studies.
SaveHighRock Lake.org, Robert Petree, 1/4/06	SaveHighRockLake.org feels that the present proposal for operations is totally unacceptable and must be modified significantly in order to begin to honor the terms specified in the Electric Consumers Protection Act of 1986. While High Rock Lake may be a large impoundment, the proposal must include consideration for the fact that it is a very shallow impoundment and is incapable of providing the flows specified in the DLA continuously. History has already demonstrated that the operating guidelines included in the DLA will result in extreme environmental devastation of aquatic habitat, continued water quality problems, increased sedimentation and present continuing problems to safe recreation.	Comment noted. APGI also notes that the Federal Power Act (as revised by ECPA) requires a consideration of power and non-power values, but does not prescribe any specific outcome. Consistent with the requirements of the Act, this License Application proposes a number of measures that will enhance aquatic habitat, address water quality problems, increase recreation opportunities and satisfy downstream water needs.
SaveHighRock Lake.org, Robert Petree, 1/4/06	The 8,000+ members of SaveHighRockLake.org feel that the operational proposals presented by the High Rock Lake Coalition would address these concerns. According to the results of the studies completed, High Rock provides more recreation days and recreational opportunities for the public than all three of the other impoundments in the project. It is also already listed as “Impaired” by the State of North Carolina. These two facts alone demonstrate that some special considerations must be given to High Rock in order to protect the environment and wildlife there as well as insuring the safety of the public. Almost every study correctly concluded that higher more stable water levels at High Rock would be beneficial to water quality, fish habitat, wetlands and aquatic vegetation, sedimentation, visual quality and recreational safety. We feel that any proposal must: 3. Fairly represent the results of the scientific studies to protect wetlands, aquatic habitat, water quality, area economic impact and recreational usage and safety.	In making its proposal for the future operation of High Rock Reservoir, APGI fully considered the results of the various scientific studies which are discussed throughout Exhibit E of this License Application. APGI acknowledges that its proposed operation of High Rock Reservoir may not produce optimum conditions for wetlands, fish and wildlife, but there will be enhancement of these resources under the proposed new guide curve. Further restrictions on reservoir water levels at High Rock will significantly reduce the value of High Rock as a storage and flow-regulation facility. The ability to store water and regulate flow from High Rock is valuable both for hydropower production and for downstream flow regulation and augmentation for purposes of enhancing water quality, aquatic habitats and recreation.
	MISCELLANEOUS	
City of Salisbury, David Treme, 1/4/06	The DLA's statement at page IS-2 that Alcoa "owns all of the lands necessary under North Carolina law to operate and maintain the developments of the Yadkin Project" requires clarification. Alcoa only owns flood rights at the Salisbury Pump Station up to an elevation of 623.9. However, as documented in the Salisbury Sediment-Flooding Report, the Yadkin Project operations presently cause water levels to regularly exceed Alcoa's maximum flood rights. By the end of a 30-year period under a new license, the frequency and severity of Water Pump Station flooding, and the probability of damage and loss, caused by the Yadkin Project will increase. The statement at IS-2 should be modified or explained.	APGI owns all the lands necessary under federal and North Carolina law to operate and maintain the developments of the Yadkin Project, including all necessary flood rights. APGI needs flooding rights only for flooding caused by the operation of the High Rock Dam. The operation of the High Rock Dam is not the cause of the flooding problems at the Salisbury Water Pump Station. For more information, see APGI’s response (Appendix E-3) to the Salisbury Technical Report (Appendix E-25).

Initial Statement

Initial Statement

Before the Federal Energy Regulatory Commission
Application for License for Major Project -- Existing Dam

(1) Alcoa Power Generating Inc. (APGI), Yadkin Division, herein referred to as the "Applicant," applies to the Federal Energy Regulatory Commission (FERC) for a new license for the Yadkin Hydroelectric Project (Project), FERC No. 2197, as described in the attached exhibits.

(2) The location of the Project is:

State or territory:	North Carolina
Counties:	Davidson, Davie, Montgomery, Rowan, and Stanly
Townships or nearby towns:	Albemarle, Badin, Denton, Granite Quarry, Lexington, Mocksville, Rockwell, Salisbury, and Troy
Stream or other body of water:	Yadkin River

(3) The exact name and business address of the applicant are:

Alcoa Power Generating Inc.
Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

The exact name and business address of the person authorized to act as agent for the applicant in this application is:

Mr. Brian S. Dahlberg
Vice President
Hydroelectric Operations
Alcoa Power Generating Inc.
Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

Primary Contact for relicensing:

Mr. Gene Ellis
Licensing & Property Manager
Alcoa Power Generating Inc.

Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

(4) The applicant is a domestic corporation and is not claiming preference under Section 7(a) of the Federal Power Act.

(5) (i) The statutory or regulatory requirements of North Carolina that affect the Project as proposed, with respect to bed and banks and to the appropriation, diversion, and use of water for power purposes, and with respect to the right to engage in the business of developing, transmitting, and distributing power in any other business necessary to accomplish the purposes of the license under the Federal Power Act, are:

APGI is not aware of any specific laws or regulations in North Carolina with respect to the bed and banks of the Yadkin River, or to the appropriation, diversion or use of the waters therein which are applicable to the Yadkin Project.

N.C.G.S. § 55-15-01 sets forth the requirements for a "foreign corporation" to conduct business in North Carolina.

(ii) The steps which the applicant has taken or plans to take to comply with the law cited above are:

North Carolina follows the riparian system of water rights, whereby the owner of riparian land possesses the right to use the waters passing over its lands reasonably, including temporarily impounding the water through the erection of a dam. See, e.g., Dunlap v. Carolina Power & Light Co., 212 N.C. 814, 823 (N.C. 1938) APGI owns all of the lands and riparian rights necessary under North Carolina law to operate and maintain the developments of the Yadkin Project.

APGI is a Tennessee Corporation, originally incorporated as Knoxville Power Company. It was domesticated in North Carolina in 1954.

(6) The name and address of the owner of existing Project facilities:

Alcoa Power Generating Inc.
Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

(7) Person, citizen, association of citizens, domestic corporation, municipality, or state that has or intends to obtain and will maintain any proprietary right necessary to construct, operate, or maintain the Project:

Alcoa Power Generating Inc.
Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

(8) (i) Every county in which any part of the project, and any Federal facilities that would be used by the Project, would be located:

Davidson County, North Carolina

Davidson County
P.O. Box 1067
Lexington, NC 27292
Mr. Robert Hyatt, County Manager

Davie County, North Carolina

Davie County
123 South Main Street
Mocksville, NC 27028
Mr. Terry Bralley, County Manager

Montgomery County, North Carolina

Montgomery County
P.O. Box 425
Troy, NC 27371
Mr. Lance Metzler, County Manager

Rowan County, North Carolina

Rowan County
202 North Main Street
Salisbury, NC 28144
Mr. William Cowan, County Manager

Stanly County, North Carolina

Stanly County
201 South Second Street
Albemarle, NC 28001
Mr. Jerry Myers, County Manager

(ii) Every city, town, or similar local political subdivision in which any part of the Project, and any Federal facilities that would be used by the Project, would be located; or that has a population of 5,000 or more people and is located within 15 miles of the Project dam:

City of Albemarle, North Carolina

City of Albemarle, North Carolina
157 North 2nd Street
Albemarle, NC 28001
Mr. Raymond Allen, Manager

City of Lexington, North Carolina

City of Lexington, North Carolina
Lexington City Hall
28 W Center Street
Lexington, NC 27292
Mr. John Gray, City Manager

City of Salisbury, North Carolina

City of Salisbury, North Carolina
P.O. Box 479
Salisbury, NC 28145
Mr. David Treme, City Manager

(iii) Every irrigation district, drainage district, or similar purpose political subdivision in which any part of the Project, and any Federal facilities that would be used by the Project, would be located; or that owns, operates, maintains, or uses any Project facilities or any Federal facilities that would be used by the Project:

Not applicable

(iv) Every other political subdivision in the general area of the Project that there is reason to believe would likely be interested in, or affected by, that application:

Town of Badin, North Carolina

Town of Badin, North Carolina
P.O. Box 611
Badin, NC 28009
Mr. Matt Brinkley, Town Manager

Town of Denton, North Carolina

Town of Denton, North Carolina
P.O. Box 306
Denton, NC 27239
Mr. William Pless, Town Manager

(v) All Indian tribes that may be affected by the project:

The Catawba Indian Nation of South Carolina

The Catawba Indian Nation of South Carolina
996 Avenue of the Nations
Rock Hill, SC 29730
Mr. Gilbert B. Blue, Principal Chief

The Eastern Band of Cherokee Indians

The Eastern Band of Cherokee Indians
88 Council House Loop
Cherokee, NC 28719
Chief Michell A. Hicks

This application is executed in the:

State of North Carolina

County of Stanly

By: Mr. Brian S. Dahlberg
Vice President
Hydroelectric Operations
Alcoa Power Generating Inc.
Yadkin Division
P.O. Box 576
NC Highway 740
Badin, NC 28009-0576

Being duly sworn, deposes, and says that the contents of this application are true to the best of his knowledge or belief. The undersigned Applicant has signed the application this _____ day of _________________, 2006.

Alcoa Power Generating Inc., Yadkin Division
Applicant

By:_________________________________
NAME

Subscribed and sworn to before me, a Notary Public of the state of ________________ this _____ day of _____________, 2006.

____
Notary Public

Exhibit A

Project Description

Exhibit A – Project Description

A.1 Introduction

The Yadkin Project (Project) is located on the Yadkin River, approximately 60 miles northeast of Charlotte in central North Carolina, as shown on Figure A-1. The Project is located in Davidson, Davie, Montgomery, Rowan, and Stanly counties, North Carolina, as shown on Figures A-2 and A-3. The Yadkin River and its tributaries are part of the Yadkin-Pee Dee River Basin, which extends from the eastern slopes of the Blue Ridge Mountains to the Atlantic coast near Georgetown, South Carolina. The Yadkin River's name changes to the Pee Dee River at its confluence with the Uwharrie River. The Pee Dee River continues its southeastern flow to Winyah Bay, where it meets the Atlantic Ocean.

The Project is owned by Alcoa Power Generating Inc. (APGI), a wholly-owned subsidiary of Alcoa Inc. (Alcoa). APGI's Yadkin Division (Yadkin) is responsible for operation of the Project. The Project includes four hydroelectric developments, the High Rock, Tuckertown, Narrows and Falls developments, which are located on a 38-mile stretch of the Yadkin River. High Rock, the most upstream development, is located at mile 253 on the Yadkin River and serves as the principal storage facility for the entire Yadkin-Pee Dee River. The Tuckertown, Narrows, and Falls developments are located approximately 8.7 miles, 16.5 miles, and 19.0 miles downstream, respectively, of the High Rock Development. Downstream of the Yadkin Project is Progress Energy's (PE) two-development Yadkin-Pee Dee River Project (FERC No. 2206), the licensing of which is occurring concurrently with the Yadkin Project. PE's two developments, Tillery and Blewett Falls, are located approximately 15 and 43 miles downstream, respectively, of the Falls Development. The upper portion of the Yadkin River drainage basin, above North Wilkesboro, is regulated by the U.S. Army Corps of Engineers' (USACE) W. Kerr Scott Dam. The W. Kerr Scott Dam, which is located approximately 132 miles upstream of the High Rock Development, provides flood control for the city of Wilkesboro and maintains a conservation pool to provide a continuous minimum flow of 125 cubic feet per second (cfs) in the Yadkin River.

Throughout the License Application, all elevations are referenced to the U.S. Geological Survey (USGS) Datum, unless otherwise noted. Table A.1-1 shows the conversion from the Yadkin Datum to the USGS Datum. To convert an elevation in the Yadkin Datum to the USGS Datum, apply the conversion shown in column, "USGS Datum Conversion". For example, the normal full pool elevation at High Rock Reservoir is 655.0 ft, Yadkin Datum, which equals 623.9 ft, USGS Datum.

Table A.1-1: USGS Datum Conversion

Development	USGS Datum Conversion
High Rock	-31.1 ft
Tuckertown	-31.3 ft
Narrows	-31.3 ft
Falls	-31.2 ft

Pursuant to 18 CFR § 388.112 additional details concerning the Yadkin Project facilities have been withheld from this Section of the License Application by APGI as Critical Energy Infrastructure Information (CEII). This information is included in Exhibit F provided in Volume II of the License Application.

A.2 High Rock Development

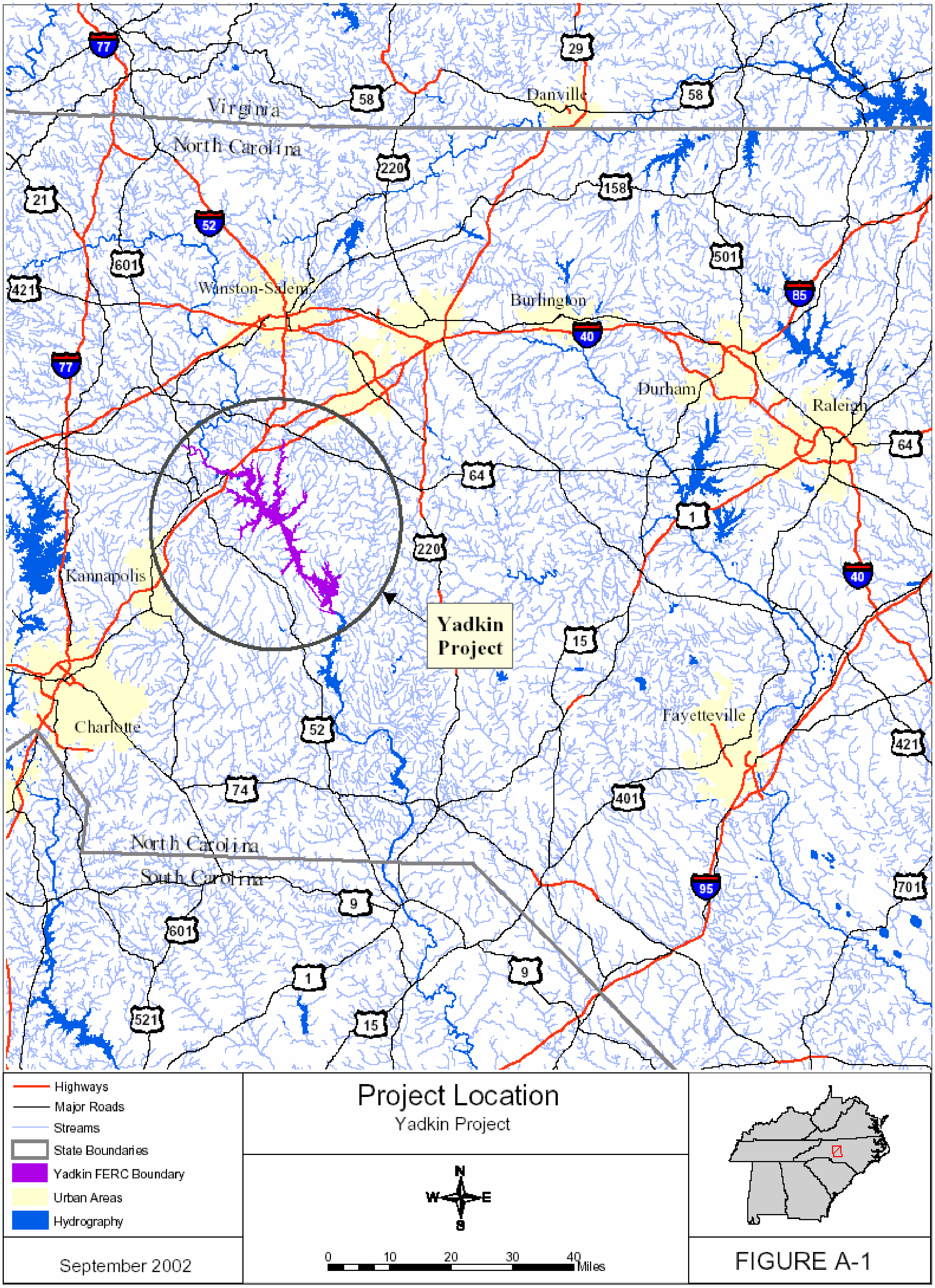
The High Rock Development (Figure A-4) is located in Davidson, Davie, and Rowan counties, North Carolina, approximately 16 miles from Badin, North Carolina at mile 253 on the Yadkin River. High Rock was the third of the Project developments to be built. Although land purchasing began in 1916, construction was not completed until 1927. This was due, in part, to the need to relocate numerous roads, ferries, the railroad, and other infrastructure.

A.2.1 High Rock Development Structures

High Rock Dam is a concrete gravity structure. The dam is comprised of two short non-overflow sections, a Stoney gate-controlled spillway section, and an integral intake/powerhouse section.

The non-overflow sections are located at the east end of the powerhouse and at the west end of the gate-controlled spillway. The gate-controlled spillway section includes ten Stoney gates that release surplus water during flood events. The spillway gates are operated locally at the site by fixed individual electrically powered hoists.

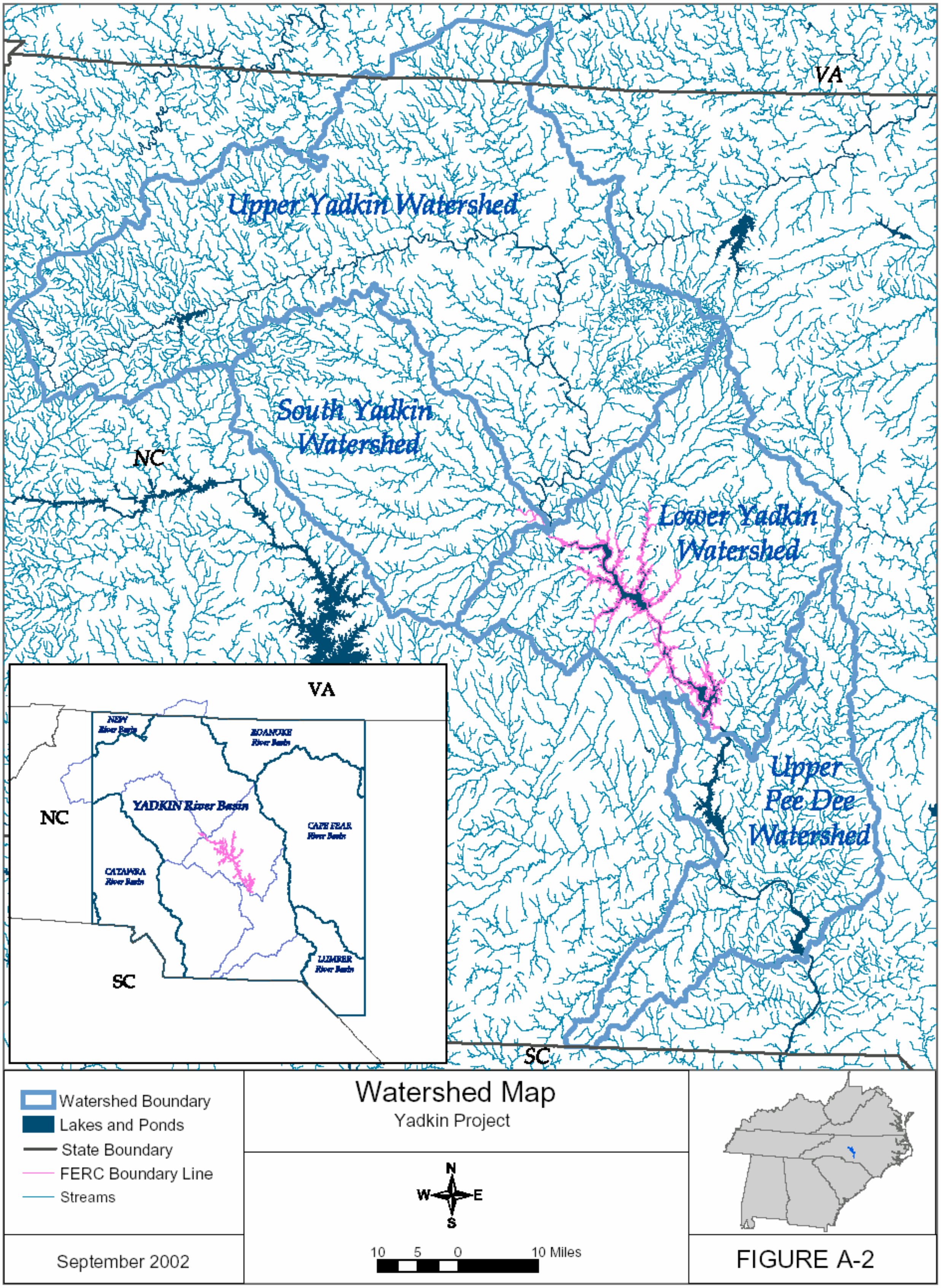
The High Rock powerhouse and intake form a single structural unit integral with the dam. It consists of a concrete substructure containing three water passages and a brick superstructure. The intake structure includes trashracks and six headgates.

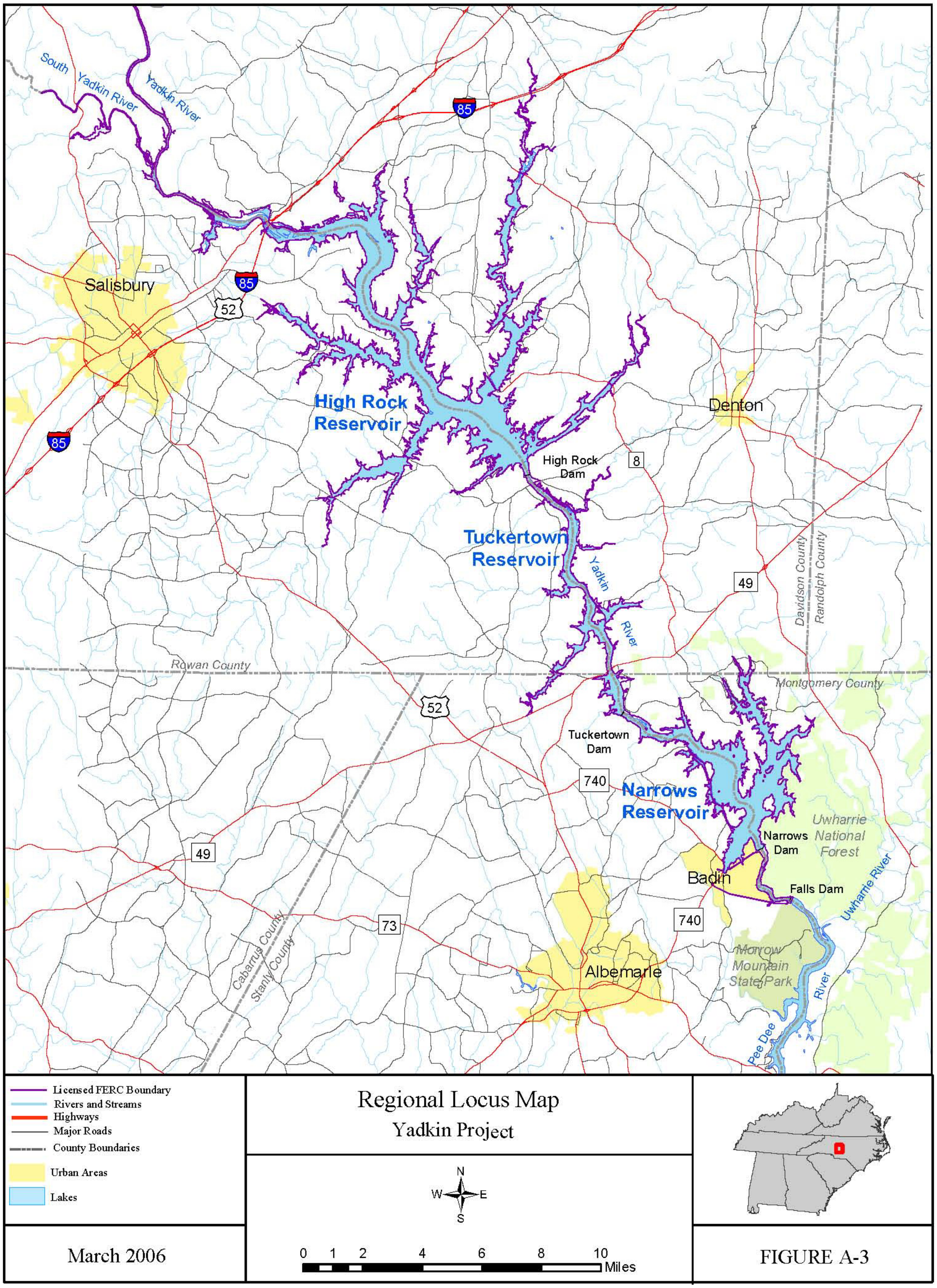


Project Location
Yadkin Project

September 2002

FIGURE A-1


VA
Upper Yadkin Watershed
South Yadkin Watershed
NC
Lower Yadkin Watershed
Upper Pee Dee Watershed
SC
VA
NEW River Basin
ROANOKE River Basin
NC
YADKIN River Basin
CAPE FEAR River Basin
CATAWBA River Basin
LUMBER River Basin
SC
Watershed Boundary
Lakes and Ponds
State Boundary
FERC Boundary Line
Streams
Watershed Map
Yadkin Project
N
W
E
S
10 5 0 10 Miles
September 2002
FIGURE A-2


South Yadkin River
Yadkin River
85
Salisbury
52
High Rock Reservoir
Denton
High Rock Dam
8
Tuckertown Reservoir
Yadkin River
49
Davidson County
Randolph County
Rowan County
Montgomery County
52
Tuckertown Dam
740
Narrows Reservoir
Narrows Dam
Uwharrie National Forest
Badin
Falls Dam
Uwharrie River
49
73
740
Cabarrus County
Stanly County
Albemarle
Morrow Mountain State Park
Pee Dee River
Licensed FERC Boundary
Rivers and Streams
Highways
Major Roads
County Boundaries
Urban Areas
Lakes
Regional Locus Map
Yadkin Project
N
W
E
S
March 2006
0 1 2 4 6 8 10 Miles
FIGURE A-3

A.2.2 High Rock Reservoir

The drainage area above High Rock Dam is 3,973 square miles. The dam impounds High Rock Reservoir, which has an available storage capacity of approximately 217,400 acre-ft at the normal full pool elevation of 623.9 ft, based on a drawdown of 30 ft. High Rock Reservoir extends upstream about 19 miles to Yadkin North Fork and Hanna's Ferry, and at full pool elevation, the reservoir has a surface area of approximately 15,180 acres. The mean depth of the reservoir is 17 ft with a maximum depth of 62 ft.

A.2.3 High Rock Turbines and Generators

The High Rock powerhouse contains three 10,970 kilowatt (kW) vertical Francis turbines, each operating under a net head of 55.0 ft, direct-connected to generators having a total capacity of 41,250 kW (Units 1, 2, and 3 @ 13,750 kW), for a total installed capacity of 32,190 kW as limited by the turbines[1]. The High Rock Development has a total hydraulic capacity of 10,050 cfs.

APGI proposes to perform refurbishments and upgrades at High Rock Units 1, 2, and 3 under the new license. Exhibit B.2.3 provides additional information on the refurbishments and upgrades proposed for the High Rock Development.

A.2.4 High Rock Transmission Lines

There are no transmission lines associated with the High Rock Development that are part of the licensed Project. There is a double-circuit 100-kilovolt (kV) transmission line extending from the High Rock Development southerly to the Tuckertown Development and continuing southeasterly to the Badin substation. This transmission line, however, is a regional line used by various entities and is not included in the Project. Heading easterly from High Rock Development is a Duke Power Company transmission line.

A.2.5 Lands of the United States at High Rock Development

There are no federal lands within the Project boundary of the High Rock Development.

[1] Turbine capacity is based on the unit output in kW at the best efficiency point of turbine. Generator capacity is based on the kVA rating of the generator and the system power factor. The lower of these two values is the authorized installed capacity. If the turbine capacity is lower, the unit is turbine limited. If the generator capacity is lower, the unit is generator limited.

Figure A-4
High Rock Development Fact Sheet

HIGH ROCK DAM

Year Completed:
  1927
Drainage Area:
  3,973 square miles
Reservoir Area:
  15,180 acres
Powerhouse:
  3 Units
Total Capacity:
  32.19 MW
  10,050 cfs
Dam:
  Concrete Gravity
  Gated Spillway

A.3 Tuckertown Development

The Tuckertown Development is located in Davidson, Montgomery, Rowan, and Stanly counties, North Carolina, approximately 8 miles from Badin, North Carolina, at mile 244.3 on the Yadkin River. Tuckertown was the last of the Project developments to be built, and was completed in 1962.

A.3.1 Tuckertown Development Structures

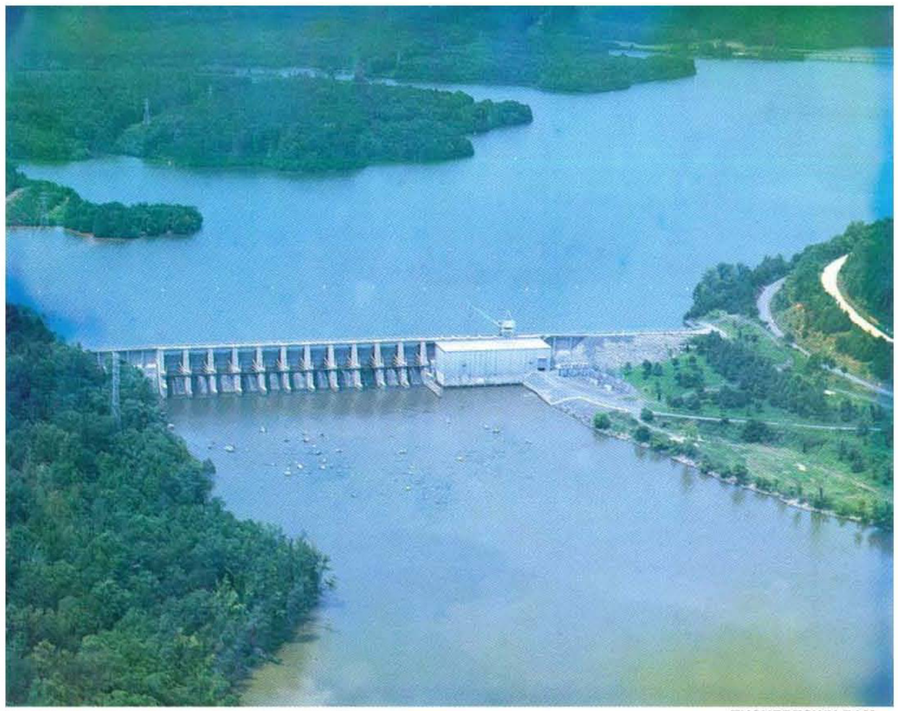
Tuckertown Dam is a concrete gravity and embankment structure and consists of a rockfill embankment section, an earthfill embankment section, three non-overflow gravity sections, a Tainter gate spillway section, and an integral intake/powerhouse section as shown in Figure A-5.

The rockfill embankment is located between the east non-overflow section and the east abutment. It was constructed of dumped rockfill with a sloping impervious core. The earthfill embankment is a homogeneous earthfill section at the west abutment. This section wraps around the adjacent right non-overflow gravity section.

The east non-overflow gravity section is located at the east end of the powerhouse. The west non-overflow gravity section is located at the west end of the gated spillway section. The middle non-overflow section is located between the east end of the gated spillway and the west end of the powerhouse. The gate-controlled spillway section includes eleven Tainter gates that release surplus water during flood events.

The Tuckertown powerhouse and intake form a single structural unit integral with the dam. The powerhouse is located immediately downstream of the intake structure between the east non-overflow and middle non-overflow gravity sections. The structure consists of a concrete substructure containing three water passages and a conventional steel truss and frame structure. The intake structure includes trashracks and six motor operated fixed wheel headgates.

Figure A-5
Tuckertown Development Fact Sheet



TUCKERTOWN DAM

Year Completed:
1962
Drainage Area:
4,080 square miles
Reservoir Area:
2,560 acres
Powerhouse:
3 Units
Total Capacity:
38.04 MW
11,475 cfs
Dam:
Concrete Gravity
Rockfill Embankment
Earthfill Embankment
Gated Spillway

A.3.2 Tuckertown Reservoir

The drainage area above Tuckertown Dam is 4,080 square miles. The dam impounds Tuckertown Reservoir with an available storage capacity of approximately 6,700 acre-ft at the normal full pool elevation of 564.7 ft, based on a drawdown of 3 ft. At full pool the surface area of the reservoir is approximately 2,560 acres. The mean depth of the reservoir is 16 ft with a maximum depth of 55 ft.

A.3.3 Tuckertown Turbines and Generators

The Tuckertown powerhouse contains three 12,680 kW Kaplan turbines, each operating under a net head of 53.5 ft, direct-connected to generators having a total capacity of 46,665 kW (Units 1, 2, and 3 @ 15,555 kW maximum capacity), for a total installed capacity of 38,040 kW as limited by the turbines. The Tuckertown Development has a total hydraulic capacity of 11,475 cfs.

APGI proposes to perform refurbishments and upgrades at Tuckertown Units 1, 2, and 3 under the new license. Exhibit B.3.3 provides additional information on the refurbishments and upgrades proposed for the Tuckertown Development.

A.3.4 Tuckertown Transmission Lines

There are no transmission lines associated with the Tuckertown Development that are part of the licensed Project. The Tuckertown Development has two short-taps with a 100 kV distribution voltage to the High Rock-Badin Transmission Line. These taps are regional lines used by various entities and are not included in the Project.

A.3.5 Lands of the United States at Tuckertown Development

There are no federal lands within the Project boundary of the Tuckertown Development.

A.4 Narrows Development

The Narrows Development is located in Davidson, Montgomery, and Stanly counties, North Carolina, approximately 2 miles from Badin, North Carolina, at mile 236.5 on the Yadkin River. Narrows was the first of the Project developments to be built, and was completed in 1917. Energy generation at Narrows Units 1, 2 and 3 began in 1917. Narrows Unit 4 went on line in 1924.

A.4.1 Narrows Development Structures

Narrows Dam consists of a main dam section and a bypass spillway section (see Figure A-6). The main dam section is a concrete gravity structure

The main dam section consists of a non-overflow gravity section, a Tainter gate-controlled spillway section, a trash gate section, an intake section, a downstream powerhouse, and four steel penstocks. The non-overflow gravity section extends from the gated spillway section to the west river abutment. A training (wing) wall separates the non-overflow gravity section and the gate-controlled spillway section. The gate-controlled spillway section includes a trash gate section and twenty-two Tainter gates that release surplus water during flood events. The trash gate section is located at the west end of the intake structure. The intake section is located adjacent to the trash gate section. The intake structure is constructed of reinforced concrete. It includes trash racks and eight headgates. Individual steel penstocks extend from the intake section to the powerhouse. The powerhouse is located approximately 280 to 360 ft downstream of the intake section. The powerhouse consists of a reinforced concrete substructure and a brick superstructure.

The bypass spillway section is comprised of a non-overflow gravity section, a Stoney gate-controlled spillway section, and a trash gate section. The non-overflow gravity section extends from the bypass spillway to the east river abutment. The gate-controlled section includes ten Stoney gates and is used in conjunction with the main dam gated spillway section to control surplus waters during flooding events. There is also a trash gate at the south end of the bypass spillway.

A.4.2 Narrows Reservoir

The drainage area above Narrows Dam is 4,180 square miles. The dam impounds Narrows Reservoir with an available storage capacity of approximately 129,100 acre-ft at the normal full pool elevation of 509.8 ft, based on a drawdown of 31.1 ft. At full pool, the surface area of the reservoir is approximately 5,355 acres. The mean depth of the reservoir is 45 ft with a maximum depth of 175 ft.

A.4.3 Narrows Turbines and Generators

The Narrows powerhouse contains four vertical Francis turbines, each operating under a net head of 174.5 ft. Units 1, 2, and 3 have a capacity of 26,860 kW and Unit 4 has a capacity of 27,200 kW. The turbines are direct-connected to the generators having a total capacity of 124,250 kW (Units 1 and 2 @ 27,500 kW, Unit 3 @ 31,250 kW, and Unit 4 @ 38,000 kW), for a total installed capacity of 107,780 kW, as limited by the turbines. The Narrows Development has a total hydraulic capacity of 10,000 cfs.

APGI proposes to refurbish and upgrade Narrows Unit 2 under the current Project license. APGI proposes refurbishments and upgrades at Narrows Units 1 and 3 under the new license. Exhibit B.4.3 provides additional information on the refurbishments and upgrades proposed for the Narrows Development (Units 1 and 3) under the new license.

Figure A-6
Narrows Development Fact Sheet

NARROWS DAM

Year Completed
1917
Drainage Area:
4,180 square miles
Reservoir Area:
5,355 acres
Powerhouse:
4 Units
Total Capacity:
107.78 MW
10,000 cfs
Dam:
Concrete Gravity
Gated Main and Bypass Spillways
Penstocks:
Units 1 – 4: 15 foot diameter
Unit 1: 309 feet long
Unit 2: 338 feet long
Unit 3: 367 feet long
Unit 4: 396 feet long

A.4.4 Narrows Transmission Lines

The Narrows Development includes a four-circuit 13.2-kV transmission line that connects the hydroelectric generating station at the Narrows Development directly to Alcoa's Badin Works, as shown on Figure A-7. This transmission line is an APGI dedicated line and is part of the licensed Project. The approximate length of this transmission line is 8,000 ft.

A.4.5 Lands of the United States at Narrows Development

There are no federal lands within the Project boundary of the Narrows Development. The Uwharrie National Forest is adjacent to a portion of the Narrows Development.

A.5 Falls Development

The Falls Development (Figure A-8) is located in Montgomery and Stanly counties, North Carolina, approximately 3 miles from Badin, North Carolina, at mile 234 on the Yadkin River. The Falls Development was the second of the Project developments to be built, and was completed in 1919. Falls Units 2 and 3 went on line in 1919, and Falls Unit 1 went on line in 1922.

A.5.1 Falls Development Structures

Falls Dam is a concrete gravity structure. The development consists of a non-overflow gravity section, a Stoney gate-controlled spillway section, a Tainter gate-controlled spillway section, a trash gate section, and an integral intake/powerhouse section. The non-overflow gravity section extends from the north end of the spillway section to the river abutment.

The spillway section consists of a Stoney gate section, a Tainter gate section, and a trash gate. There are ten Stoney gates and two Tainter gates to release surplus water during storm or flooding events. The ten Stoney gates are operated by individually fixed electrically powered screw-stem hoists from the spillway deck. Four of the Stoney gates may be remotely operated from the dispatch center in Alcoa, Tennessee, and also manually at the site. The two Tainter gates are operated by a movable, electrically powered hoist from the deck. The trash gate is locally operated by a rising screw stem hoist.

The powerhouse and intake form a single structural unit integral with the dam. The powerhouse is located between the south end of the gate-controlled spillway section and the river abutment. The structure consists of an integral reinforced concrete and concrete gravity substructure and a brick superstructure. The intake structure includes trashracks and six headgates.

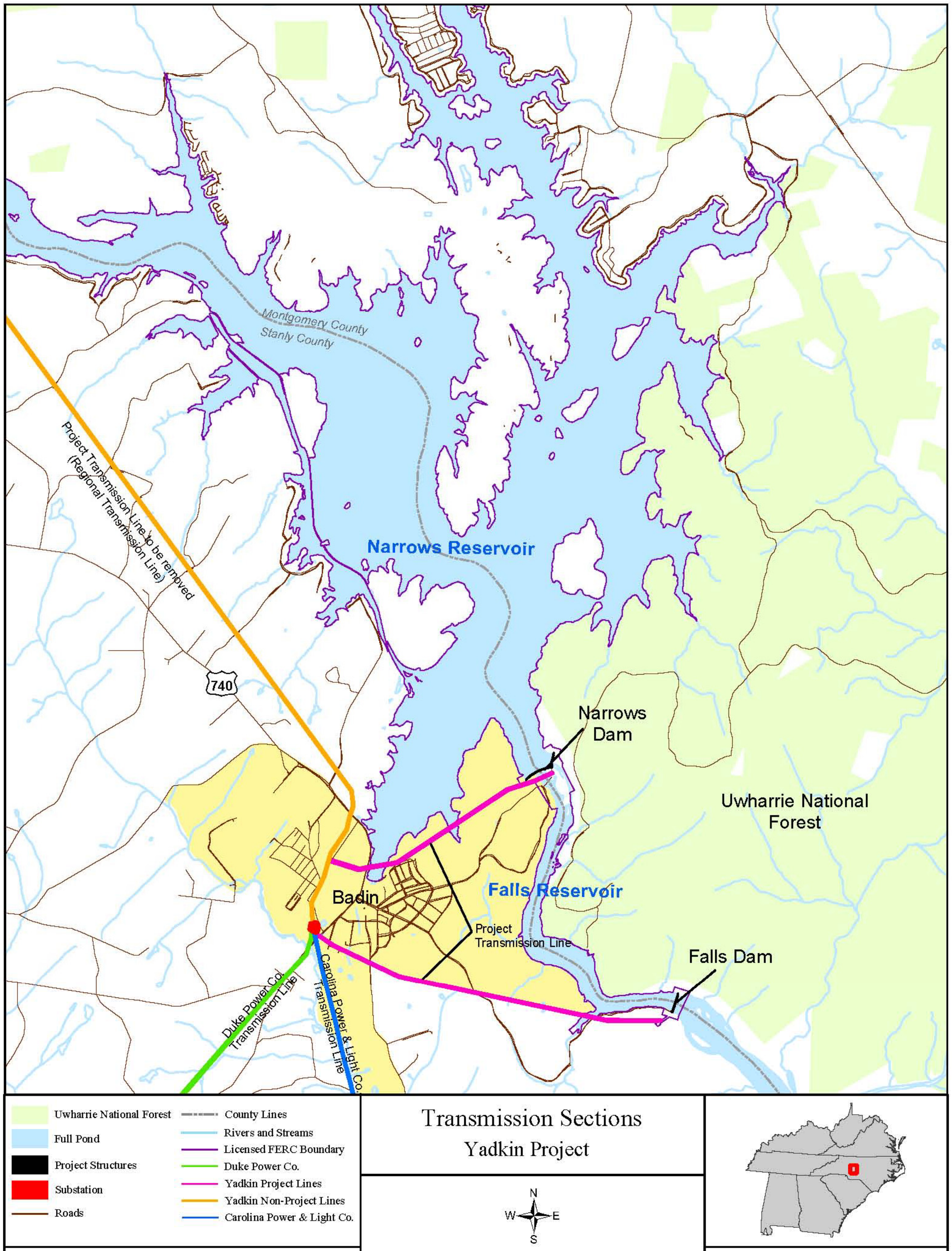

Montgomery County
Stanly County
Narrows Reservoir
Project Transmission Line to be removed
(Regional Transmission Line)
740
Narrows
Dam
Uwharrie National
Forest
Falls Reservoir
Badin
Project
Transmission Line
Falls Dam
Duke Power Co.
Transmission Line
Carolina Power & Light Co.
Transmission Line
Uwharrie National Forest
Full Pond
Project Structures
Substation
Roads
County Lines
Rivers and Streams
Licensed FERC Boundary
Duke Power Co.
Yadkin Project Lines
Yadkin Non-Project Lines
Carolina Power & Light Co.
Transmission Sections
Yadkin Project
N
W
E
S
0 0.25 0.5 1 1.5 2
Miles
March 2006
FIGURE A-7

Figure A-8
Falls Development Fact Sheet


FALLS DAM

Year Completed:
  1919
Drainage Area:
  4,190 square miles
Reservoir Area:
  204 acres
Powerhouse:
  3 Units
Total Licensed Capacity:
  31.13 MW
  8,570 cfs
Dam:
  Concrete Gravity
  Gated Spillway

A.5.2 Falls Reservoir

The drainage area above Falls Dam is 4,190 square miles. The dam impounds Falls Reservoir with an available storage capacity of approximately 760 acre-ft at the normal full pool elevation of 332.8 ft, based on a drawdown of 4 ft. At full pool, the surface area is approximately 204 acres. The mean depth of the reservoir is 27 ft with a maximum depth of 52 ft.

A.5.3 Falls Turbines and Generators

The Falls powerhouse contains one 10,410 kW S. Morgan Smith vertical Francis turbine unit (Unit 1) and two 11,190 kW Allis Chalmers propeller-type turbine units (Units 2 and 3), each operating under a net head of 54.0 ft, and direct-connected to generators having a total capacity of 33,750 kW (Unit 1 @ 8,750 kW, Units 2 and 3 @ 12,500 kW) for a total generating capacity of 31,130 kW as limited by the generator for Unit 1 and the turbines for Units 2 and 3. The Falls Development has a total hydraulic capacity of 8,570 cfs.

APGI proposes to perform refurbishments and upgrades at Falls Units 1, 2, and 3 under the new license. Exhibit B.5.3 provides additional information on the refurbishments and upgrades proposed for the Falls Development.

A.5.4 Falls Transmission Lines

The Falls Development includes a single-circuit 100-kV transmission line that connects the hydroelectric generating station at Falls directly to Alcoa's Badin Works, as shown on Figure A-7. This transmission line is an APGI dedicated line and is part of the licensed Project. The approximate length of this transmission line is 15,000 ft.

A.5.5 Lands of the United States at Falls Development

There are no federal lands within the Project boundary of the Falls Development. The Uwharrie National Forest is adjacent to a portion of the Falls Development.

Exhibit B

Project Operation and Resource Utilization

Exhibit B – Project Operation and Resource Utilization

B.1 Introduction

This exhibit provides a detailed description of the Yadkin Project (Project) operations and resource utilization. In accordance with Federal Energy Regulatory Commission (FERC) requirements, each of the four Project developments is described individually.

B.2 High Rock Development

B.2.1 Operation

High Rock Development is operated by full-time power dispatchers under the direction of the Alcoa Power Generating Inc. (APGI) Operations Manager. Project operation and generation dispatch is remotely controlled from the Dispatch Center located in Alcoa, Tennessee. During high flow conditions, maintenance personnel are sent to High Rock Dam, as required, to operate the spillway gates.

Based on gross generation records from 1972 through 2005 and the net plant capability under the most favorable operating conditions as reported on the FERC Form 1 (40 megawatt [MW]) the average annual plant factor at High Rock is approximately 42 percent.

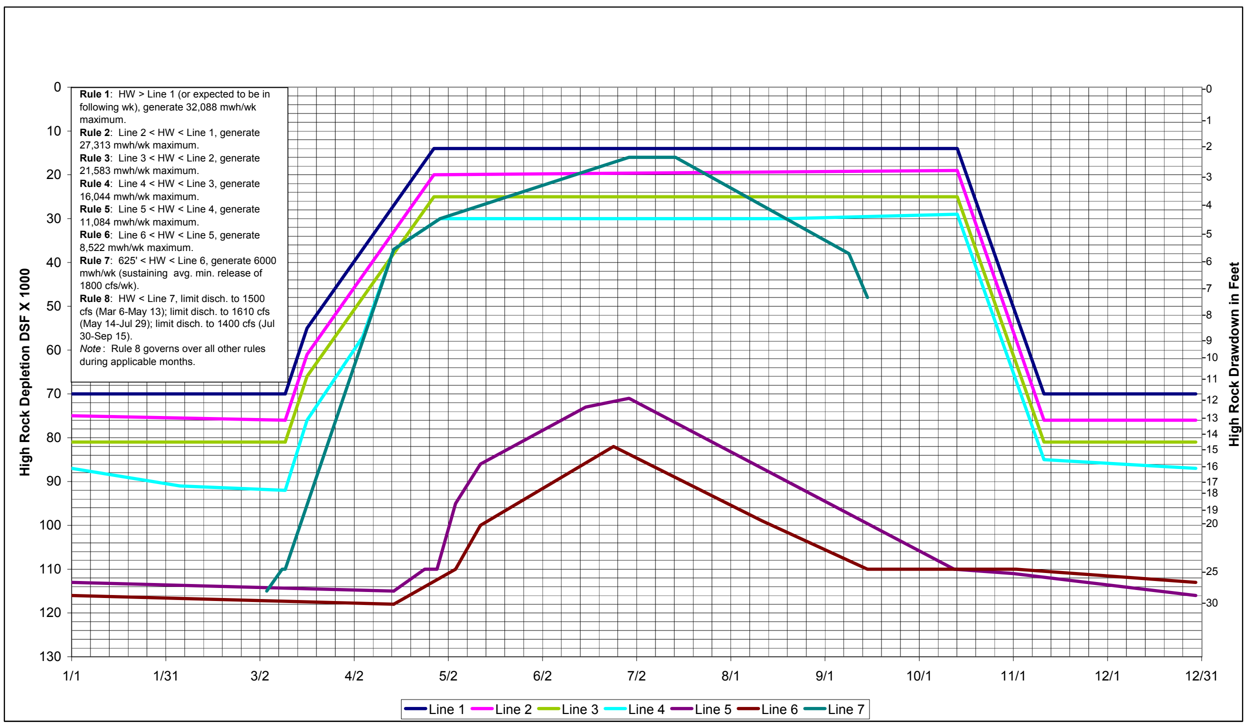
B.2.1.1 Existing Operations

The High Rock Development is operated in a store-and-release mode in accordance with an operating guide. The operating guide, reviewed and approved by FERC, was established in 1968. Within the limitations of available streamflow, the operating guide is designed to maintain higher water elevations in High Rock Reservoir from mid-May to mid-September, followed by a fall-winter drawdown to allow for refill during the late winter and spring. During periods of low water levels and low streamflow at High Rock Reservoir, the operating guides have overriding requirements for APGI to discharge a minimum amount of water to satisfy downstream needs from early March to mid-September. Based on historical data, the operating guides normally limit drawdown of High Rock Reservoir to 5 ft or less, greater than 95 percent of the time between Memorial Day and Labor Day.

The operation of High Rock powerhouse and consequent releases of water through the turbines depend primarily on the current reservoir water level, streamflow into the reservoir, and time of year. The High Rock operating guide is presented in Figure B-1. It should be noted that this figure presents reservoir elevation in terms of drawdown (in ft, right vertical axis) and depletion (in day-second-ft, left vertical axis). The High Rock operating guide regulates energy generation, not headwater.

In 1926, APGI and the predecessor company of Progress Energy (PE) reached an agreement that was modified in 1968 and accepted by the Federal Power Commission (now FERC) as a headwater benefits (HWB) settlement. Headwater benefits are defined by Section 10(f) of the Federal Power Act (FPA) as the additional electric generation at a downstream project (in this case, PE's project) made possible by the regulation of the river flow by the headwater, or upstream, project (in this case, the Yadkin Project). Regulation of river flow is achieved by the use of upstream storage reservoirs that retain water during high inflow periods that might otherwise be spilled rather than used for generation. (See 18 CFR §11.10). Section 10(f) of the FPA directs FERC to condition the license of the downstream licensee upon reimbursing the owner of the upstream storage for an equitable part of the annual costs of interest, maintenance, and depreciation expenses of the headwater project. These reimbursement payments are often referred to as "headwater benefits" payments and are subject to FERC's approval.

Figure B-1: High Rock Development Operating Guide



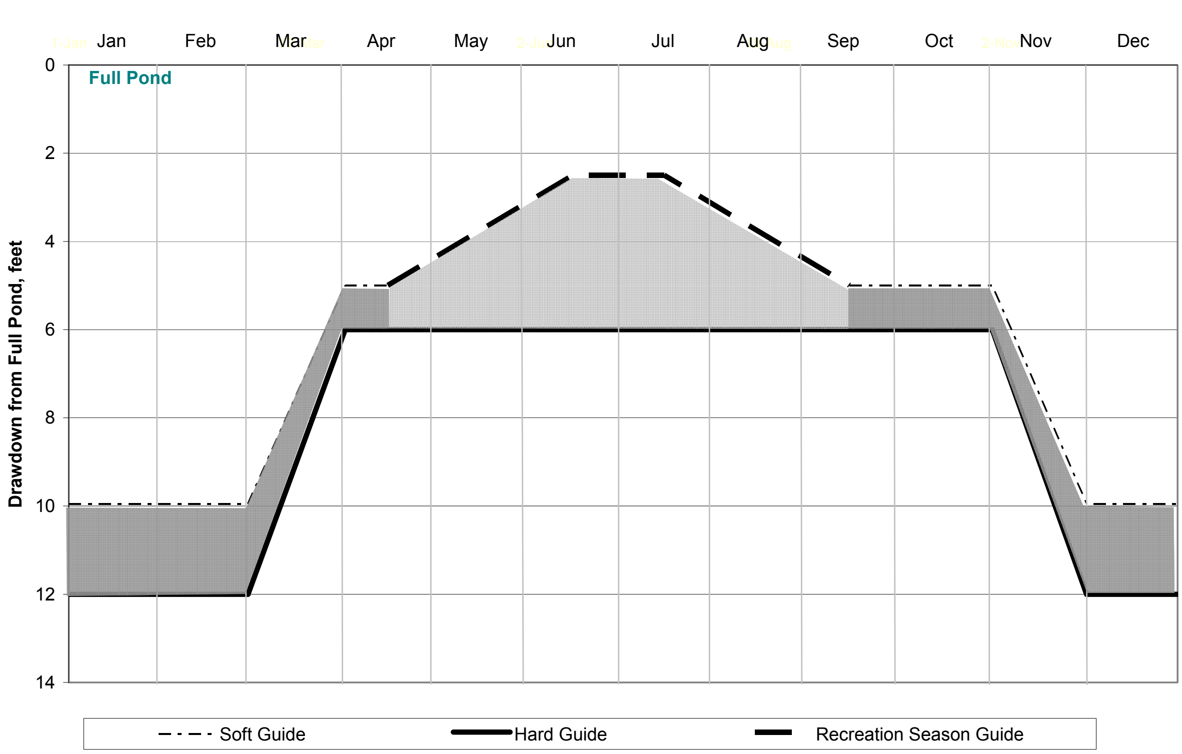
Water storage in the Yadkin Project reservoirs during periods of high streamflow allows a controlled release to enhance energy generation downstream. This regulation of flow also provides benefits to two PE developments downstream by seasonally increasing the flow available for hydropower generation at its two downstream facilities. By way of the March 1968 FERC order, PE pays APGI an annual headwater benefits fee for this benefit. The agreement with PE requires that the regulated weekly average streamflow, during the ten week period preceding the recreation period (May 15 through September 15) is not less than 1,500 cubic feet per second (cfs); during the period May 15 through July 1, is not less than 1,610 cfs; and during the period July 1 through September 15, is not less than 1,400 cfs.

B.2.1.2 Proposed Operations

Reservoir Operations

APGI proposes that under the new license, High Rock will be operated in accordance with a revised Guide Curve (Figure B-2) that features three basic guides: a Hard Guide, a Soft Guide, and a Recreation Season Guide (April 15 to September 15). During normal operations, APGI will maintain the reservoir elevation at or above the Soft Guide or the Recreation Season Guide elevation. Generation is not restricted for normal operations. If at any time the water level at High Rock falls below the Soft Guide or Recreation Season Guide and above the Hard Guide curve elevation (dark shaded section), APGI will reduce its generation and water releases from High Rock to the flow equivalent of no more than 1,500 cfs weekly average discharge until such time that the High Rock reservoir level returns to or above the Soft Guide or Recreation Season Guide curve. Operation in this range is expected to occur infrequently, and would be caused by conditions such as: actual inflows not meeting projected inflows; human error; equipment malfunction or failure; drought periods; or electrical system emergency (e.g., transmission bottlenecks, real and reactive power support, load following support, etc.) as discussed in the proposed Hydro Project Maintenance and Emergency Protocol (HPMEP) for the Project (see Exhibit B.6.4).

Figure B-2: Proposed High Rock Guide Curve



The reservoir would not be drawn down below the Hard Guide (within 6 ft of full April 1 through October 31 and within 12 ft of full December 1 through February 28 with transition periods for fill and drawdown during March and November in accordance with the Hard Guide shown in Figure B-2) except as needed to meet required downstream minimum flows or as outlined in the proposed Low Inflow Protocol (LIP), or in cases of emergency, equipment failure and maintenance situations as outlined in the proposed HPMEP (see Exhibit B.6.4).

Minimum Flows

APGI proposes to operate the Yadkin Project with a weekly average minimum flow of not less than 900 cfs from the Project, as measured at the Falls Development (see Exhibit B.6 for further discussion). The proposed weekly average release would allow APGI to generate more energy during the higher value peak demand period (typically during weekdays) while releasing flows from the Yadkin Project to contribute to minimum flows downstream of Blewett Falls Dam (FERC No. 2206).

Dissolved Oxygen Enhancements

APGI proposes to undertake a series of Project modifications designed to increase dissolved oxygen (DO) concentrations and enhance water quality in the four Project tailwaters through installation of aeration technology at High Rock, in conjunction with the proposed unit refurbishment and upgrade, as described in Exhibit B.2.3. APGI proposes installation of new aerating turbines with a "through-the-runner" aeration capability at the High Rock development. APGI proposes to operate the aerating equipment between May 1 and November 30 of each year as needed.

B.2.2 Estimate of Capacity and Generation

The dependable capacity for the High Rock Development is based on the annual energy production during the critical streamflow period (2001) for the 1930 to 2003 period of record (POR). The dependable capacity is based on the 2001 energy generation divided by the number of hours per year. The dependable capacity calculated on this basis is 5.6 MW.

The average annual gross generation of High Rock Development is 133,397 megawatt hours (MWh) based on the most recent 20-year period (1986 to 2005).

B.2.2.1 Stream Flows

A 74-year streamflow dataset was developed for each Project development, and other areas of interest, using U.S. Geological Survey (USGS) gages located throughout the Yadkin-Pee Dee River Basin. The average daily streamflow dataset, which is referred to throughout this License Application as the USGS flow dataset, covers the October 1, 1929 to December 31, 2003 POR and the portion of the Yadkin-Pee Dee River extending from the U.S. Army Corps of Engineers' (USACE) W. Kerr Scott Dam on the upstream end to the USGS Pee Dee gage at Pee Dee, South Carolina on the downstream end. Details regarding the USGS flow dataset development are discussed below.

Inflows to W. Kerr Scott, the most upstream dam on the Yadkin River, were back-calculated based on USACE published outflow, change in storage, and precipitation[1] records and estimated evaporation rates[2], for the 1962 to 2003 POR. For the 1939 to 1962 POR, inflows to W. Kerr Scott were determined using the tributary flows at USGS Wilkesboro gage station minus tributary flows at the USGS Reddies River gage station, with the difference prorated for the drainage area to W. Kerr Scott. For the 1929 to 1939 POR, inflows to W. Kerr Scott were estimated using the drainage area ratios and data from the Wilkesboro gage.

Proceeding downstream, the USGS Yadkin College gage record extends back beyond 1930. The inflows to this node (gains) are the difference between the gage flows and W. Kerr Scott inflows, prior to W. Kerr Scott regulation, or the difference between the gage flows and the W. Kerr Scott discharges, since the construction of W. Kerr Scott.

The scarcity of gages on the main stem of the Yadkin River between Yadkin College and Rockingham complicated the development of the inflows between these two gages. At High Rock, a USGS gage was present from 1919 to 1927 and 1941 to 1962[3]. To facilitate the development of the missing flow record (1929 to 1941 and 1962 to 2003), *Fillin*[4], a program developed by the USGS, was utilized. Working on monthly data, *Fillin* was used to correlate flows at a location of interest with flows from gages in the watershed. Using regression techniques, *Fillin* uses those locations with the highest correlations (depending on the month and year) to “fill in” the missing record for the location of interest.

Fillin was used to estimate the (monthly) gains between the Yadkin College and the High Rock gages (herein referred to as “High Rock gains”) and between the High Rock and Rockingham gages (herein referred to as “Rockingham gains”) for the period when the gains were not known (1929 to 1941 and 1962 to 2003). The gains represent the difference between the flows at these gages. Since these gages are influenced by regulation upstream, the flows were adjusted to reflect unregulated conditions by adding back the known change in storage and estimated net evaporation from the upstream reservoirs. The monthly High Rock gain is equal to the difference between the monthly unregulated High Rock and Yadkin College flows. The monthly Rockingham gain is the difference between the monthly unregulated Rockingham and High Rock flows.

[1] Precipitation at W. Kerr Scott is based on Corps of Engineers measurements and, when not available (prior to July 1, 1965), Salisbury station measurements.

[2] Evaporation is derived from monthly USGS measurements from Lake Michie in Durham, North Carolina (contained in the report entitled Evaporation from Lake Michie, North Carolina, 1961-71, USGS Water Resources Investigation 38-73).

[3] For this latter period, which coincided with the operation of High Rock Reservoir, the USGS gage measured regulated flows from the dam. Based on operating data, “total” flows into the reservoir were back calculated using mass balance (inflow = outflow + change in storage + evaporation - precipitation).

[4] “Mixed-Station Extension of Monthly Streamflow Records,” *Journal of Hydraulic Engineering*, ASCE, Vol. 109, No. 10, October 1983.

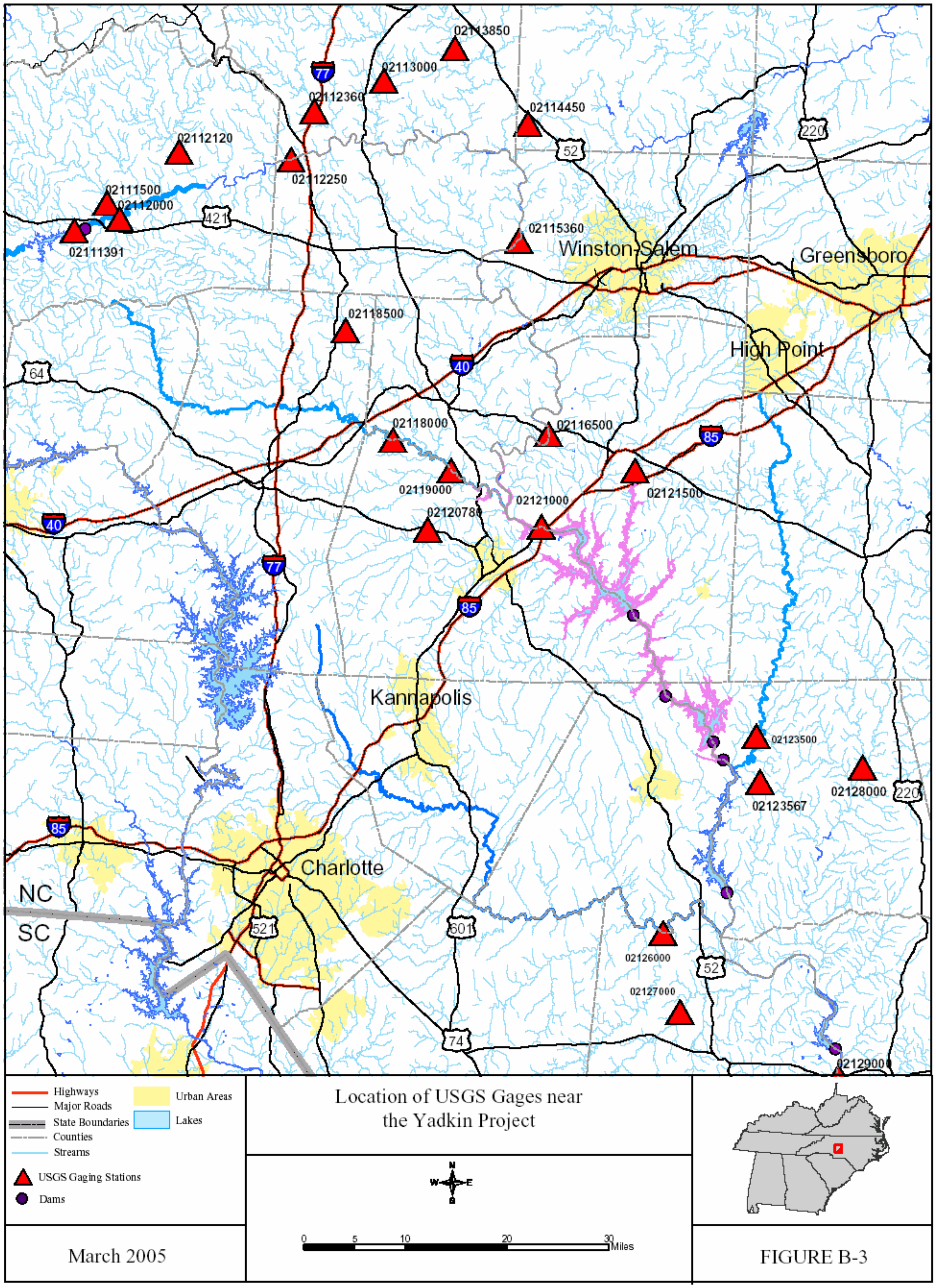
Table B.2-1 presents the USGS gages that were evaluated in the inflow development, along with their drainage areas and periods of record. Figure B-3 presents the locations of the USGS gages near the Project. Most of these gages have records that overlap in part or in full with the known gains. The only gages that cannot be correlated with High Rock are Second Creek, a tributary of the South Yadkin and Abbott's Creek, a tributary of High Rock.

Table B.2-1: USGS Gage Stations Evaluated in the Streamflow Development

USGS Gage (station number)	Drainage Area (square miles)	Period of Record
Reddies River (02111500)	89	1939 - present
Wilkesboro (02112000)	504	1903 - 1909; 1920 - present
Yadkin College (02116500)	2280	1928 - present
South Yadkin at Cooleemee (02119000)	569	1928 - 1965
South Yadkin at Mocksville (02118000)	306	1938 - present
Hunting Creek (02118500)	155	1951 - present
Second Creek (02120780)	118	1979 - present
Abbots Creek (02121500)	174	1988 - 1991; 1992 - present
Eldorado, Uwharrie River (02123500)	342	1938 – 1971
Rocky River (02126000)	1372	1929 – present
Little River (02128000)	106	1954 – present
Brown Creek (02127000)	110	1937 – 1971
Rockingham (02129000)	6863	1906 – 1911; 1927 - present
Pee Dee (02131000)	8830	1939 - present

The output from *Fillin* consists of the correlation coefficients for each of the gages in the table above and the flow estimate for each month of the filled-in record. If needed, the *Fillin*-estimated High Rock and Rockingham gains were adjusted to maintain consistency with the known gains between the USGS gages at Yadkin College and Rockingham. The monthly High Rock inflows were calculated by summing the adjusted High Rock gains with the Yadkin College flows.

The monthly High Rock inflows were disaggregated into daily flows using upstream gages. For example, if the flow at the upstream gage(s) on the fifth day of the month was 3 percent of the monthly total, the daily High Rock flow for that day was set at 3 percent of the monthly *Fillin* estimate. Multiple gages, including the Yadkin College, Cooleemee, Mocksville, Hunting Creek, South Creek, Abbott's Creek gages, were used in the daily disaggregation.



Location of USGS Gages near the Yadkin Project

March 2005

FIGURE B-3

The minimum, mean, and maximum flows at High Rock during the 1930 to 2003 USGS POR are 105 cfs, 4,760 cfs, and 112,050 cfs, respectively. Monthly flow duration curves of High Rock inflows for APGI's Existing Operations are presented in Figures B-4a through B-4l.

Figure B-4a

January Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

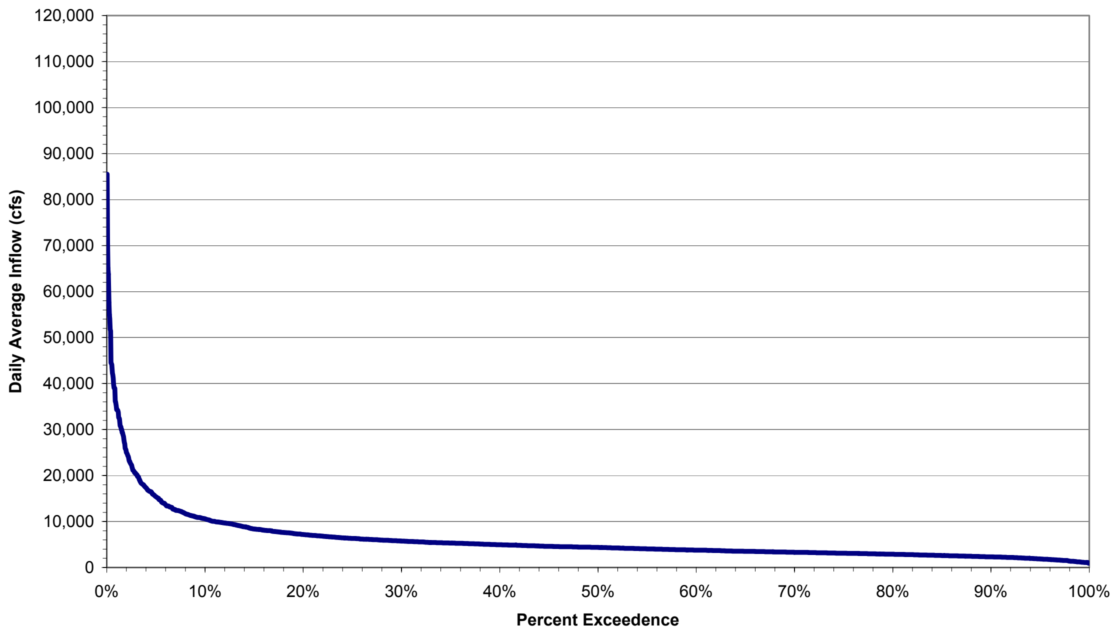


Figure B-4b

February Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

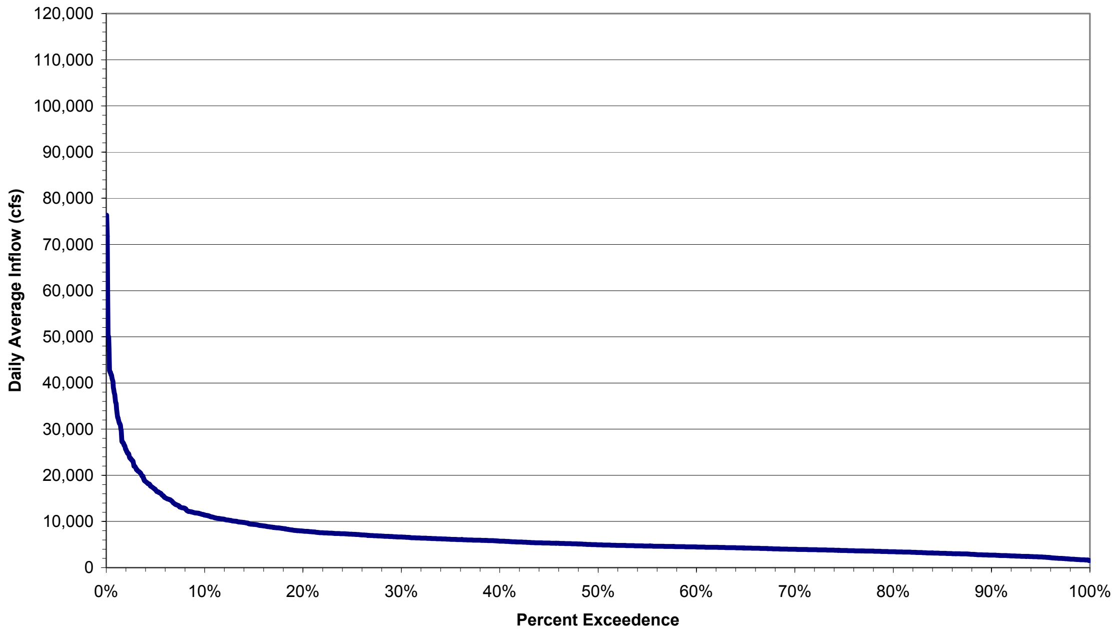


Figure B-4c

March Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

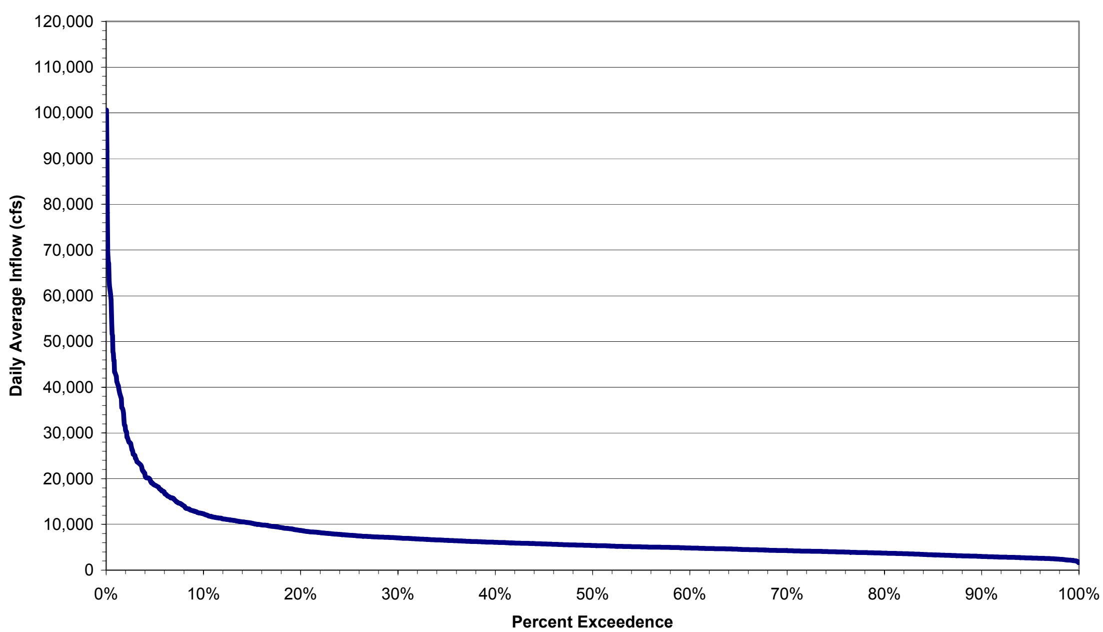


Figure B-4d

April Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

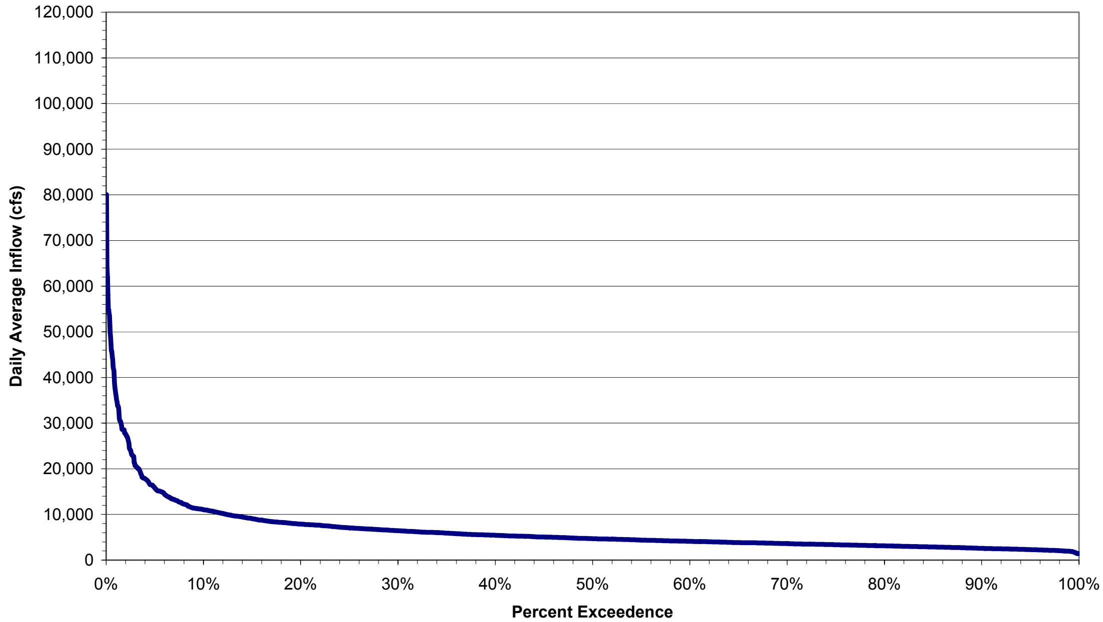


Figure B-4e

May Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

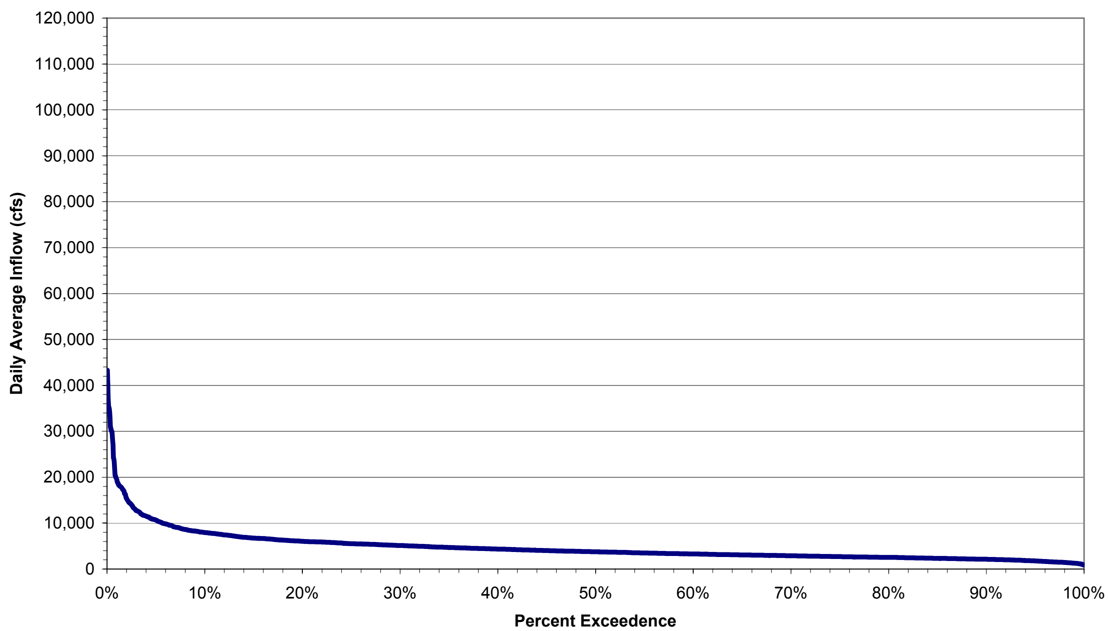


Figure B-4f

June Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

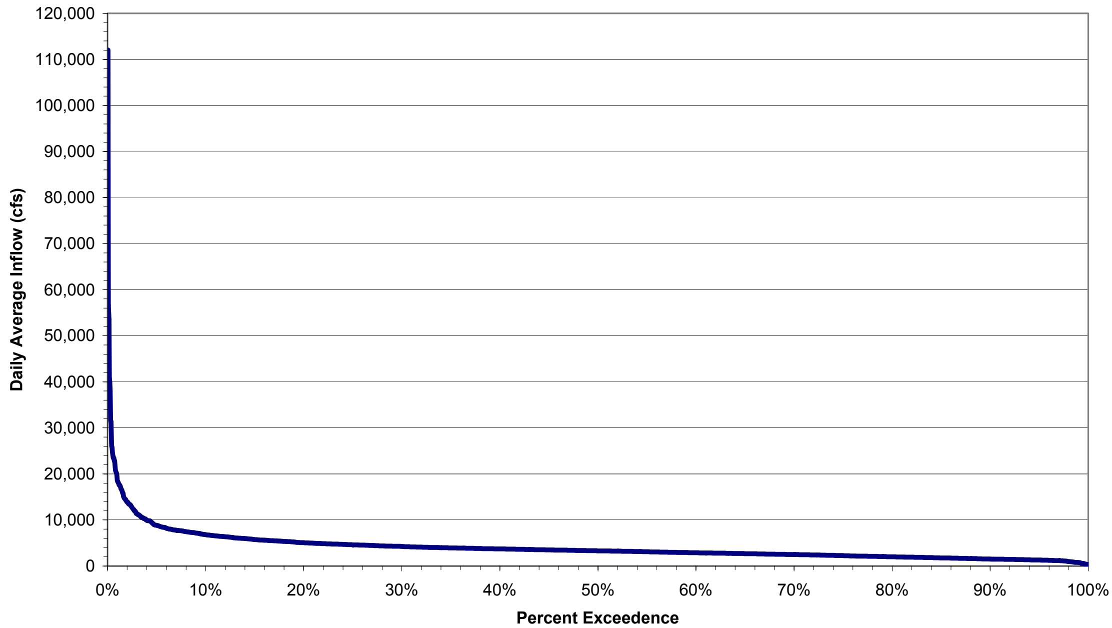


Figure B-4g

July Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

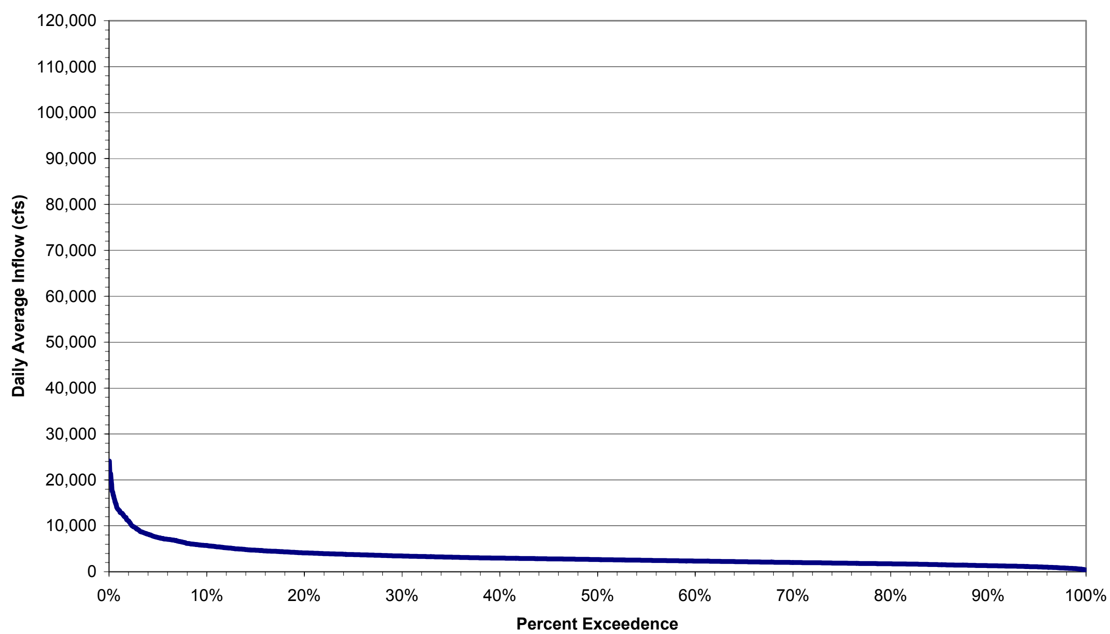


Figure B-4h

August Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

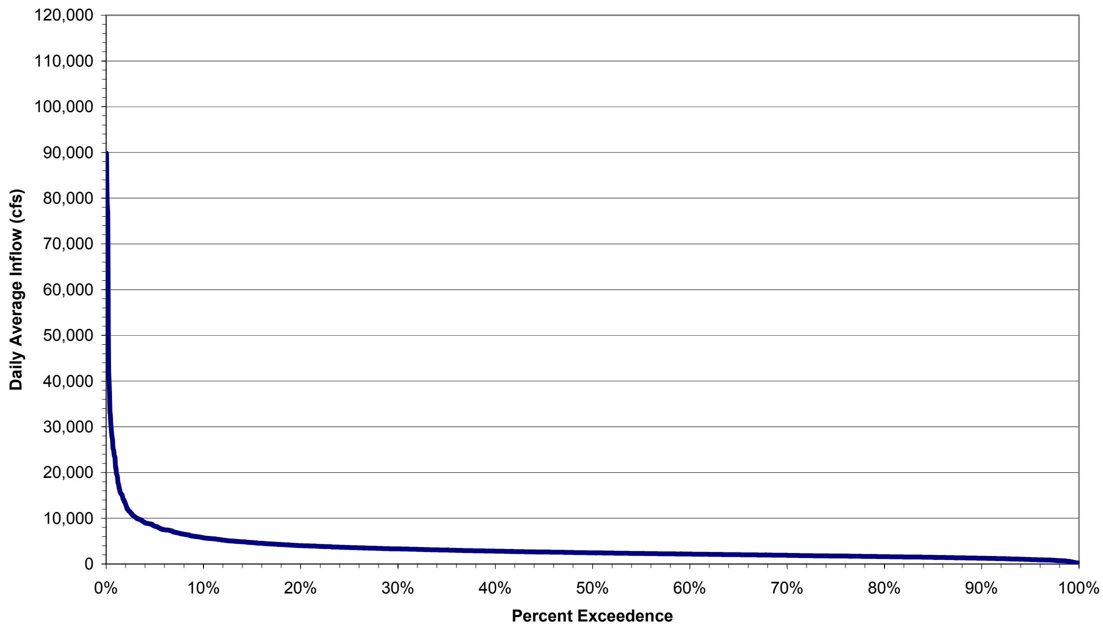


Figure B-4i

September Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

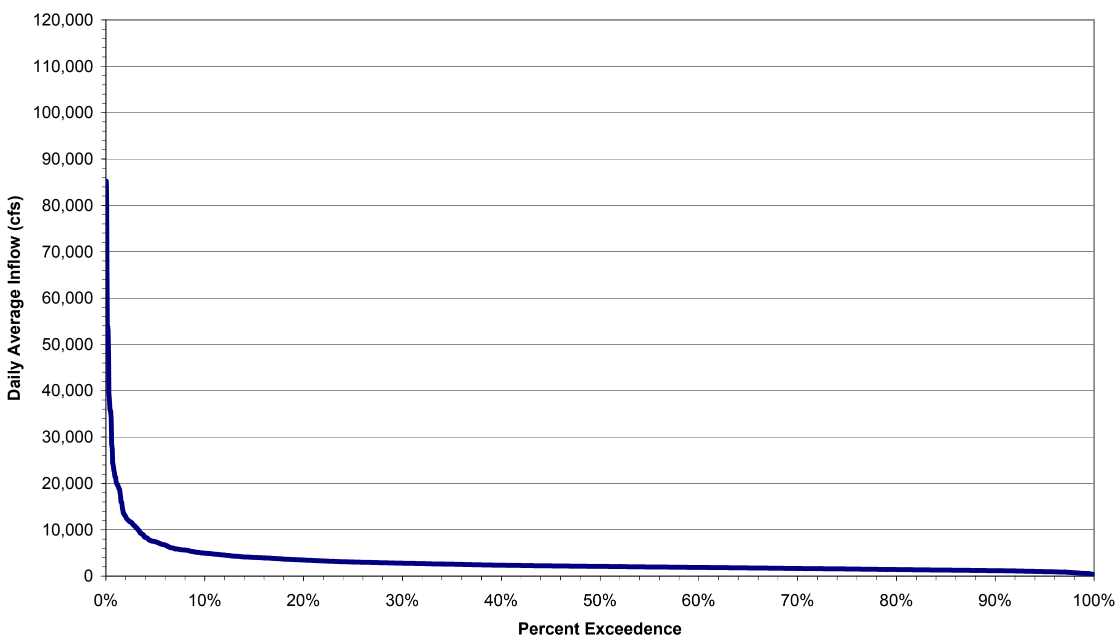


Figure B-4j

October Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

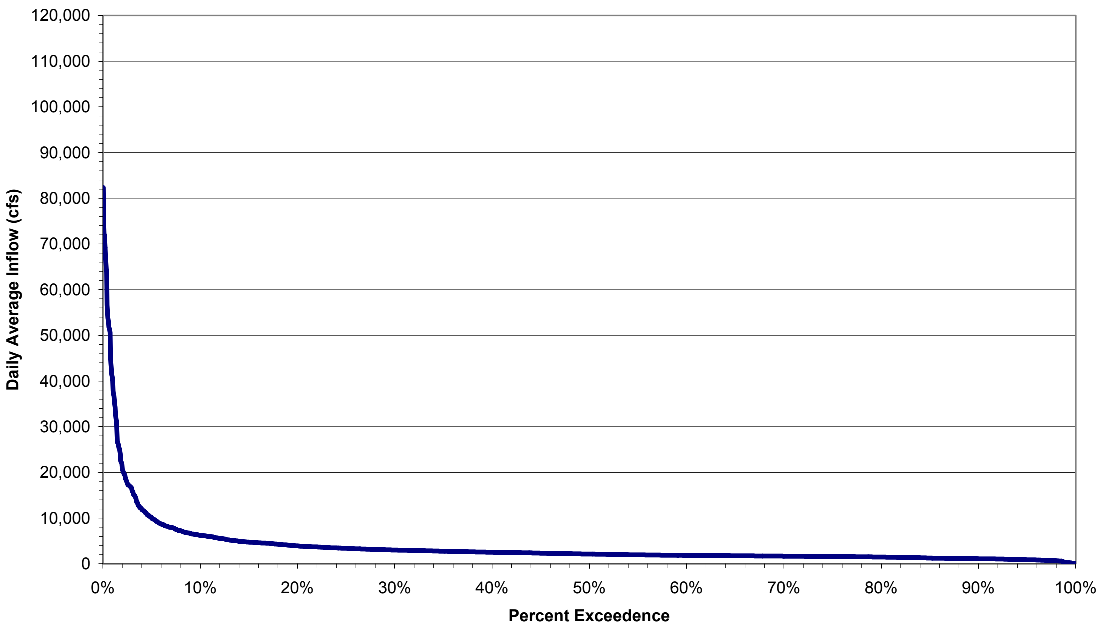


Figure B-4k

November Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)

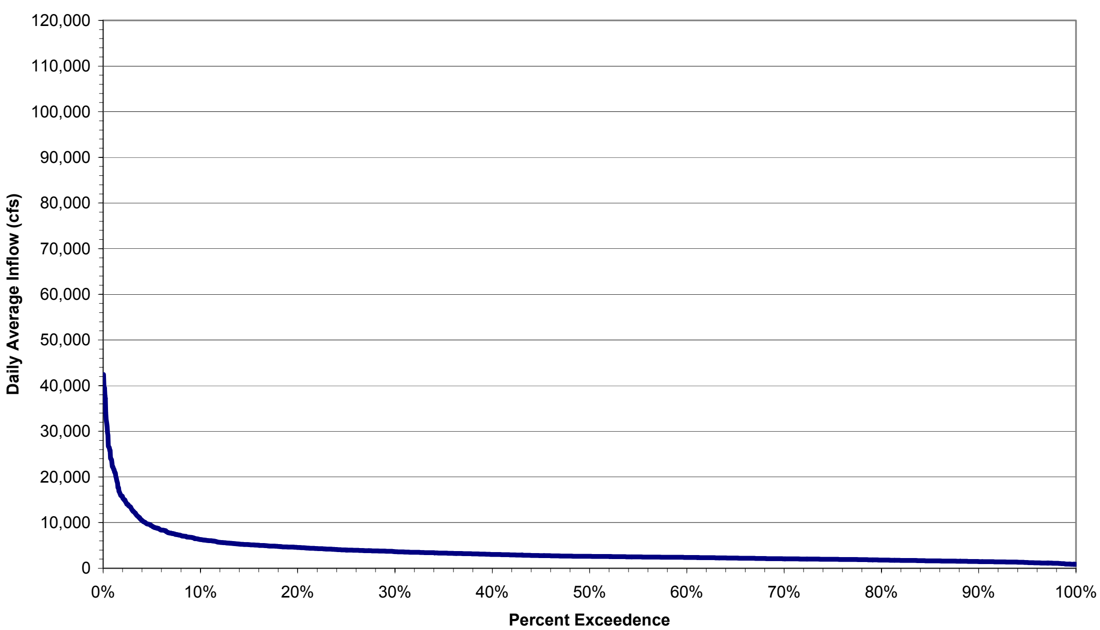
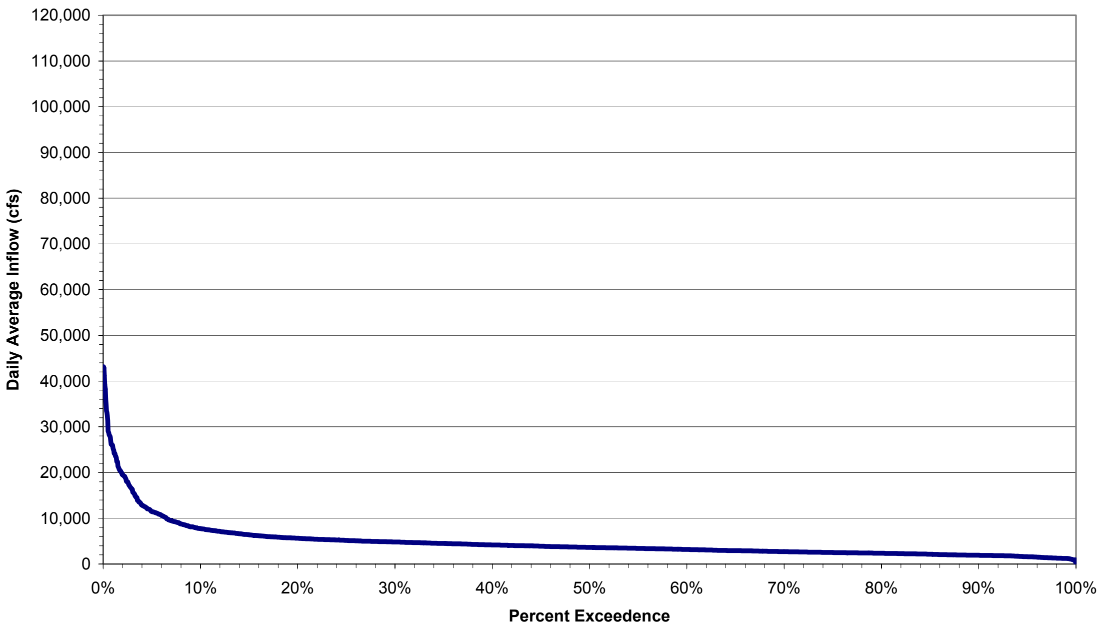


Figure B-4l

December Flow Duration Curve for Regulated
Daily Average Inflows to High Rock Reservoir (1930 - 2003)



B.2.2.2 Area Capacity Relationship

A reservoir capacity curve showing the storage volume of High Rock Reservoir is provided in Figure B-5. This curve is based on recent aerial survey data in the upper elevations of the reservoir. At the normal full pool elevation of 623.9 ft, High Rock Dam impounds an available storage capacity of approximately 217,400 acre-ft, which corresponds to a drawdown of approximately 30 ft. The gross storage capacity of High Rock Reservoir is 237,900 acre-ft. APGI's proposed operation of High Rock Reservoir provides a winter drawdown target of 10 ft for normal operation, which corresponds to a usable storage of approximately 109,500 acre-ft.

B.2.2.3 Power Plant Hydraulic Capacity

The existing estimated total hydraulic capacity of the power plant is 10,050 cfs. After the proposed unit refurbishments and upgrades are completed at High Rock, the estimated hydraulic capacity of the power plant will be 10,000 cfs at best efficiency and 10,680 cfs at maximum discharge capacity.

B.2.2.4 Tailwater Curve

The tailwater rating curve for the High Rock Development is presented in Figure B-6.

Figure B-5: High Rock Reservoir Elevation vs. Available Storage

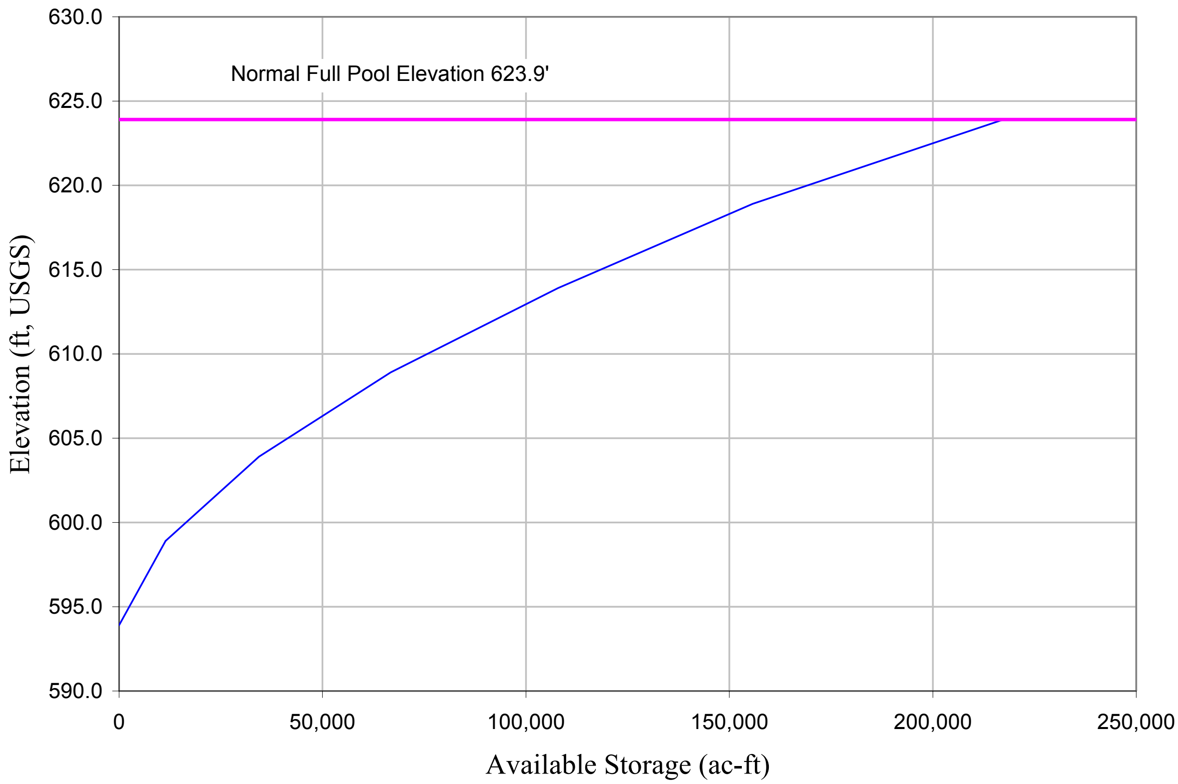
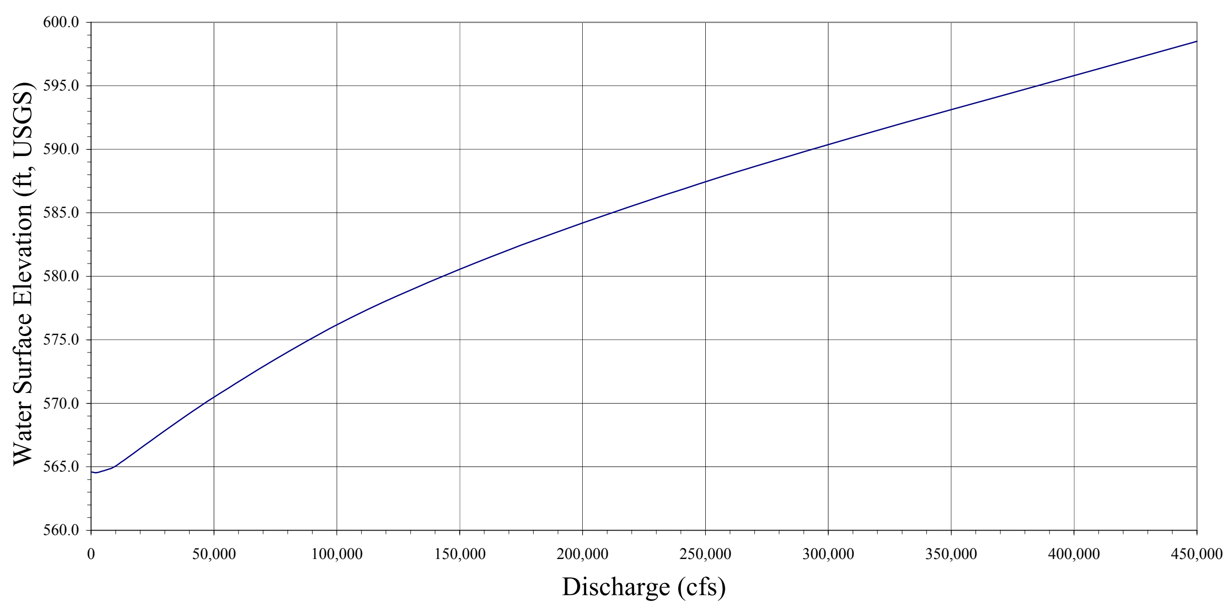


Figure B-6: High Rock Dam, Tailwater Rating Curve



B.2.2.5 Power Plant Capacity Versus Head

The maximum head occurs when High Rock Reservoir is at the normal full pool elevation of 623.9 ft. Assuming High Rock is operating at maximum capacity, the tailwater elevation would be 565 ft. This results in a gross head of 58.9 ft. At the proposed winter drawdown elevation of 613.9 ft, the gross head is 48.9 ft.

The plant capacity at maximum discharge capacity at normal full pool elevation will be approximately 40.4 MW for the three proposed units. Plant capacity will be approximately 33.0 MW at the proposed winter drawdown elevation. Due to APGI's plans to refurbish and upgrade the units and related ongoing engineering tasks, a curve of plant capacity versus head is not currently available.

B.2.3 Plans for Future Development

APGI plans to refurbish/upgrade High Rock Units 1, 2, and 3 to sustain future operation and to increase generation capacity. The refurbishment activities will result in increased hydraulic efficiency. Once the refurbishments and upgrades are completed, the High Rock powerhouse will contain three 13,440 kW vertical Francis turbines, each operating under a net head of 55.0 ft, direct-connected to generators having a total capacity of 41,070 kW (Units 1, 2, and 3 @ 13,690 kW), for a total authorized installed capacity of 40,320 kW as limited by the turbines. The High Rock Development will have a total hydraulic capacity of 10,680 cfs.

APGI also plans to install appropriate aeration technology to increase dissolved oxygen concentrations and enhance water quality in the High Rock tailwater. The installation of aeration technologies at High Rock would take part simultaneously with the unit refurbishment and upgrade work to lower the overall costs of installation. APGI proposes installation of new aerating turbines with a "through-the-runner" aeration capability at the High Rock Development (see Exhibit E.2.7 for further discussion).

B.3 Tuckertown Development

B.3.1 Operation

Tuckertown Development is operated by full-time power dispatchers under the direction of the APGI Operations Manager. Project operation and generation dispatch is remotely controlled from the Dispatch Center located in Alcoa, Tennessee. During high flow conditions, above the capacity of the remotely controlled gates, maintenance personnel are sent to Tuckertown Dam, as required, to operate the spillway gates.

Based on gross generation records from 1972 through 2005 and the net plant capability under the most favorable operating conditions as reported on the FERC Form 1 (42 MW) the average annual plant factor at Tuckertown is approximately 42 percent.

B.3.1.1 Existing Operations

The Tuckertown Development is operated as essentially a run-of-river facility, with a normal daily fluctuation of less than 1 foot and a maximum daily fluctuation of 1 to 3 ft. APGI's current license requires that, except under emergency conditions or for maintenance, the drawdown of Tuckertown Reservoir is limited to 3 ft below normal full pool elevation. Historically, the maximum annual drawdown at Tuckertown Reservoir has averaged approximately 2 ft. The average daily drawdown at Tuckertown Reservoir is less than 1 foot.

B.3.1.2 Proposed Operations

Except for maintenance or under emergency conditions, to be outlined in the proposed HPMEP (see Exhibit B.6.4), APGI proposes to operate Tuckertown Reservoir as it has been operated in the past, with drawdown limited to within 3 ft of normal full pool (not below elevation 561.7 ft).

B.3.2 Estimate of Capacity and Generation

The dependable capacity for the Tuckertown Development is based on the annual energy production during the critical streamflow period (2001) for the 1930 to 2003 POR. The dependable capacity is based on the 2001 energy generation divided by the number of hours per year. The dependable capacity calculated on this basis is 6.1 MW.

The average annual gross generation of Tuckertown Development is 140,143 MWh based on the most recent 20-year period (1986 to 2005).

B.3.2.1 Stream Flows

Tuckertown inflows were estimated using the USGS flow data set discussed in Exhibit B.2.2.1. Using the adjusted Rockingham gains, the inflows to Tuckertown were apportioned by subtracting out known gage flows for the portion of the basin between High Rock and Rockingham from the adjusted Rockingham gains and apportioning the remaining flow by incremental drainage area between the developments. Multiple gages, including the Rocky River, Little River, Brown Creek, and Eldorado gages, were used in disaggregating the monthly inflow data to daily inflow data.

The minimum, mean, and maximum flows at Tuckertown during the 1930 to 2003 USGS POR are 0 cfs, 4,955 cfs, and 114,695 cfs, respectively. Monthly flow duration curves of Tuckertown inflows for APGI's Existing Operations are presented in Figures B-7a through B-7l.

Figure B-7a

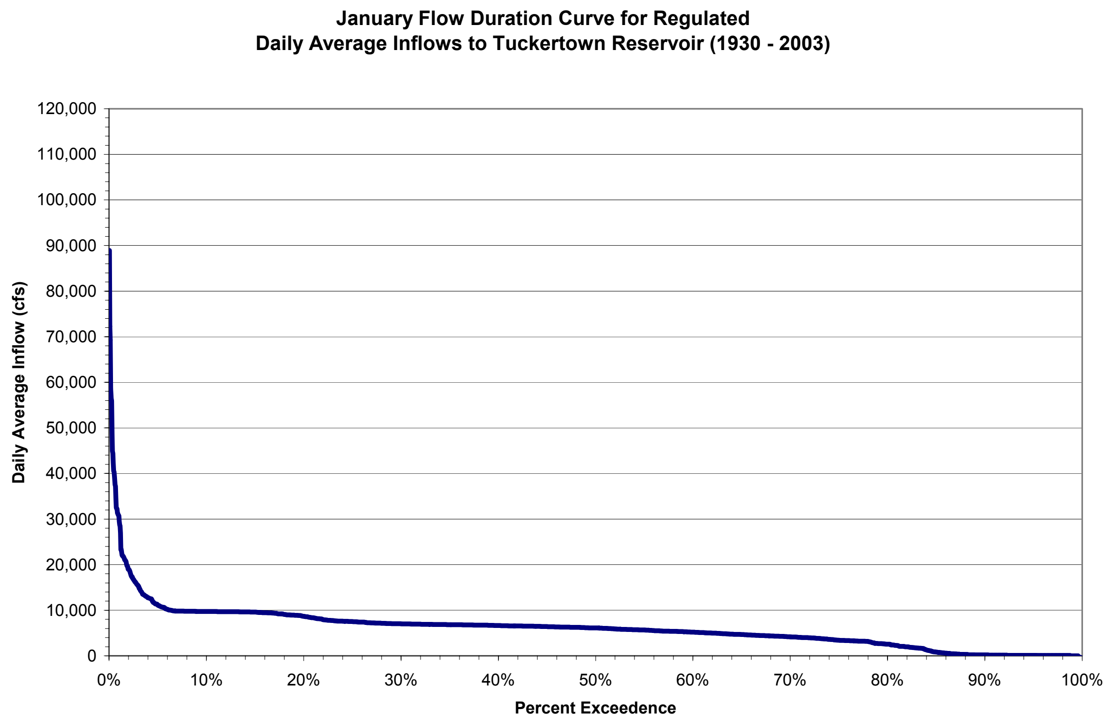


Figure B-7b

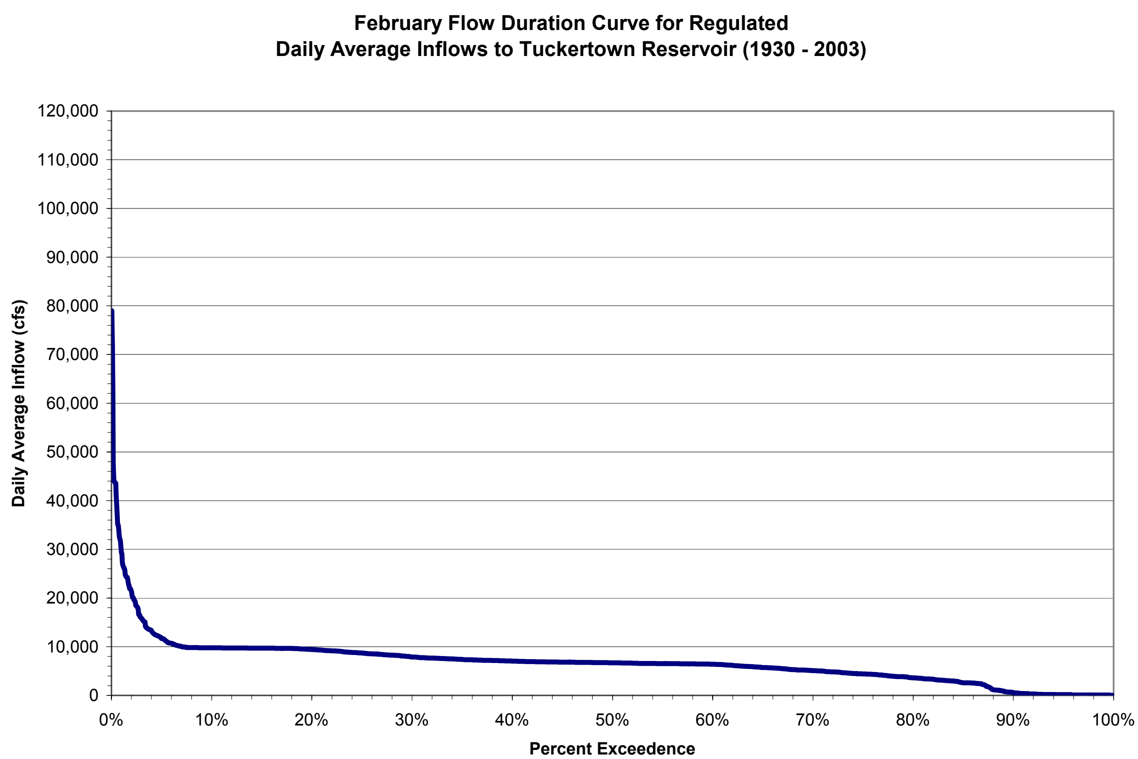


Figure B-7c

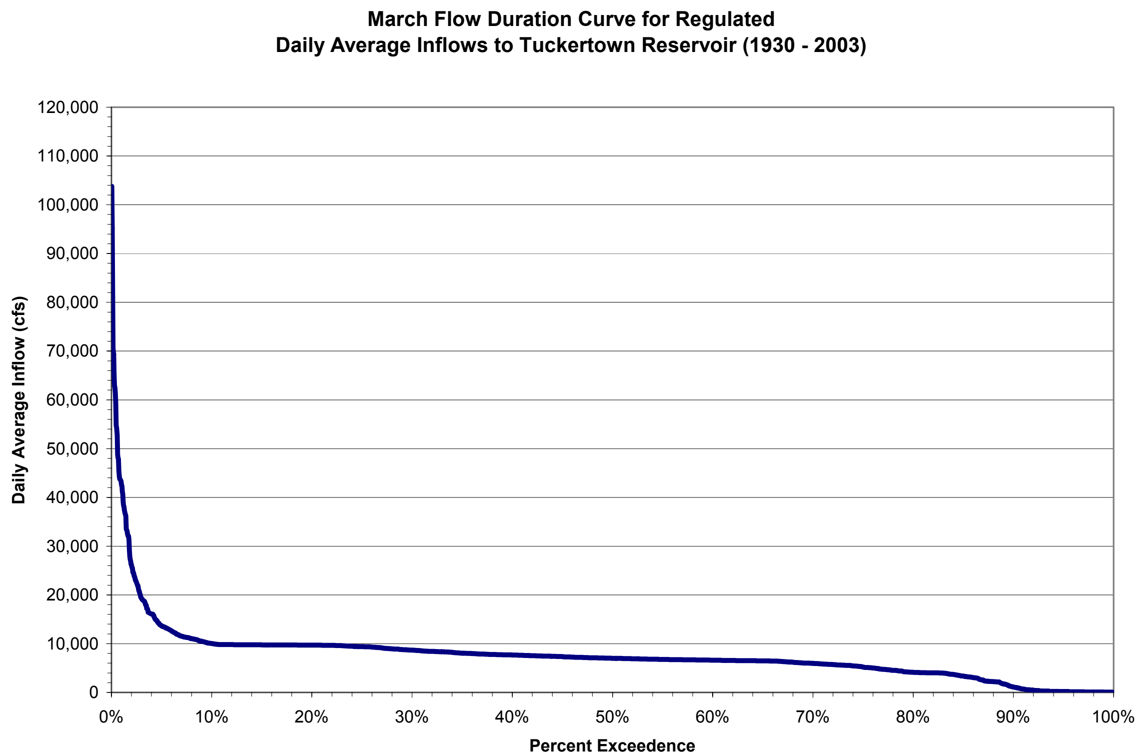


Figure B-7d

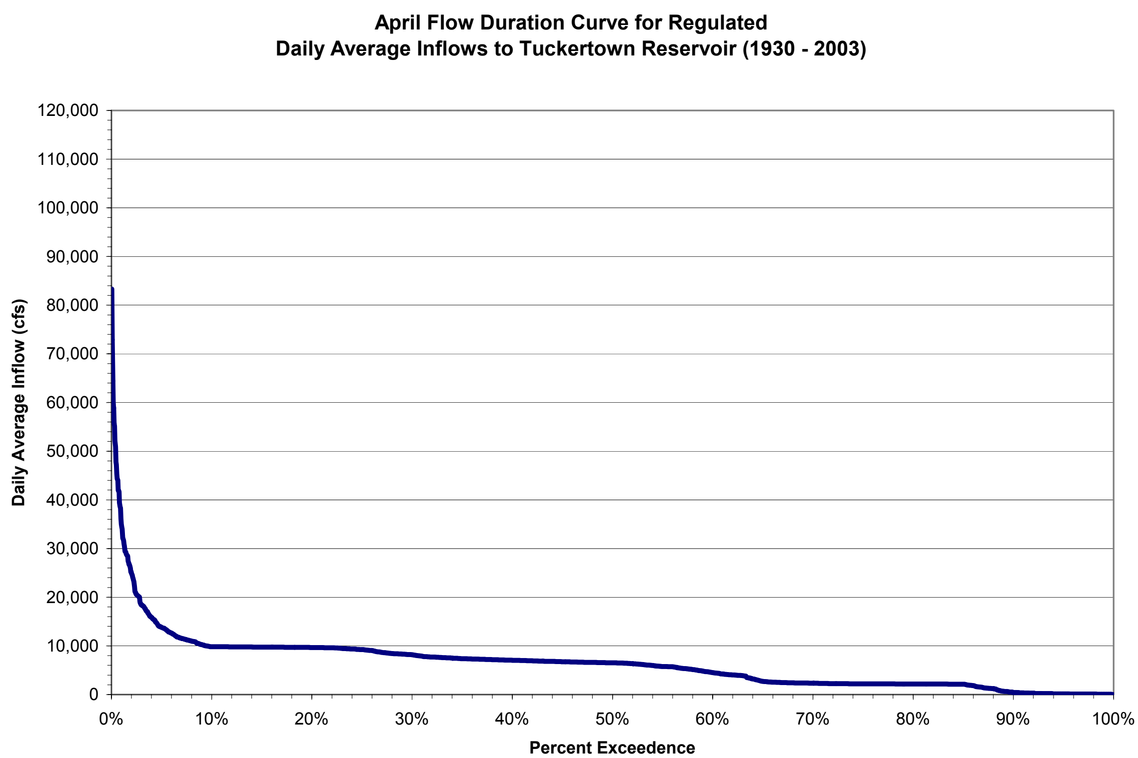


Figure B-7e

May Flow Duration Curve for Regulated
Daily Average Inflows to Tuckertown Reservoir (1930 - 2003)

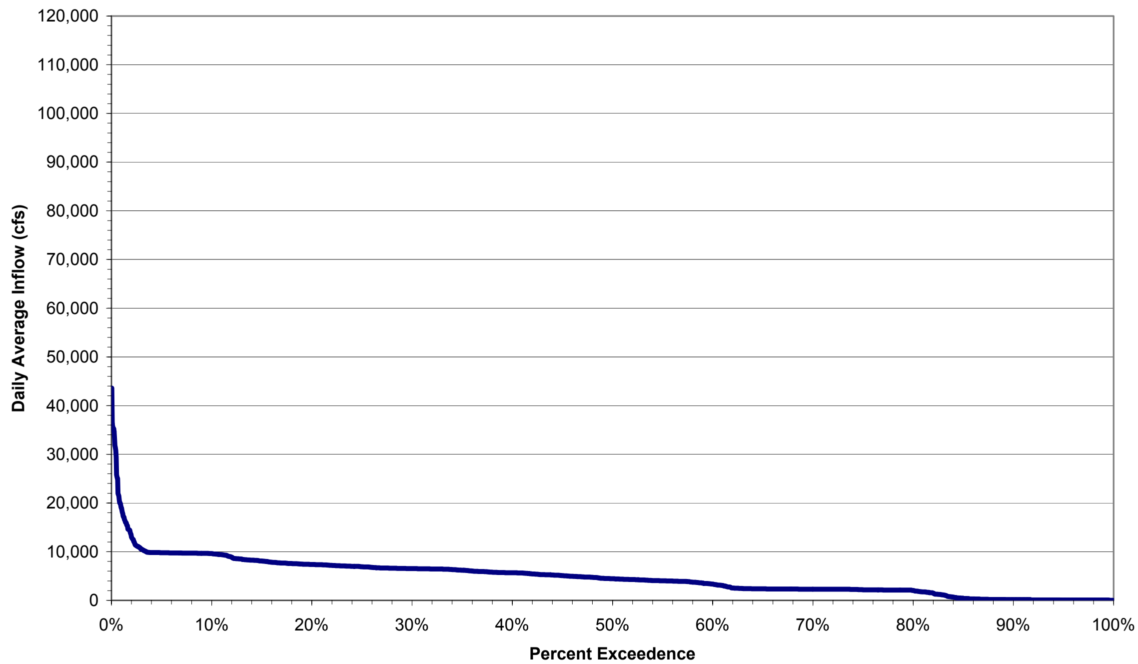


Figure B-7f

June Flow Duration Curve for Regulated
Daily Average Inflows to Tuckertown Reservoir (1930 - 2003)

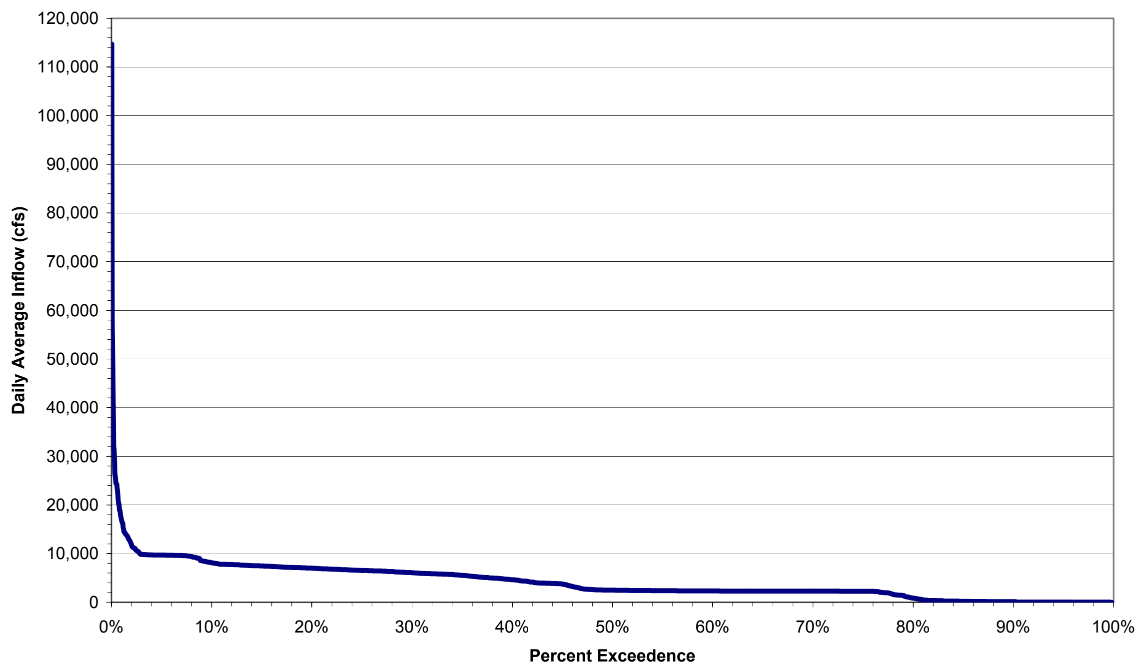


Figure B-7g

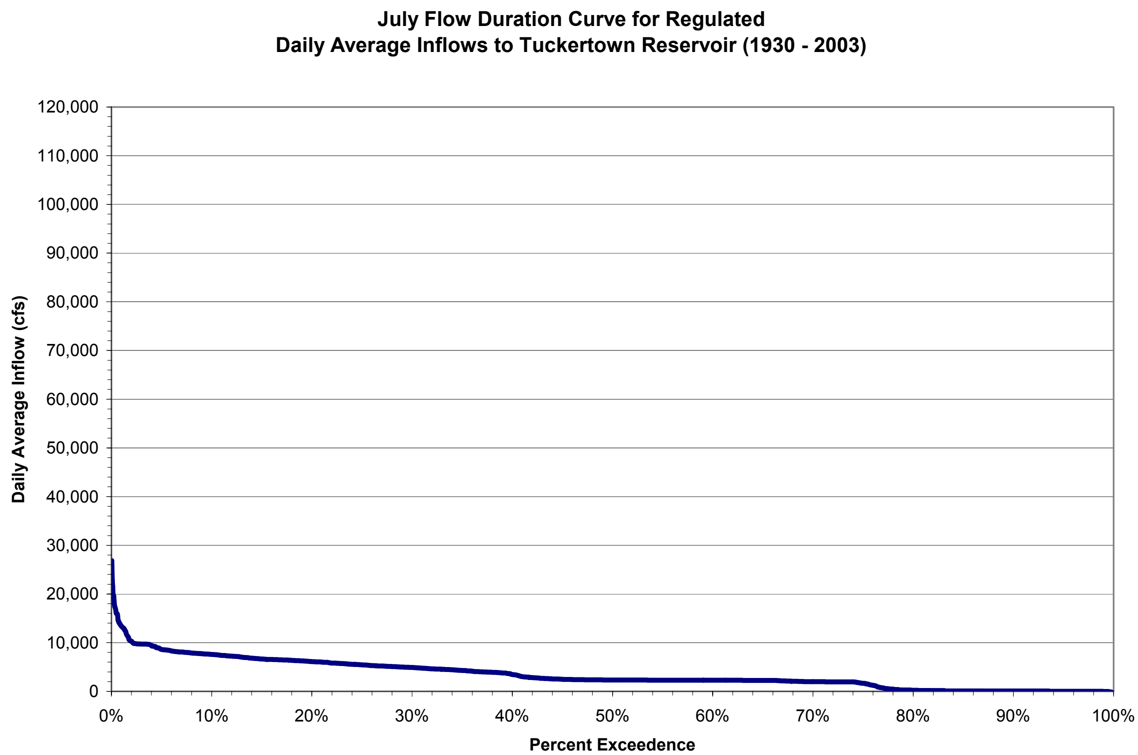


Figure B-7h

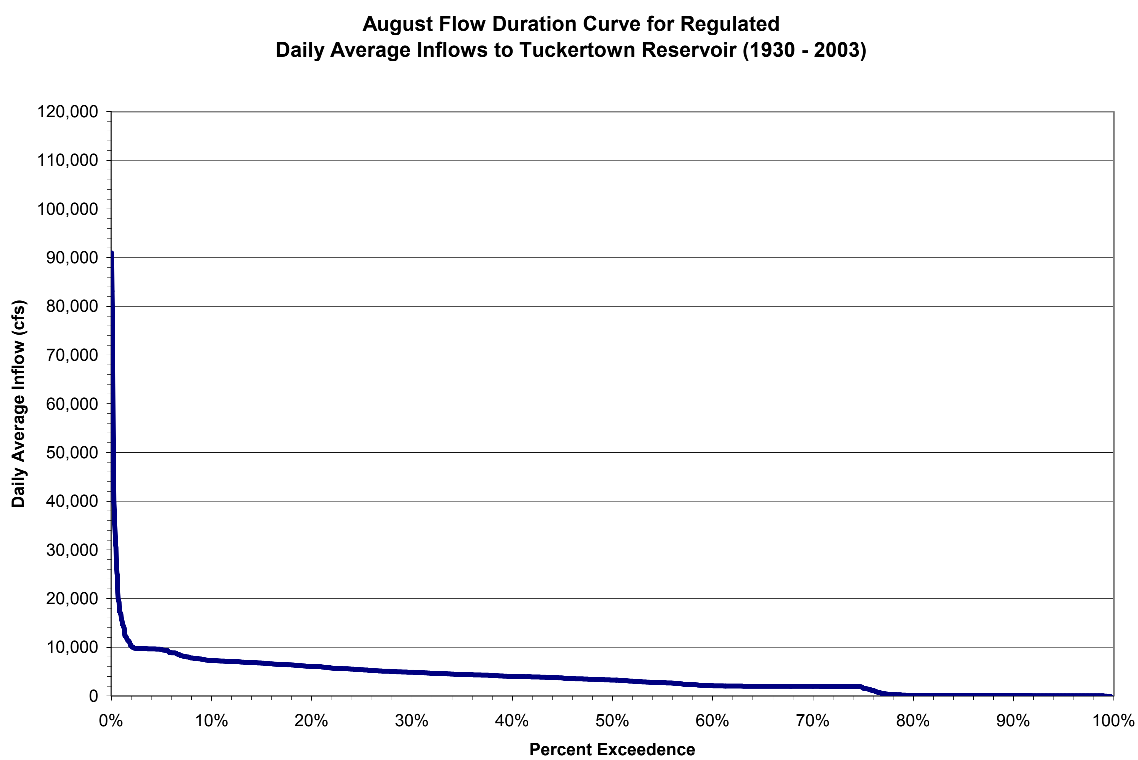


Figure B-7i

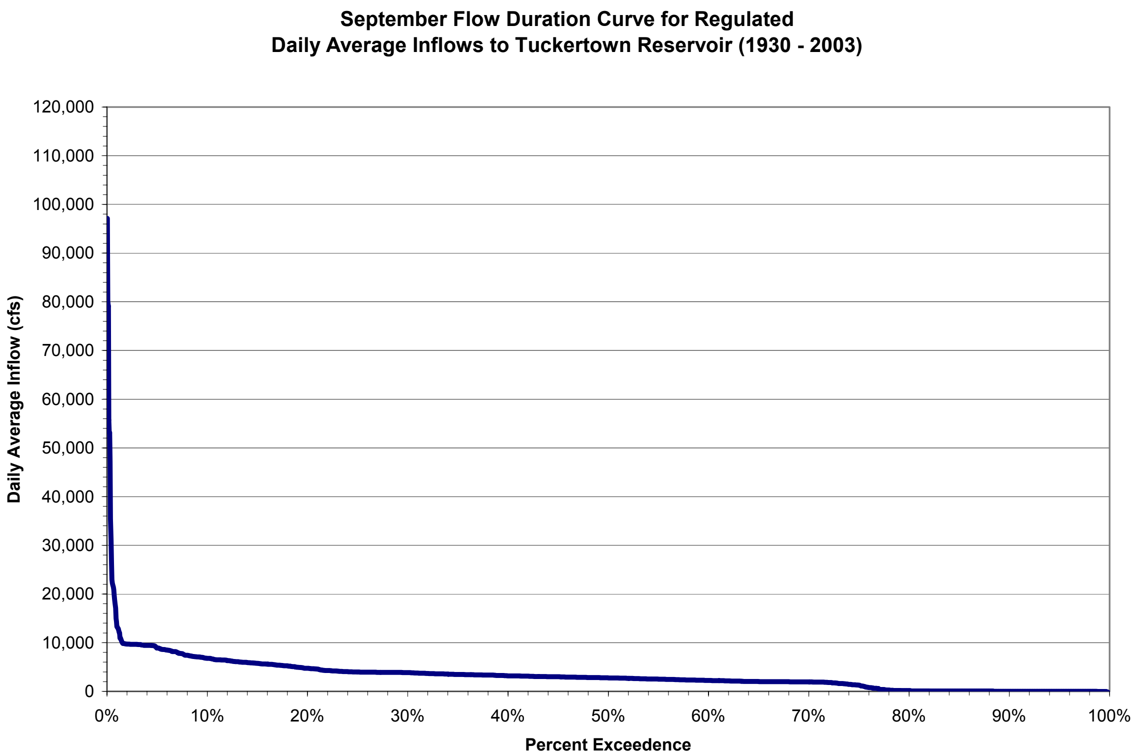


Figure B-7j

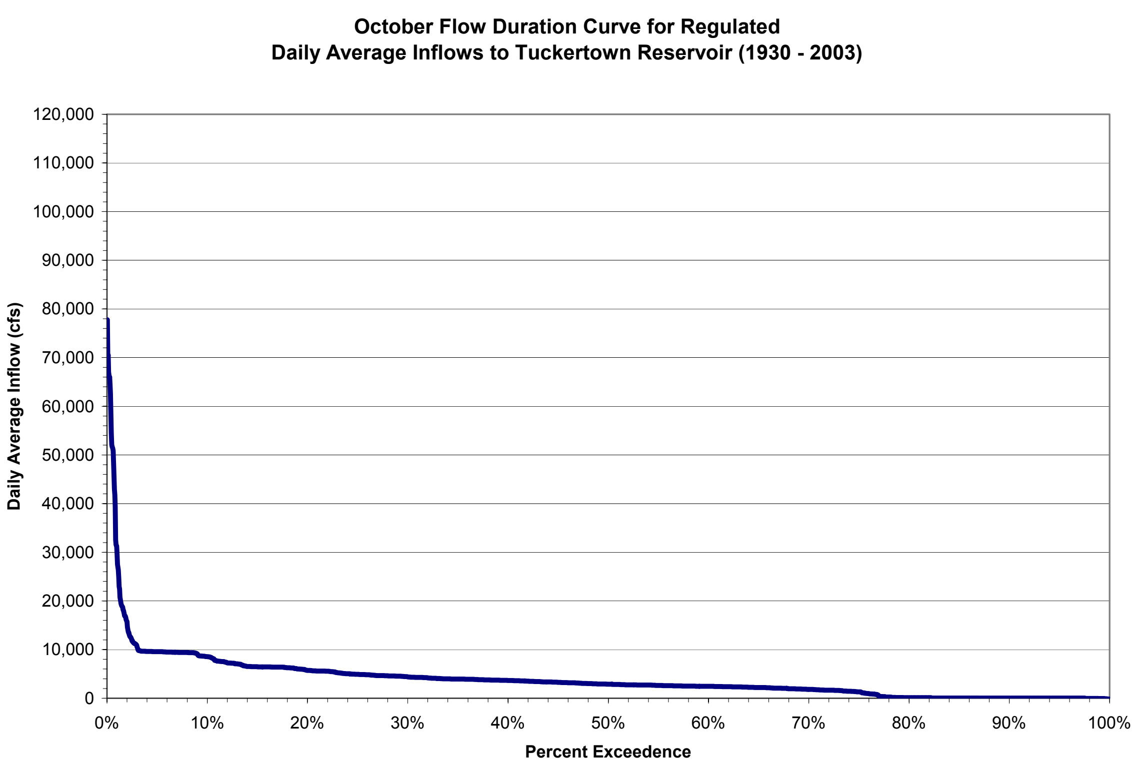


Figure B-7k

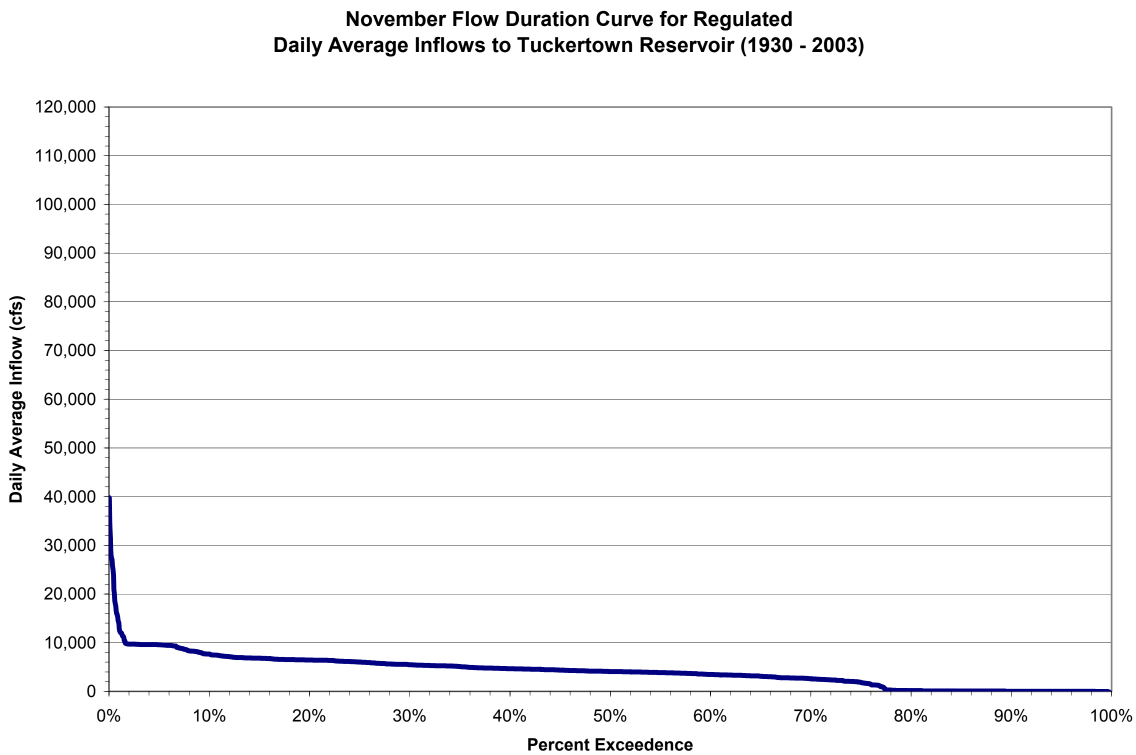
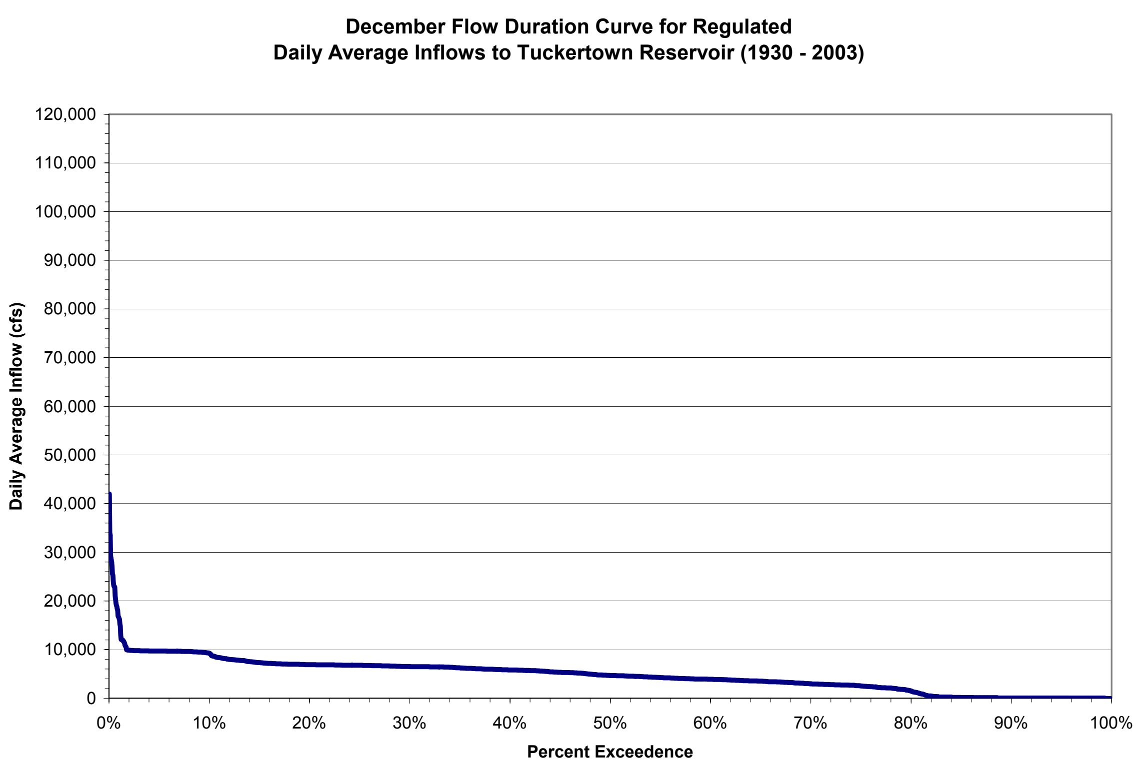


Figure B-7l



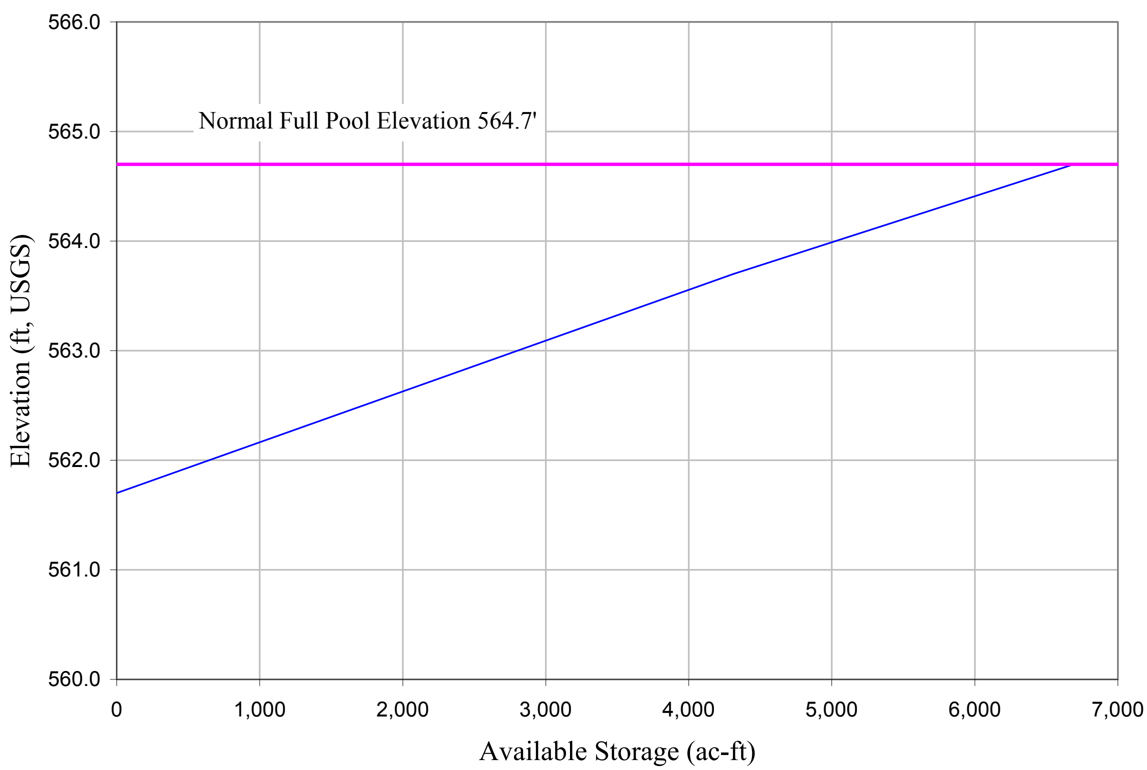
B.3.2.2 Area Capacity Relationship

A reservoir capacity curve showing the storage volume of Tuckertown Reservoir is provided in Figure B-8. At the normal full pool elevation of 564.7 ft, Tuckertown Dam impounds a usable storage volume of approximate 6,700 acre-ft, which corresponds to a drawdown of approximately 3 ft. The gross storage capacity of Tuckertown Reservoir is 42,160 acre-ft. APGI proposes to operate Tuckertown Reservoir as it has been operated in the past, with drawdown limited to within 3 ft of normal full pool (not below elevation 561.7 ft), except for maintenance or under emergency conditions outlined in the proposed HPMEP (Exhibit B.6.4). As such, under the proposed operation, the usable storage at Tuckertown would remain unchanged at 6,700 acre-ft.

B.3.2.3 Power Plant Hydraulic Capacity

The existing estimated total hydraulic capacity of the power plant is 11,475 cfs. After the proposed refurbishments and upgrades are completed at Tuckertown, the estimated hydraulic capacity of the power plant will be 6,960 cfs at best efficiency and 11,130 cfs at maximum discharge capacity. The units at Tuckertown are Kaplan units with a relatively flat turbine efficiency curve. The reduced hydraulic capacity at the best efficiency point is based on the revised turbine design for the proposed upgrade and, as noted above, the maximum plant discharge will be very similar to the existing discharge.

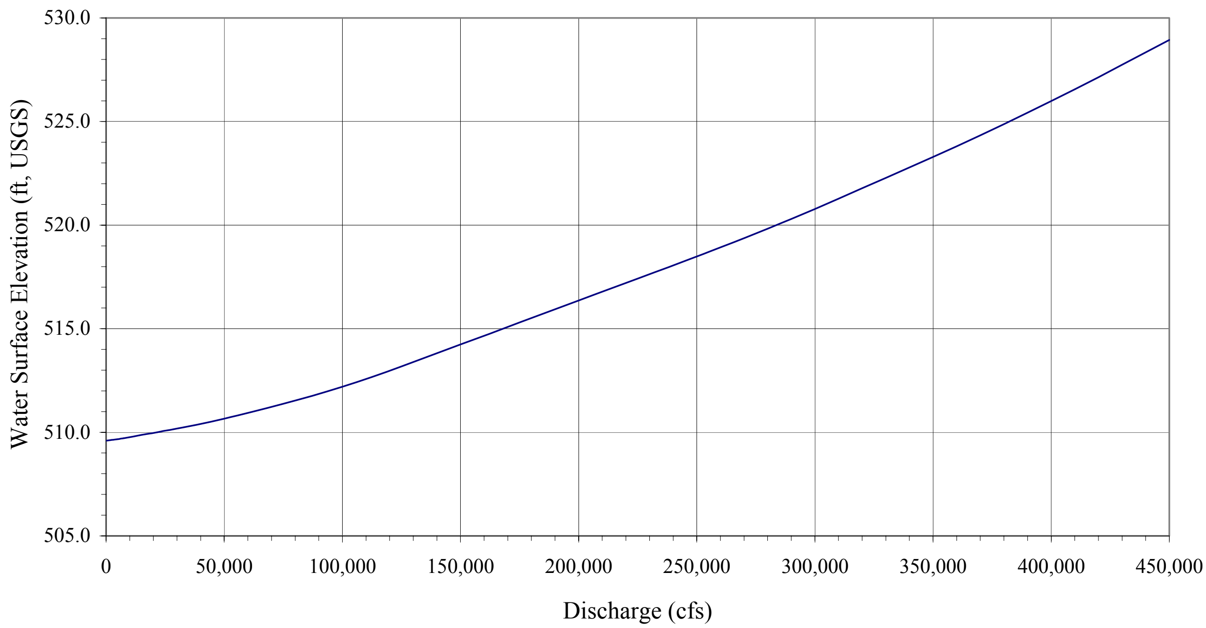
Figure B-8: Tuckertown Reservoir Elevation vs. Available Storage



B.3.2.4 Tailwater Curve

The tailwater rating curve for the Tuckertown Development is presented in Figure B-9.

Figure B-9: Tuckertown Dam, Tailwater Rating Curve



B.3.2.5 Power Plant Capacity Versus Head

The maximum head occurs when Tuckertown Reservoir is at normal full pool elevation of 564.7 ft. When Tuckertown is operating at maximum capacity, the tailwater elevation would be 510.0 ft, resulting in a gross head of 54.7 ft. The plant capacity at normal full pool elevation will be approximately 42.7 MW. Due to APGI's plans to refurbish and upgrade the units and related ongoing engineering tasks, a curve of plant capacity versus head is not currently available.

B.3.3 Plans for Future Development

APGI is proposing to refurbish and upgrade the Tuckertown generating units to sustain future operation and to increase generation capacity. The refurbishment activities will result in increased hydraulic efficiency. The refurbishments will not increase the flow rate at maximum turbine discharge nor the rated generating capacity of Tuckertown. Once the refurbishments and upgrades are completed, the Tuckertown powerhouse will contain three 9,540 kW Kaplan turbines, each operating under a net head of 53.5 ft, direct-connected to generators having a total capacity of 42,720 kW (Units 1, 2, and 3 @ 14,240 kW maximum capacity), for a total authorized installed capacity of 28,620 kW as limited by the turbines. The Tuckertown Development will have a total hydraulic capacity of 6,960 cfs at best efficiency and 11,130 cfs at maximum discharge capacity.

Under its proposed dissolved oxygen enhancement program, APGI plans to install appropriate aeration technology to increase dissolved oxygen concentrations and enhance water quality (see Exhibit E.2.7 for further discussion). No specific aeration equipment is proposed at the Tuckertown Development at this time pending future determination if improvements in dissolved oxygen at High Rock will extend to the Tuckertown tailrace.

B.4 Narrows Development

B.4.1 Operation

Narrows Development is operated by full-time power dispatchers under the direction of the APGI Operations Manager. Project operation and generation dispatch is remotely controlled from the Dispatch Center located in Alcoa, Tennessee. During high flow conditions, above the capacity of the remotely controlled gates, maintenance personnel are sent to Narrows Dam, as required, to operate the bypass and main dam spillway gates.

Based on gross generation records from 1972 through 2005 and the net plant capability under the most favorable operating conditions as reported on the FERC Form 1,119 MW, the average annual plant factor at Narrows is approximately 47 percent.

B.4.1.1 Existing Operations

Generally, the Narrows Development is operated as a run-of-river facility. Narrows Reservoir is operated with a normal daily fluctuation of less than 1 foot and a maximum daily fluctuation of 1 to 2 ft. Historically, the normal drawdown at Narrows Reservoir has been approximately 3 ft. The average daily drawdown at Narrows is 1 to 2 ft.

However, Narrows Reservoir does have some storage available that may be used during emergencies or during periods of very low streamflow to maintain the required minimum downstream releases. Table B.4-1 lists the drawdown relationship between High Rock and Narrows Reservoirs as defined by the current Operating Guides for the Operation of Badin Works.

Table B.4-1: Drawdown Relationship Between High Rock and Narrows Reservoirs

High Rock Reservoir		Narrows Reservoir	
Elevation (ft, USGS)	**Drawdown (ft)**	**Elevation (ft, USGS)**	**Drawdown (ft)**
623.9	0	509.8 – 507.7	0 – 2.1
622.9	1.0	508.2 – 503.2	1.6 – 6.6
599.9	24.0	508.2 – 503.2	1.6 – 6.6
599.9	24.0	502.7	7.1
597.9	26.0	493.7	16.1
593.9	30.0	478.8	31.1

B.4.1.2 Proposed Operations

APGI proposes to continue to operate Narrows Reservoir as it has been operated in the past, typically maintaining reservoir water levels within 3 ft of full with the ability to go to 6.6 ft below normal full pool (not below elevation 503.2 ft), as needed in order to meet required minimum flows or as outlined in the proposed LIP, or in cases of emergency, equipment failure or maintenance situations as outlined in the HPMEP (see Exhibit B.6.4).

APGI proposes to undertake a series of Project modifications designed to increase DO concentrations and enhance water quality in the Project tailwaters through installation of aeration technology at Narrows simultaneously with the proposed unit refurbishment and upgrade, as described in Exhibit B.4.3. APGI proposes installation of new aerating valves on the draft tube cones at the Narrows development. APGI proposes to operate the aerating equipment between May 1 and November 30 of each year, as needed.

B.4.2 Estimate of Capacity and Generation

The dependable capacity for Narrows Development is based on the annual energy production during the driest year (2001) for the 1930 to 2003 POR. The dependable capacity is based on the 2001 energy generation divided by the number of hours per year. The dependable capacity calculated on this basis is 20.5 MW.

The average annual gross generation of Narrows Development is 447,150 MWh based on the most recent 20-year period (1986 to 2005).

B.4.2.1 Stream Flows

Narrows inflows were estimated using the USGS flow data set discussed in Exhibit B.2.2.1. Using the adjusted Rockingham gains, the inflows to Narrows were apportioned by subtracting out known gage flows for the portion of the basin between High Rock and Rockingham from the adjusted Rockingham gains and apportioning the remaining flow by incremental drainage area between the developments. Multiple gages, including the Rocky River, Little River, Brown Creek, and Eldorado gages, were used in disaggregating the monthly inflow data to daily inflow data.

The minimum, mean, and maximum Narrows flows during the 1930 to 2003 POR are 0 cfs, 5,135 cfs, and 116,570 cfs, respectively. Monthly flow duration curves of Narrows inflows for APGI's Existing Operations are presented in Figures B-10a through B-10l.

Figure B-10a

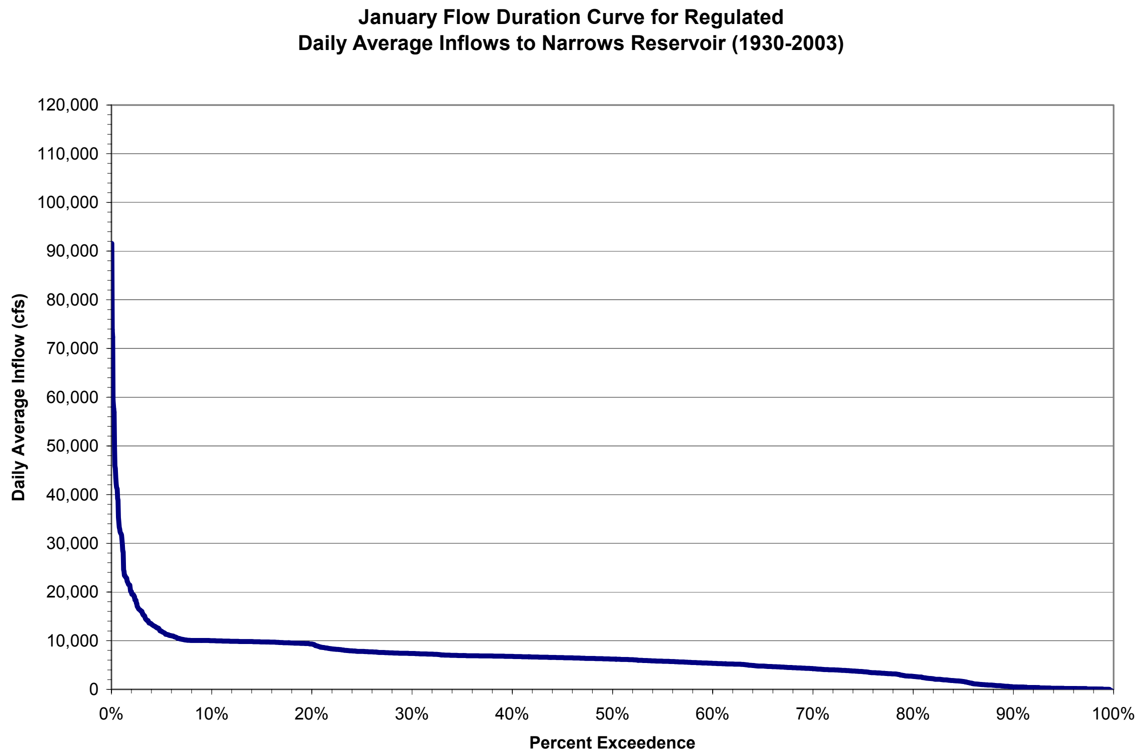


Figure B-10b

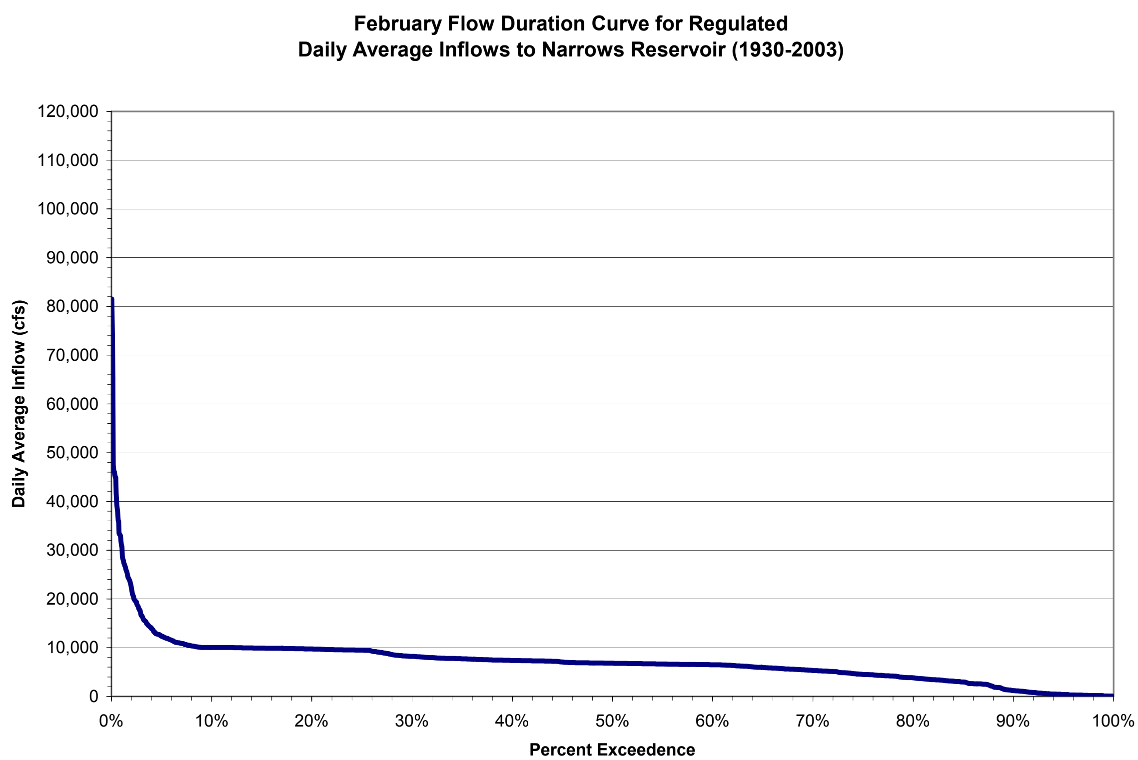


Figure B-10c

March Flow Duration Curve for Regulated Daily Average Inflows to Narrows Reservoir (1930-2003)

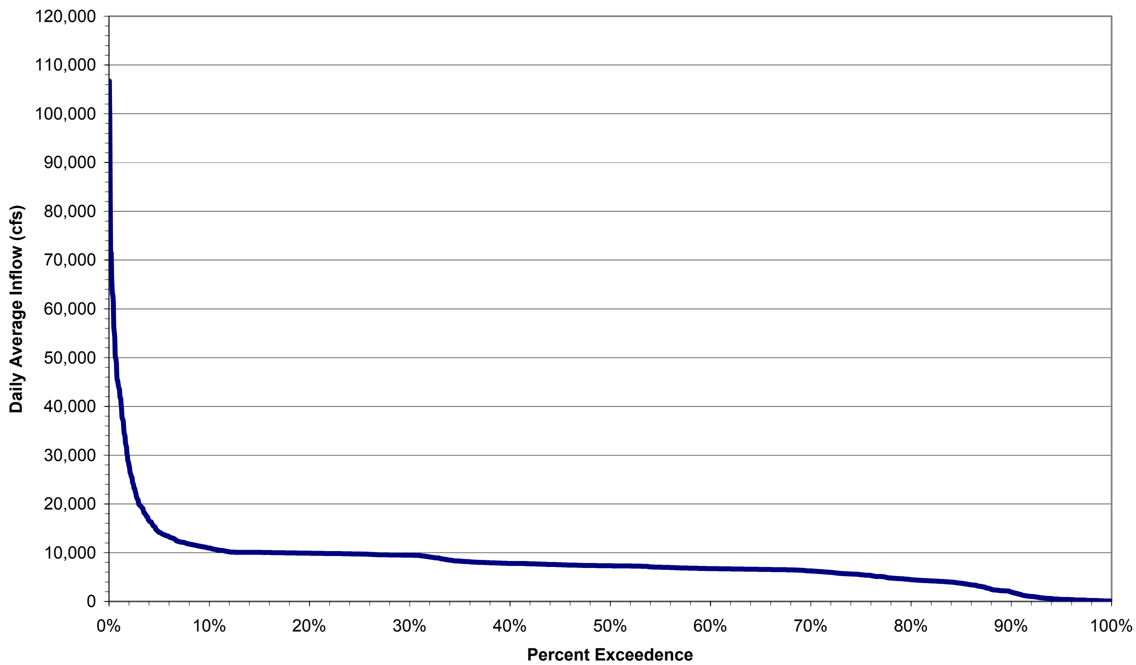


Figure B-10d

April Flow Duration Curve for Regulated Daily Average Inflows to Narrows Reservoir (1930-2003)

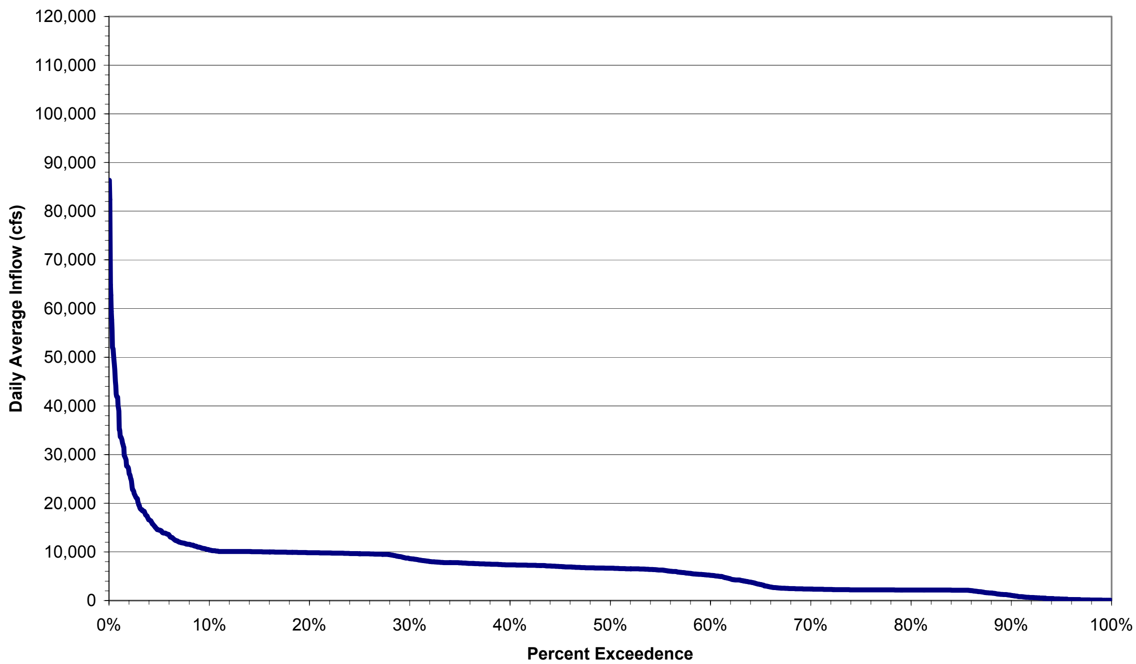


Figure B-10e

May Flow Duration Curve for Regulated
Daily Average Inflows to Narrows Reservoir (1930-2003)

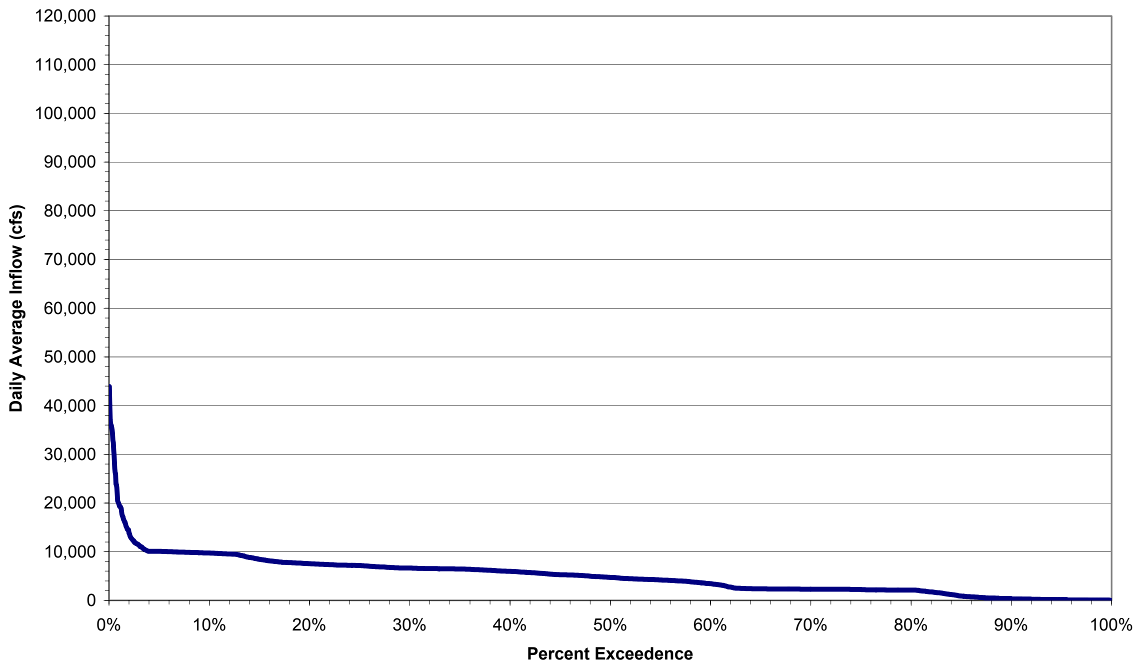


Figure B-10f

June Flow Duration Curve for Regulated
Daily Average Inflows to Narrows Reservoir (1930-2003)

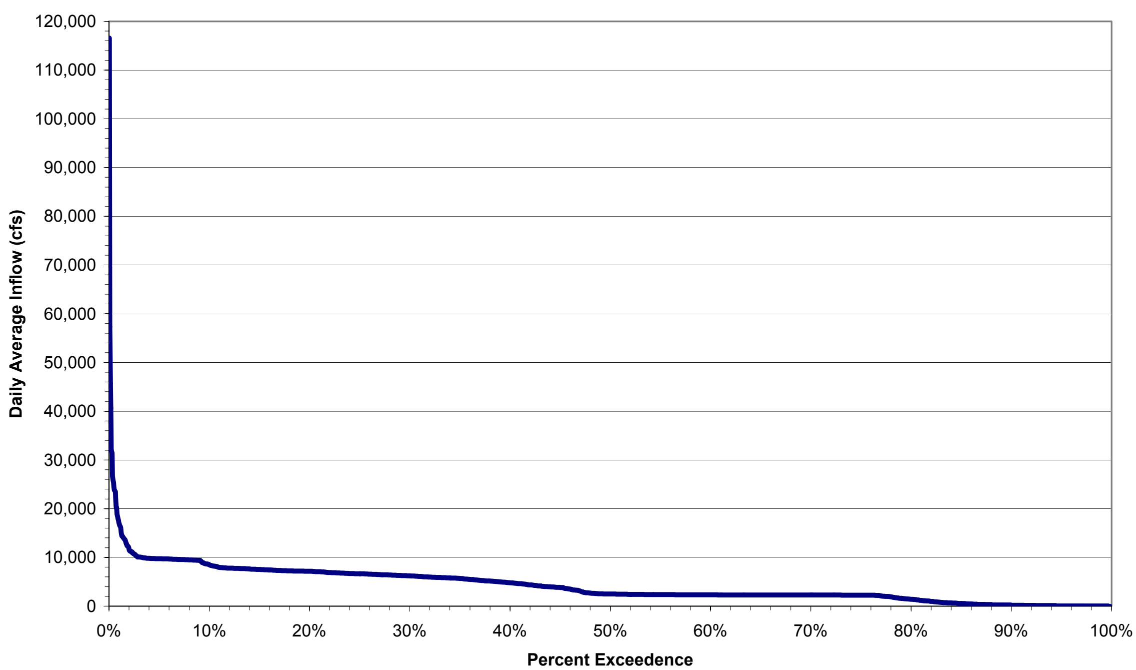


Figure B-10g

July Flow Duration Curve for Regulated Daily Average Inflows to Narrows Reservoir (1930-2003)

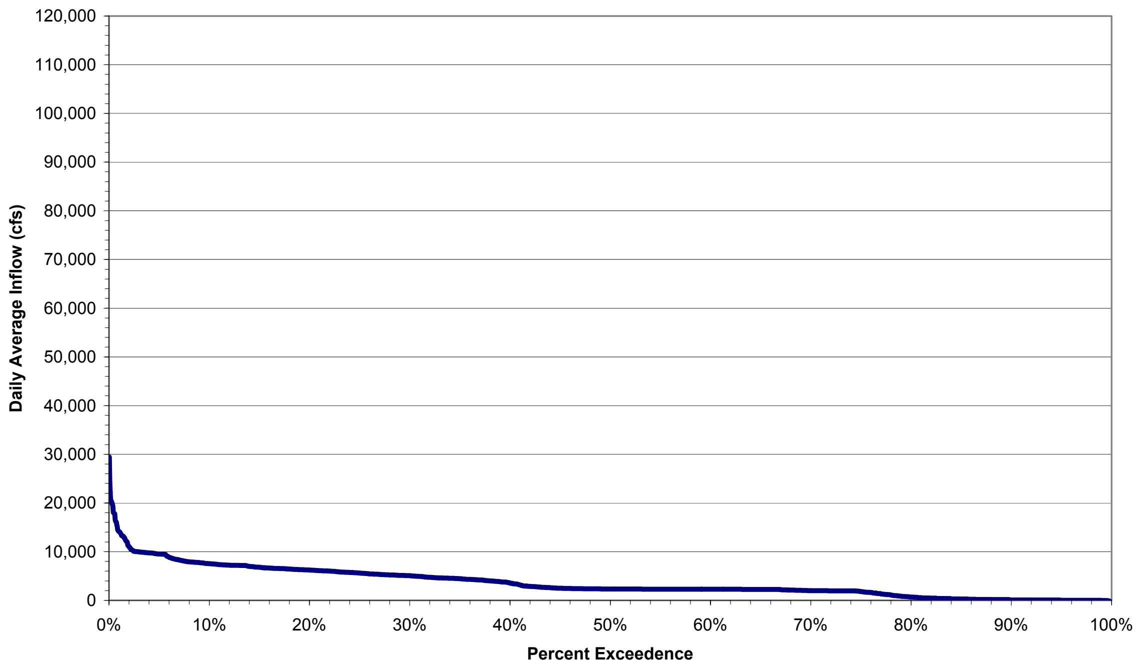


Figure B-10h

August Flow Duration Curve for Regulated Daily Average Inflows to Narrows Reservoir (1930-2003)

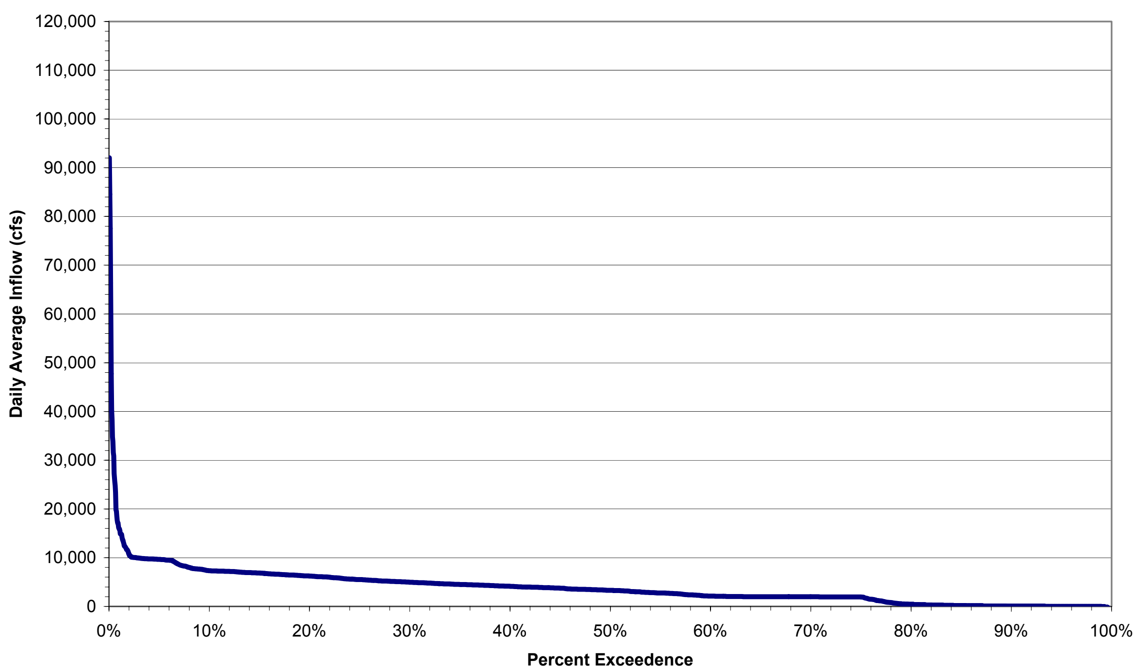


Figure B-10i

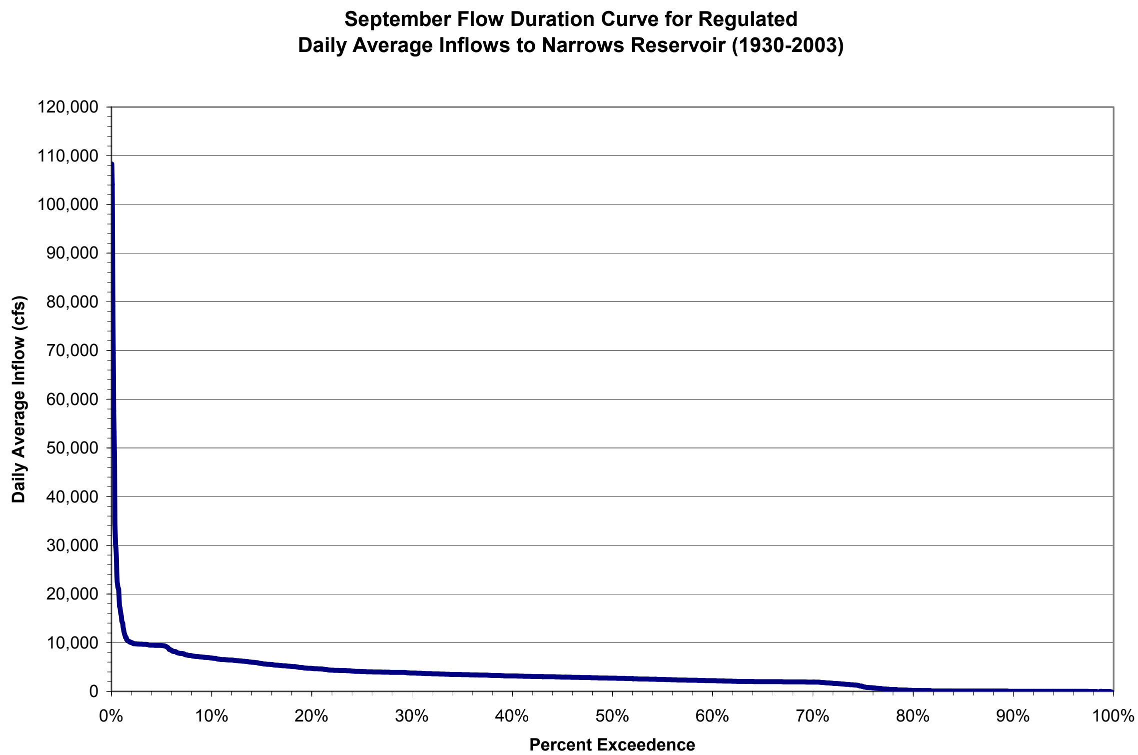


Figure B-10j

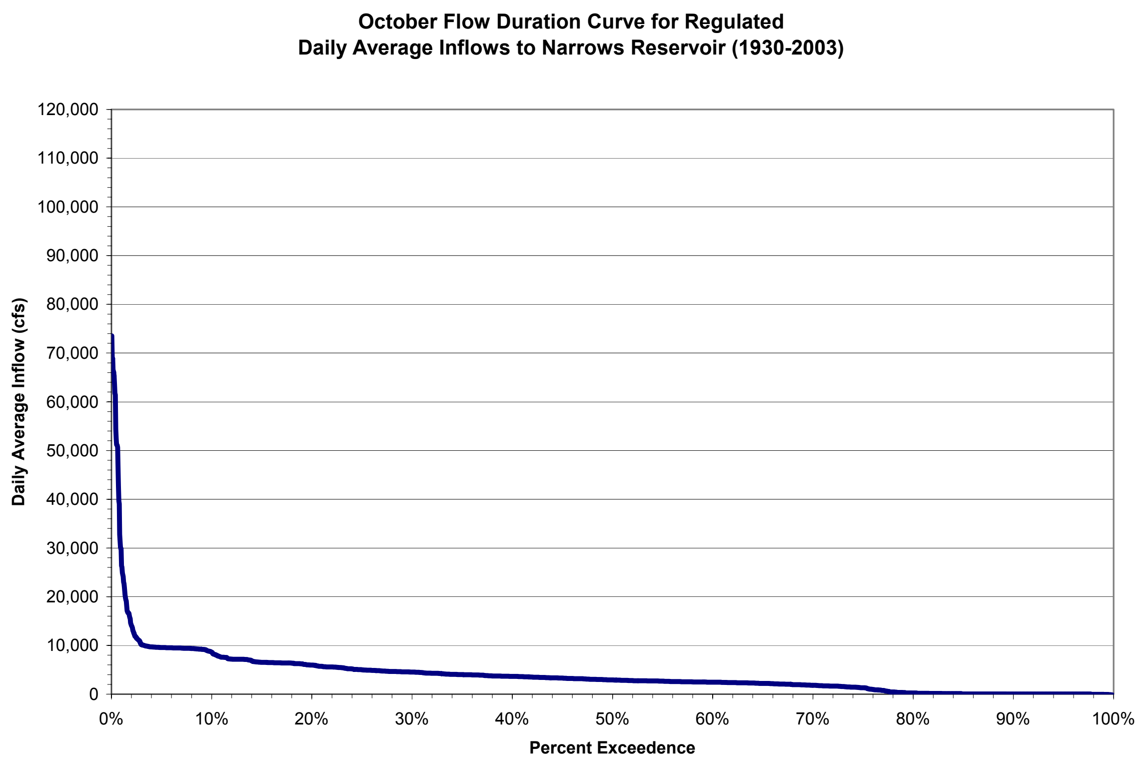


Figure B-10k

**November Flow Duration Curve for Regulated
Daily Average Inflows to Narrows Reservoir (1930-2003)**

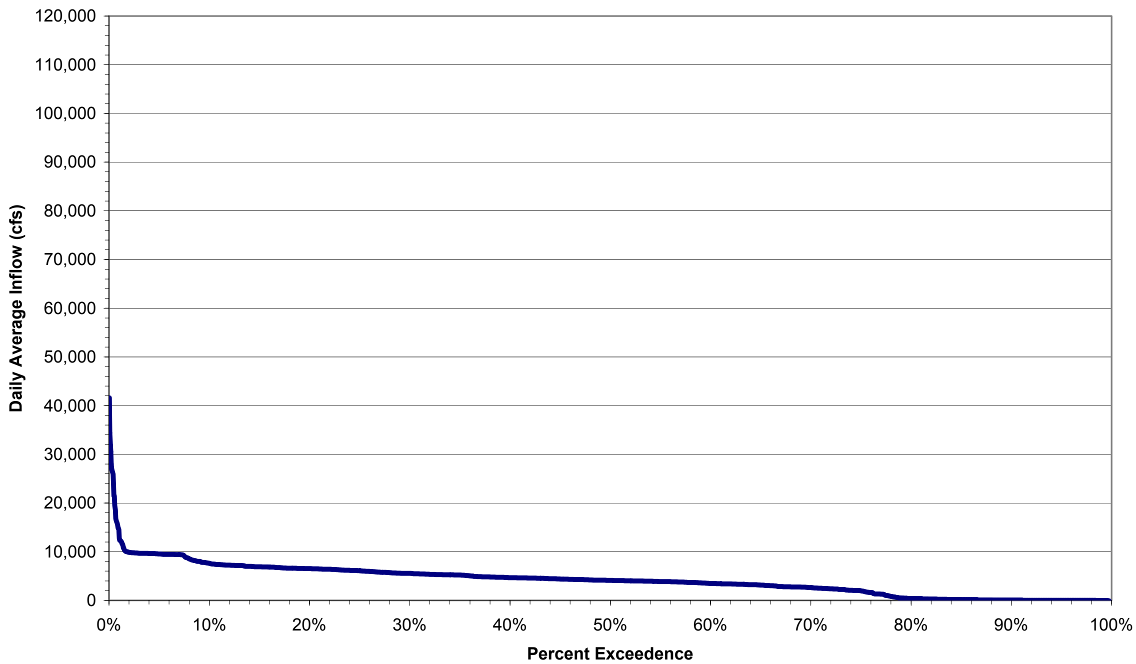
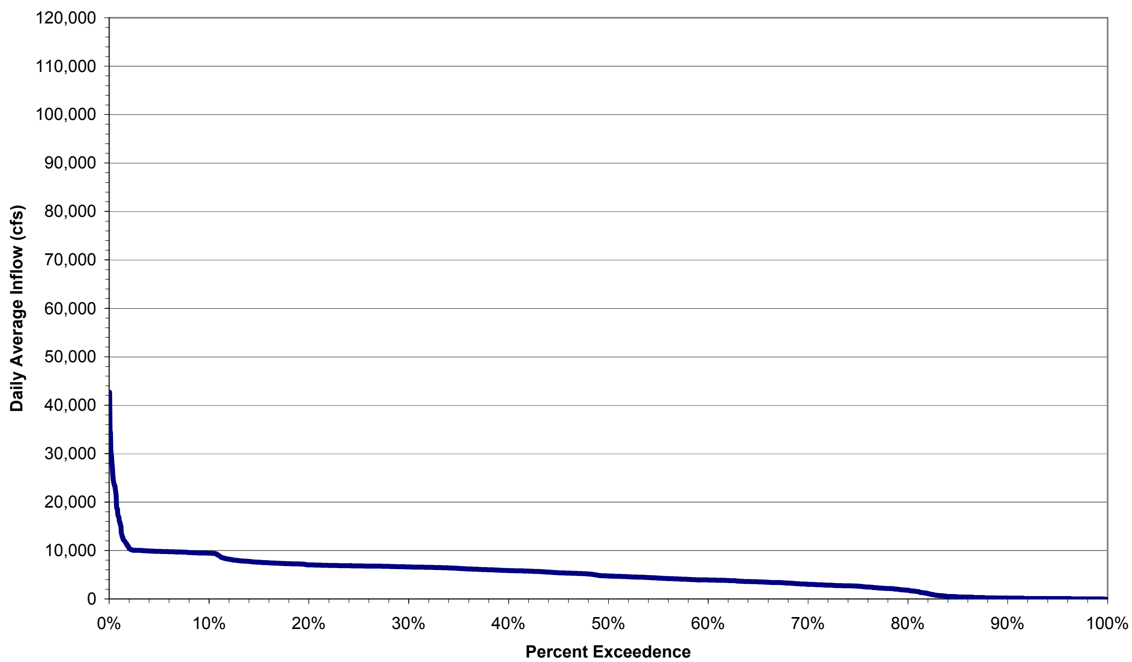


Figure B-10l

**December Flow Duration Curve for Regulated
Daily Average Inflows to Narrows Reservoir (1930-2003)**



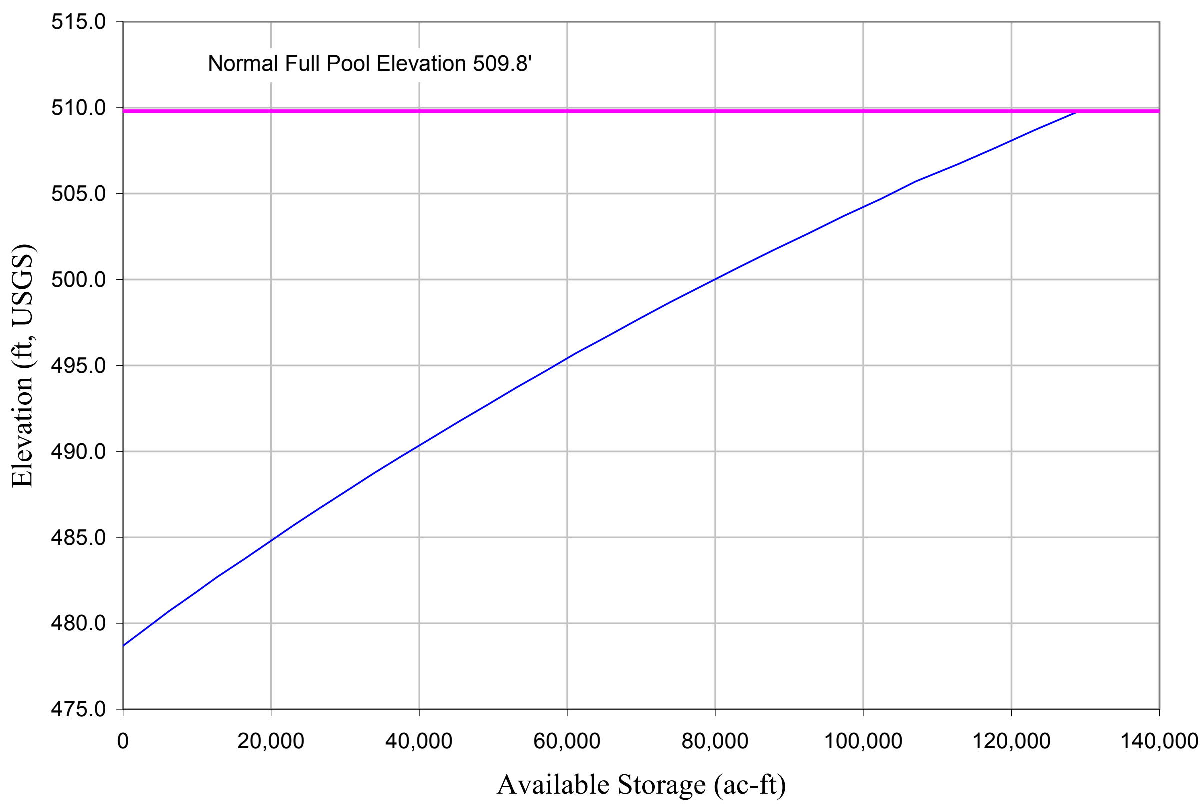
B.4.2.2 Area Capacity Relationship

A reservoir capacity curve showing the storage volume of Narrows Reservoir is provided in Figure B-11. At the normal full pool elevation of 509.8 ft, Narrows Dam impounds an available storage volume of 129,100 acre-ft, which corresponds to a drawdown of approximately 31.1 ft. The gross storage capacity of Narrows Reservoir is 142,310 acre-ft. APGI's proposed operation of Narrows Reservoir provides a drawdown target of 3 ft for normal operation which corresponds to a usable storage of 16,400 acre-ft.

B.4.2.3 Power Plant Hydraulic Capacity

The existing estimated hydraulic capacity of the power plant is 10,000 cfs at maximum discharge. After the proposed refurbishments and upgrades are completed at Narrows, the estimated hydraulic capacity of the power plant will be 8,180 cfs at best efficiency and 9,360 cfs at maximum capacity.

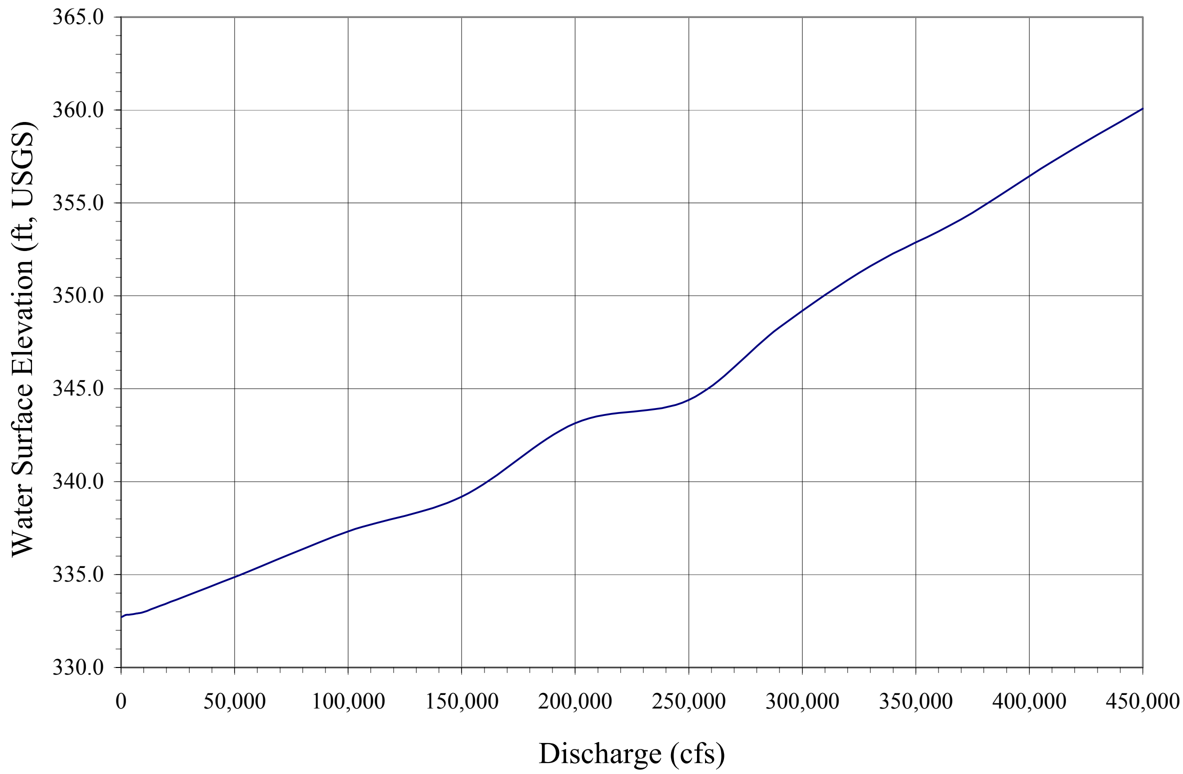
Figure B-11: Narrows Reservoir Elevation vs. Available Storage



B.4.2.4 Tailwater Curve

The tailwater rating curve for the Narrows Development is presented in Figure B-12.

Figure B-12: Narrows Dam, Tailwater Rating Curve



B.4.2.5 Power Plant Capacity Versus Head

The maximum head occurs when Narrows Reservoir is at normal full pool elevation of 509.8 ft. When Narrows is operating at maximum capacity, the tailwater elevation would be 333.0 ft. This results in a gross head of 176.8 ft. Under a mean reservoir elevation of 508.2[5] ft, the corresponding gross head is 175.2 ft. The plant capacity at maximum discharge capacity at normal full pool elevation will be approximately 120.3 MW following completion of the proposed upgrades. Due to APGI's plans to refurbish and upgrade the units and related ongoing engineering tasks, a curve of plant capacity versus head is not currently available.

B.4.3 Plans for Future Development

APGI is proposing to refurbish and upgrade the Narrows generating Units 1 and 3 in order to sustain future operation and increase generation capacity. Narrows generating Units 2 and 4 will be upgraded under the terms of the existing license. The refurbishment activities will result in

[5] Average Narrows Reservoir level for 1986 – 2003 time period.

increased hydraulic efficiency, as well as slightly lower flow rate at maximum turbine discharge. Once the refurbishments and upgrades are completed, the Narrows powerhouse will contain four vertical Francis turbines, each operating under a net head of 174.5 ft. Units 1 and 3, which will be upgraded during the term of the new license, will each have a capacity of 28,120 kW and 26,860 kW respectively. The turbines will be direct-connected to the generators (Units 1 and 3 @ 41,000 and 37,000 kW). The total authorized installed generating capacity of the Narrows Development will be 110,140 kW, as limited by the turbines. The Narrows Development will have a total hydraulic capacity of 8,180 cfs at best efficiency and maximum discharge capacity of 9,360 cfs.

APGI also plans to install appropriate aeration technology to increase DO concentrations and enhance water quality in the Narrows tailwater. The installation of effective aeration technologies at Narrows would take part simultaneously with the unit refurbishment and upgrade work to lower the overall costs of installation. APGI proposes to install new aerating valves on the draft tube cones of each of the Narrows Development units, similar to those already installed on Narrows Unit 4 (see Exhibit E.2.7 for further discussion).

B.5 Falls Development

B.5.1 Operation

Falls Development is operated by full-time power dispatchers under the direction of the APGI Operations Manager. Project operation and generation dispatch is remotely controlled from the Dispatch Center located in Alcoa, Tennessee. During high flow conditions, above the capacity of the remotely controlled gates, maintenance personnel are sent to Fall Dam, as required, to operate the spillway gates.

Based on gross generation records from 1972 through 2005 and the net plant capability under the most favorable operating conditions as reported on the FERC Form 1, 32 MW, the average annual plant factor at Falls is approximately 48 percent.

B.5.1.1 Existing Operations

Like Tuckertown, the Falls Development is essentially operated as a run-of-river facility. Falls Reservoir is operated with a normal daily fluctuation of 0 to 2 ft and a maximum daily fluctuation of 3 to 4 ft. There is no seasonal drawdown at Falls Reservoir due to its limited ability to store water. Historically, the maximum annual drawdown at Falls Reservoir has averaged approximately 4 ft. The average daily drawdown at Falls Reservoir is approximately 1 foot.

B.5.1.2 Proposed Operations

Except for maintenance or under emergency conditions as outlined in the proposed HPMEP proposed in Exhibit B.6.4, APGI proposes to operate Falls Reservoir as it has been operated in the past, with typical reservoir fluctuations of 4 ft or less.

B.5.2 Estimate of Capacity and Generation

The dependable capacity for Falls Development is based on the annual energy production during the critical streamflow period (2001) for the 1930 to 2003 POR. The dependable capacity is based on the 2001 energy generation divided by the number of hours per year. The dependable capacity calculated on this basis is 5.4 MW.

The average annual gross generation of Falls Development is 123,616 MWh based on the most recent 20-year period (1986 to 2005).

B.5.2.1 Stream Flows

Falls inflows were estimated using the USGS flow data set discussed in Exhibit B.2.2.1. Using the adjusted Rockingham gains, the inflows to Falls were apportioned by subtracting out known gage flows for the portion of the basin between High Rock and Rockingham from the adjusted Rockingham gains and apportioning the remaining flow by incremental drainage area between the developments. Multiple gages, including the Rocky River, Little River, Brown Creek, and Eldorado gages, were used in disaggregating the monthly inflow data to daily inflow data.

The minimum, mean, and maximum Falls flows during the 1930 to 2003 USGS POR are 0 cfs, 5,160 cfs, and 116,715 cfs, respectively. Monthly flow duration curves of Falls inflows for APGI's Existing Operations are presented in Figures B-13a through B-13l.

Figure B-13a

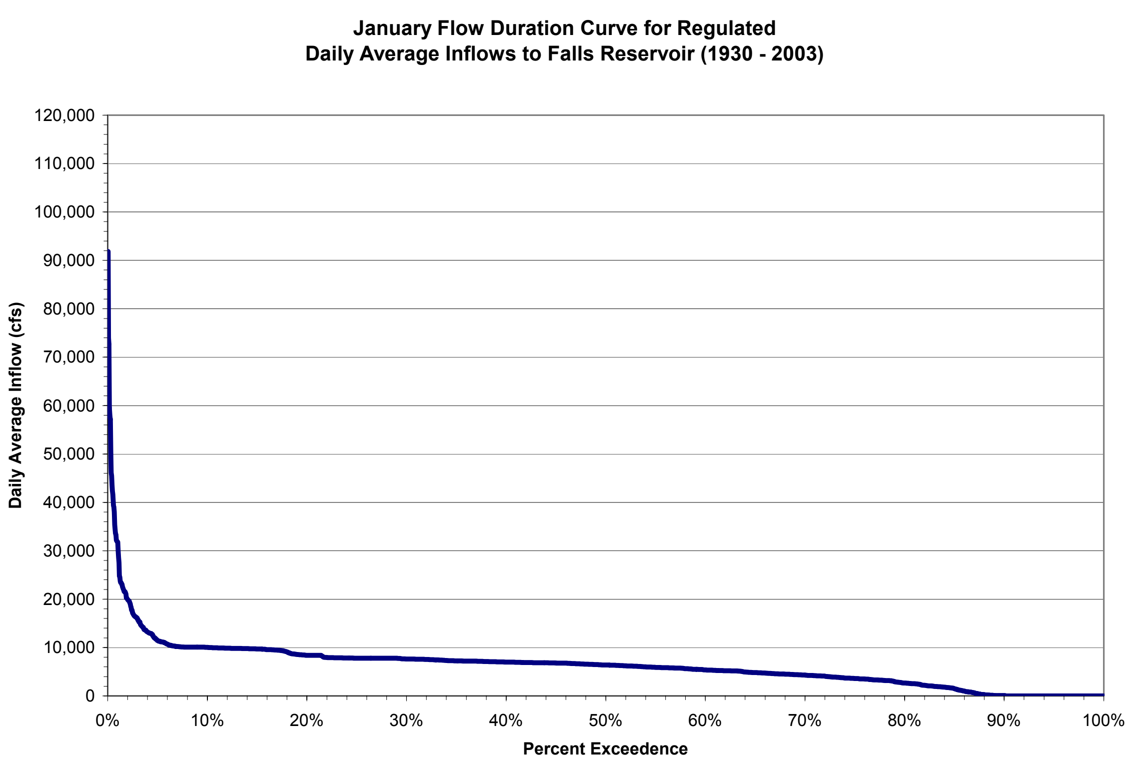


Figure B-13b

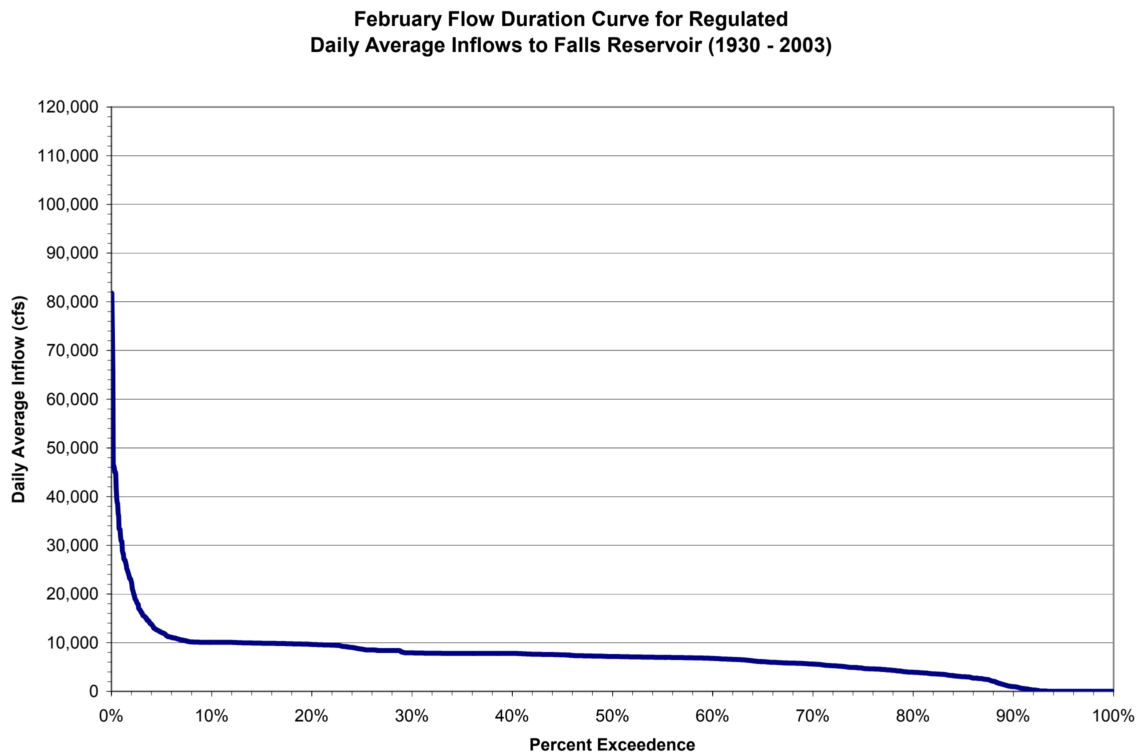


Figure B-13c

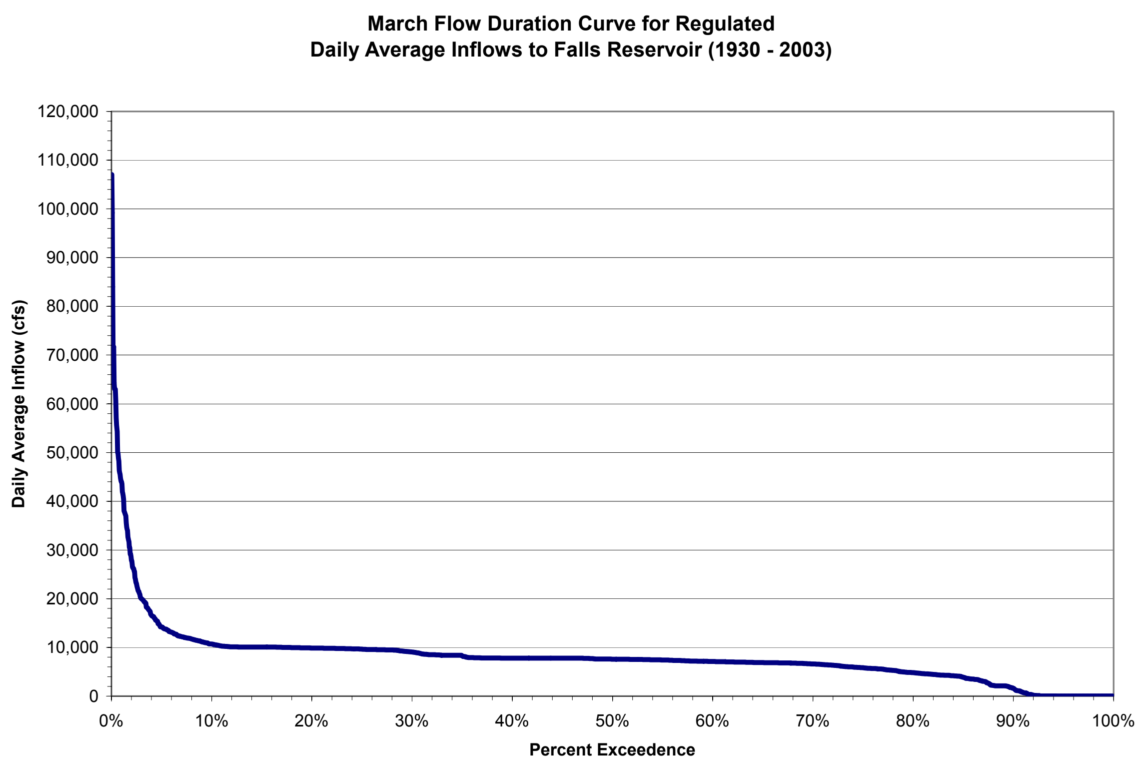


Figure B-13d

April Flow Duration Curve for Regulated Daily Average Inflows to Falls Reservoir (1930 - 2003)

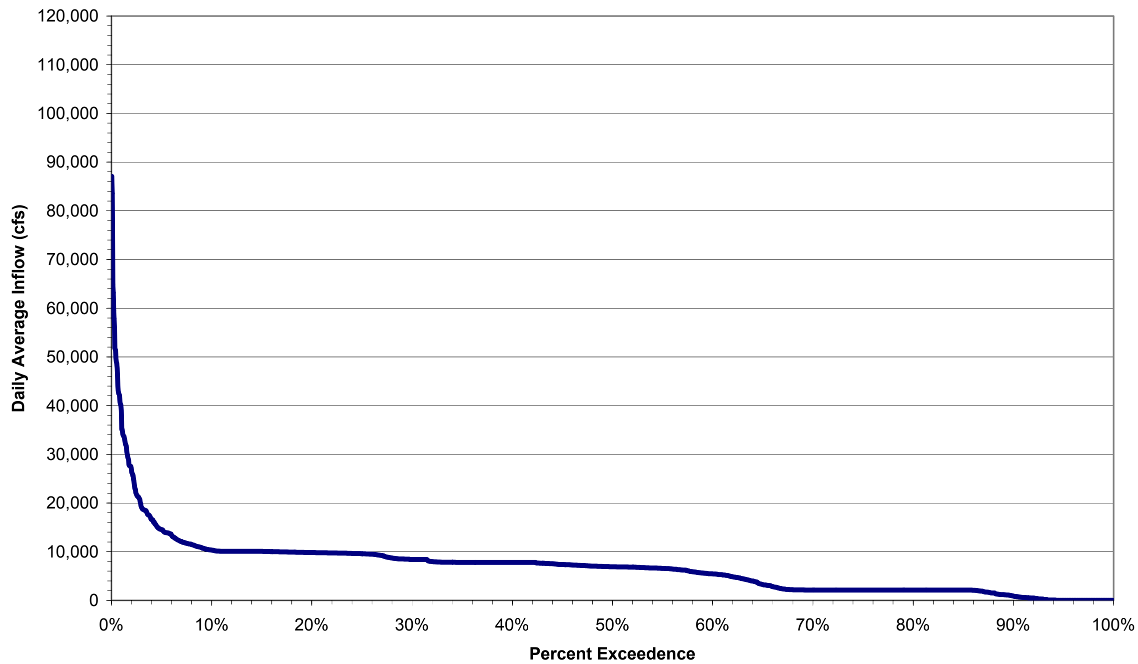


Figure B-13e

May Flow Duration Curve for Regulated Daily Average Inflows to Falls Reservoir (1930 - 2003)

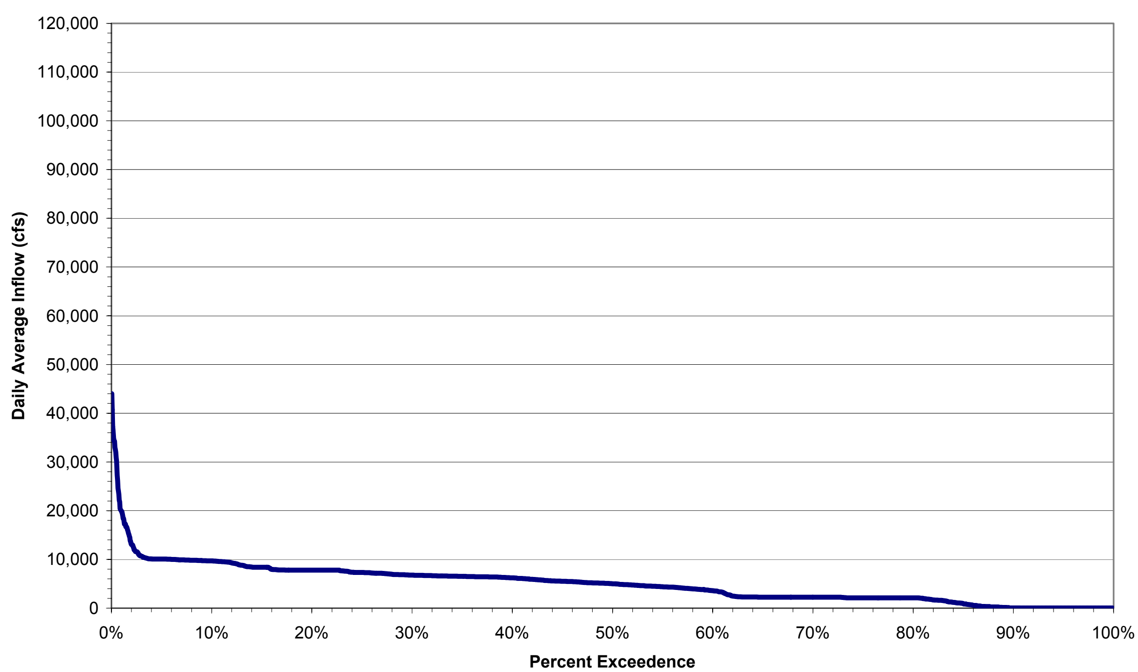


Figure B-13f

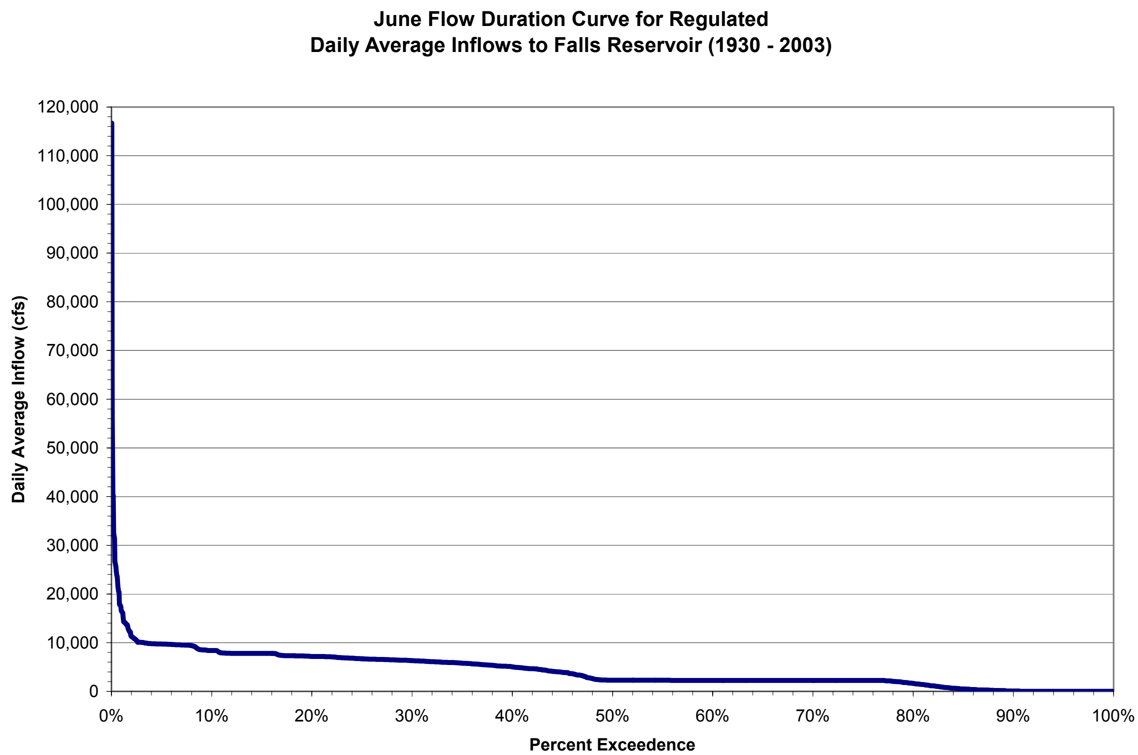


Figure B-13g

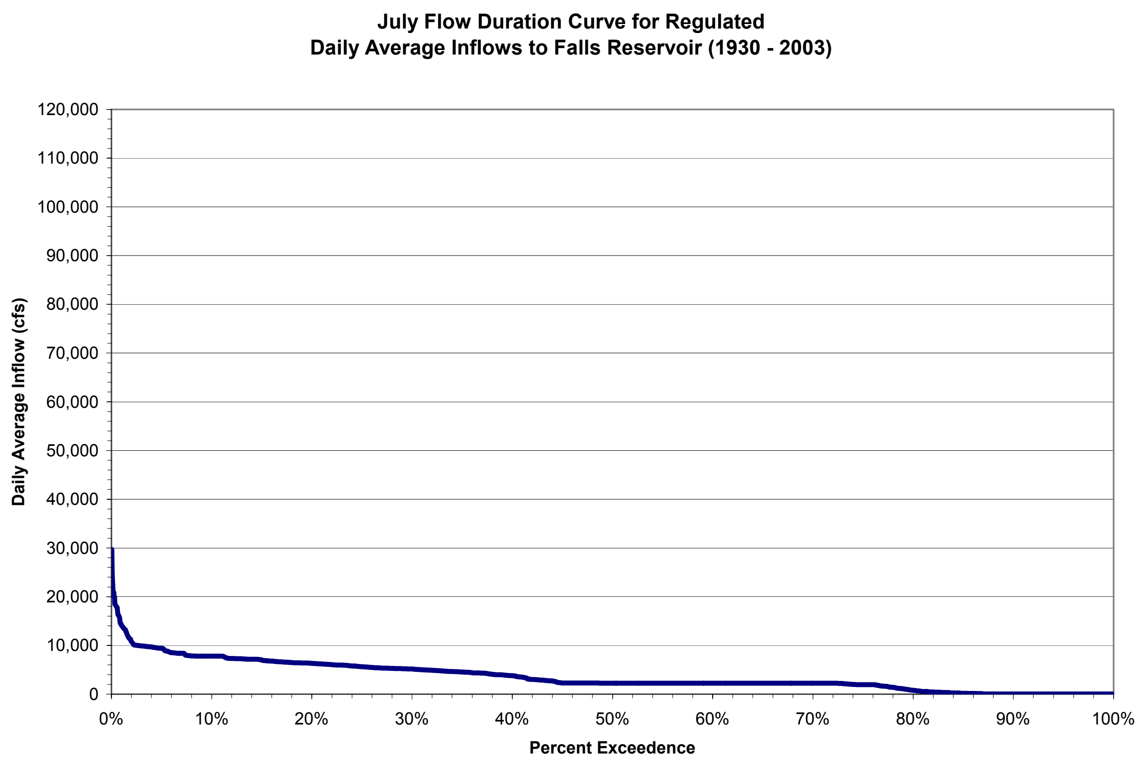


Figure B-13h

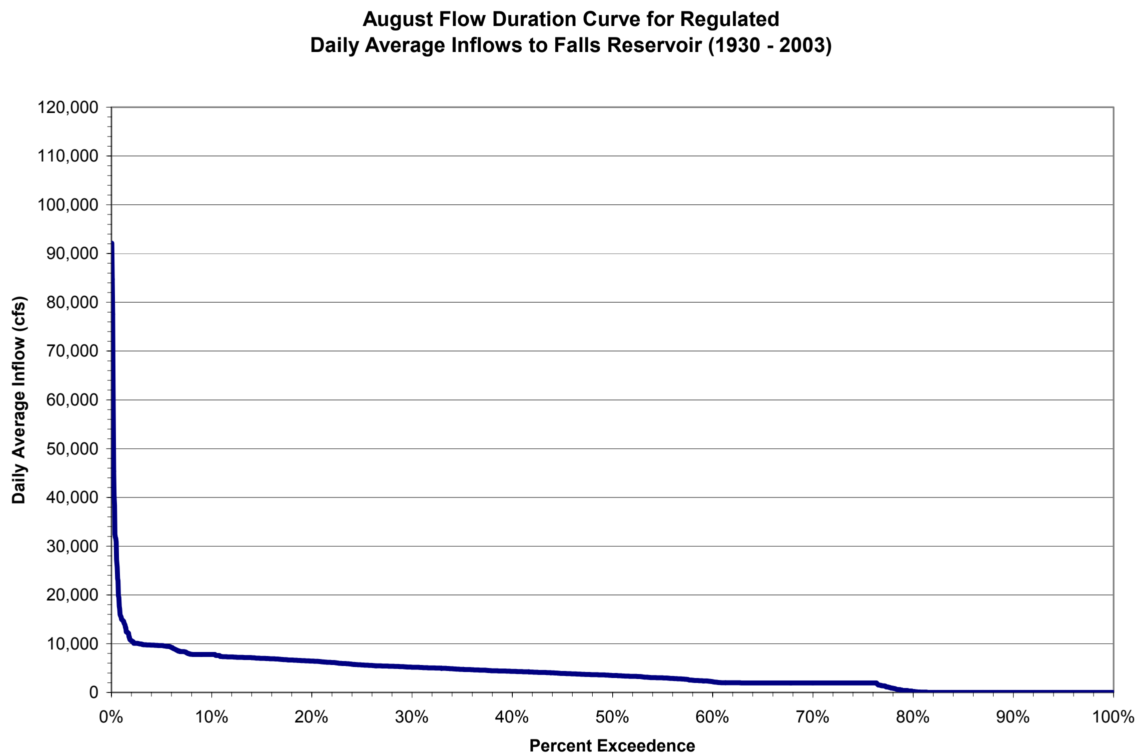


Figure B-13i

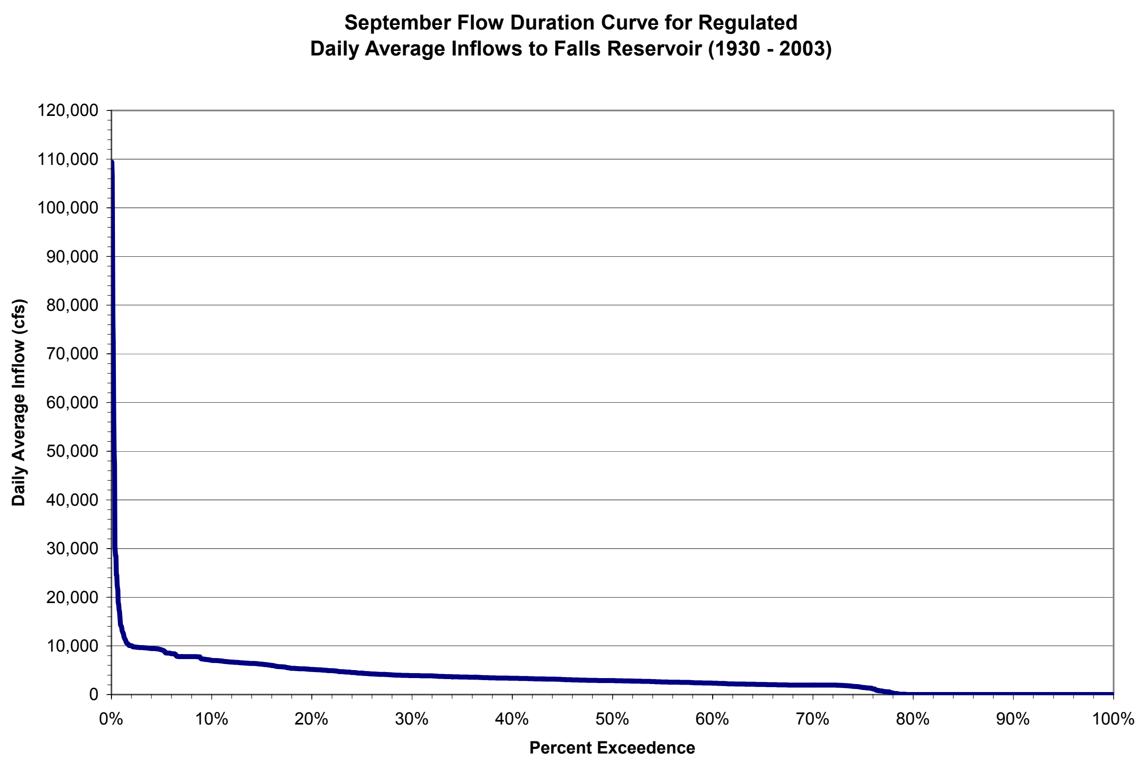


Figure B-13j

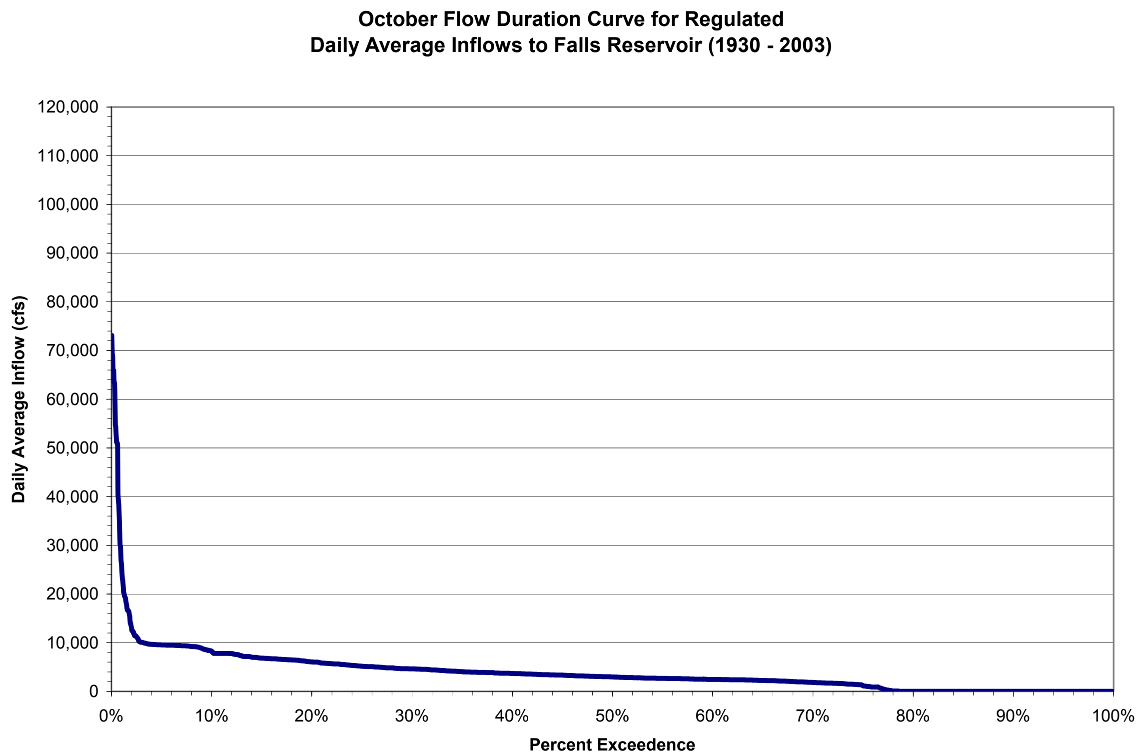


Figure B-13k

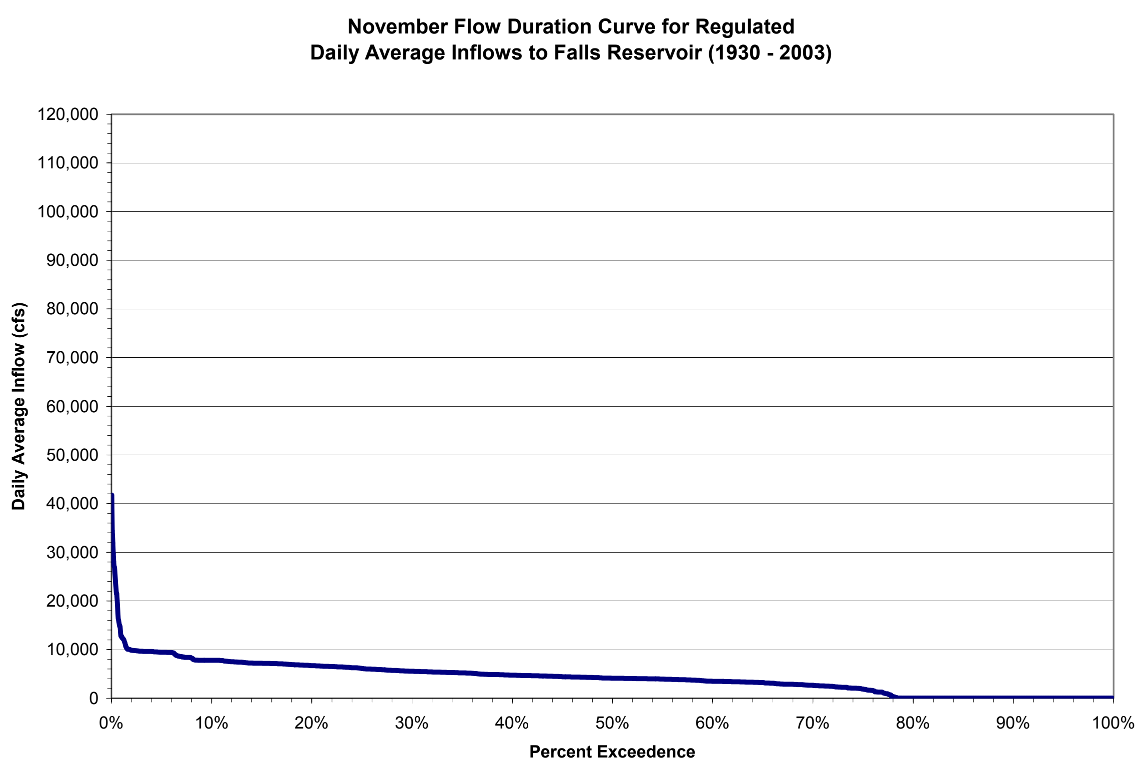
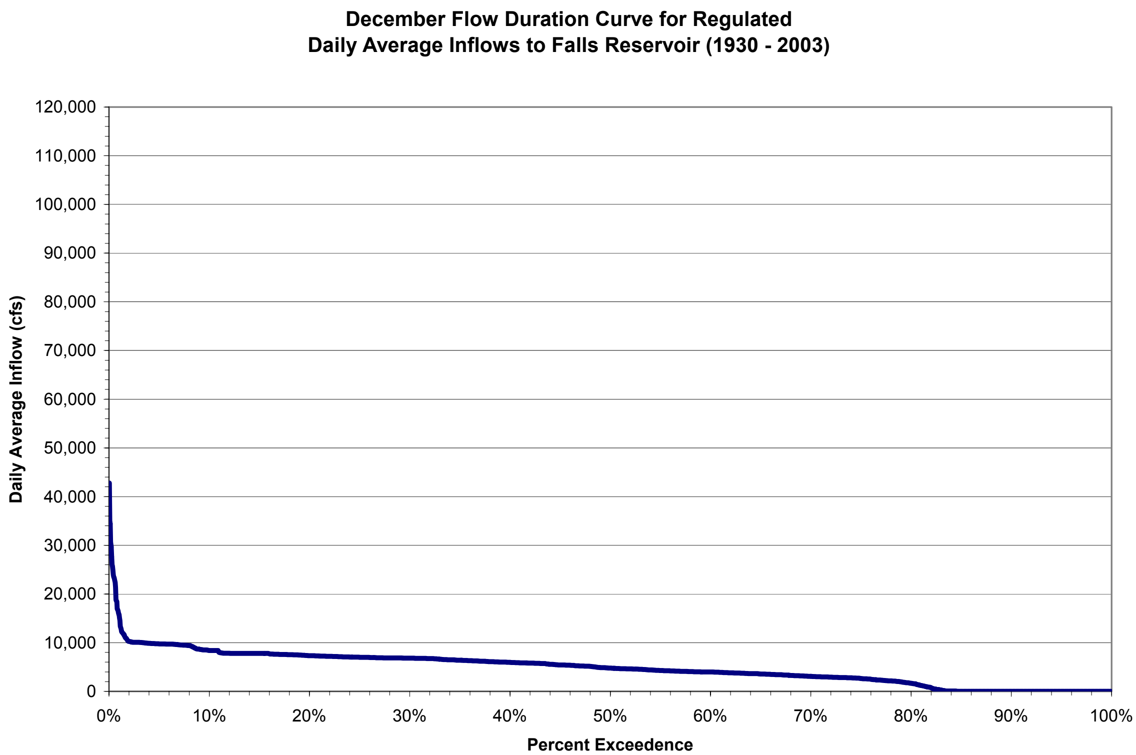


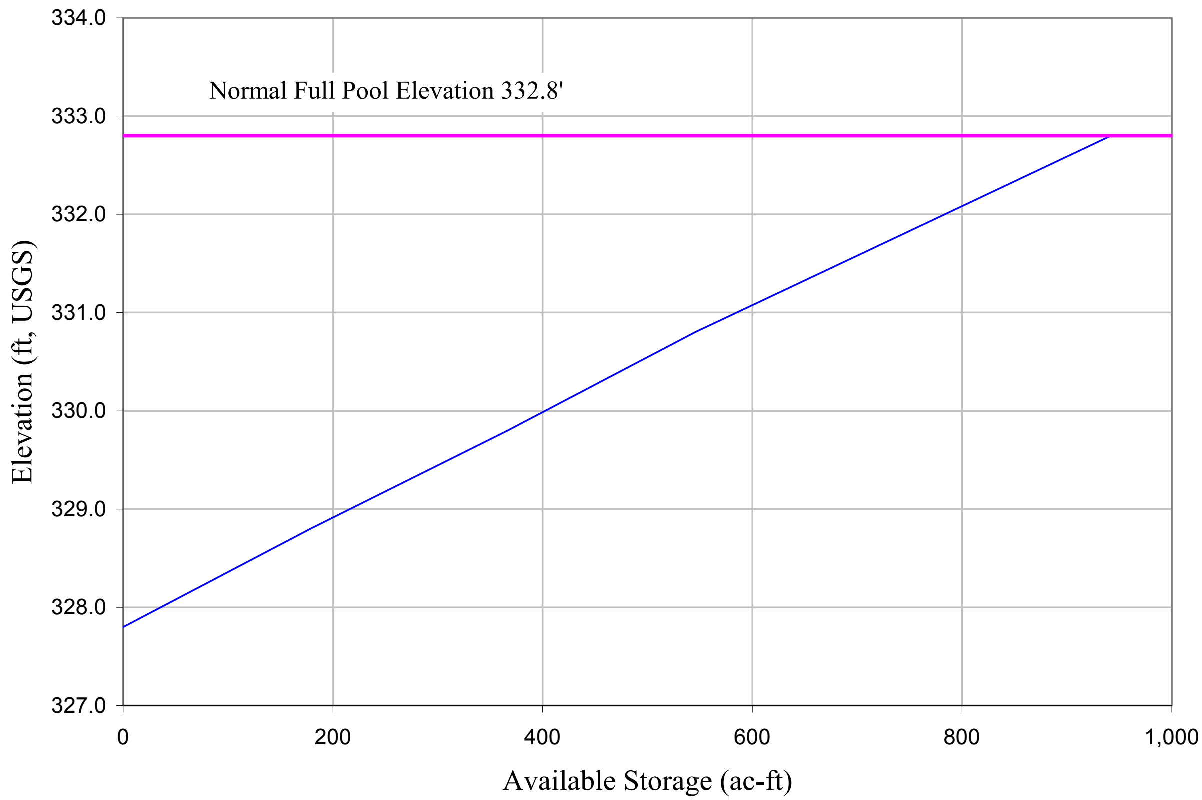
Figure B-13l



B.5.2.2 Area Capacity Relationship

A reservoir capacity curve showing the storage volume of Falls Reservoir is provided in Figure B-14. At the normal full pool elevation of 332.8 ft, Falls Dam impounds a usable storage volume of approximately 720 acre-ft, which corresponds to a drawdown of approximately 4 ft. The gross storage capacity of Falls Reservoir is 2,440 acre-ft. APGI proposes to operate Falls Reservoir as in the past, with typical reservoir fluctuations of 4 ft or less, except for maintenance or under emergency conditions as outlined in the proposed HPMEP (see Exhibit B.6.4).

Figure B-14: Falls Reservoir Elevation vs. Available Storage



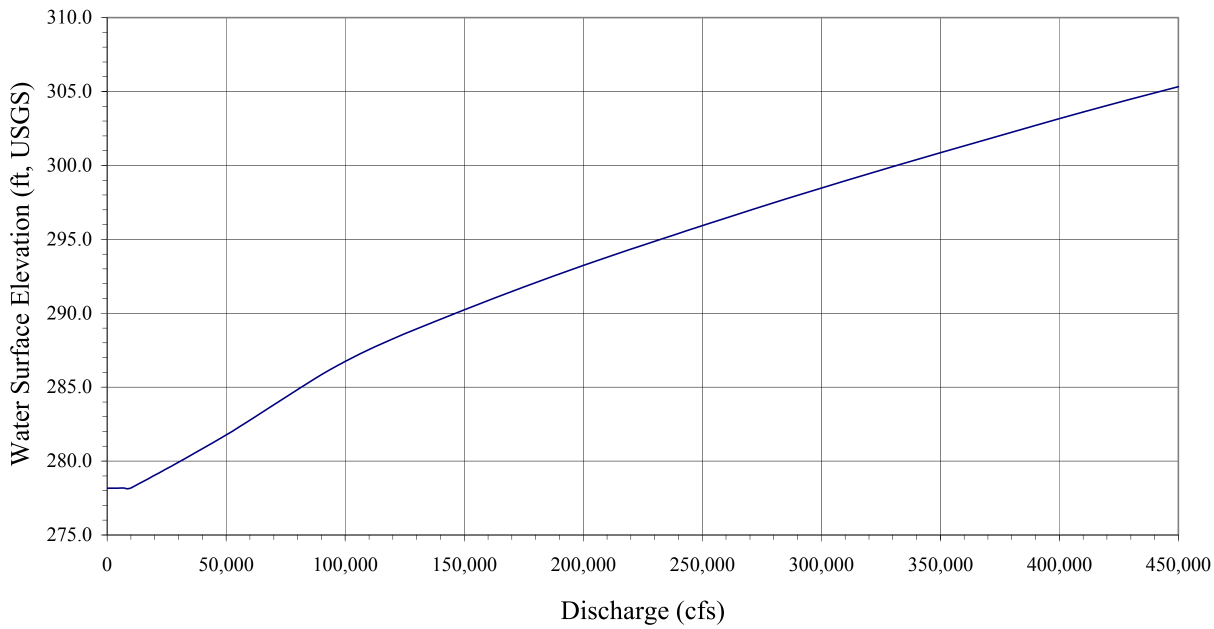
B.5.2.3 Power Plant Hydraulic Capacity

The existing estimated total hydraulic capacity of the power plant is 8,570 cfs at best efficiency. After the proposed refurbishments and upgrades are completed at Falls, the estimated total hydraulic capacity of the power plant will be 7,420 cfs at best efficiency and 8,170 cfs at maximum discharge capacity.

B.5.2.4 Tailwater Curve

The tailwater rating curve for the Falls Development is presented in Figure B-15.

Figure B-15: Falls Dam, Tailwater Rating Curve



B.5.2.5 Power Plant Capacity Versus Head

The maximum head occurs when Falls Reservoir is at normal full pool elevation of 332.8 ft. When Falls is operating at maximum capacity, the tailwater elevation would be 278.5 ft. This results in a gross head of 54.3 ft. Under a 4-foot drawdown, the reservoir elevation is 328.8 ft and the gross head is 50.3 ft. The plant capacity at normal full pool elevation will be approximately 31.9 MW. Due to APGI's plans to refurbish and upgrade the units and related ongoing engineering tasks, a curve of plant capacity versus head is not currently available.

B.5.3 Plans for Future Development

APGI is proposing to refurbish and upgrade the Falls generating units in order to sustain future operation and to increase generation capacity. The refurbishment activities will result in increased hydraulic efficiency. Once the refurbishments and upgrades are completed, the Falls Powerhouse will contain one 10,570 kW vertical Francis turbine unit (Unit 1) and two 10,150 kW propeller-type turbine units (Units 2 and 3), each operating under a net head of 54.0 ft, and direct-connected to generators having a total capacity of 34,040 kW (Unit 1 @ 11,540 kW, Units 2 and 3 @ 11,250 kW) for a total authorized installed capacity of 30,870 kW as limited by the turbines. The Falls Development will have a total maximum hydraulic discharge capacity of 8,170 cfs.

Under its proposed dissolved oxygen enhancement program, APGI plans to install appropriate aeration technology to increase DO concentrations and enhance water quality. No specific aeration equipment is proposed at the Falls Development at this time pending future determination as to whether improvements in dissolved oxygen at Narrows will extend to the Falls tailrace (see Exhibit E.2.7 for further discussion).

B.6 Yadkin Project

The following sections present matters that involve, and refer to, all four developments of the Yadkin Project.

B.6.1 Minimum Flows

APGI is proposing to operate the Yadkin Project with a year-round, weekly average minimum flow of not less than 900 cfs from the Project, as measured at the Falls Development. The proposed weekly average release would allow APGI to generate more energy during the higher value peak demand period (typically during weekdays) while releasing flows from the Project to contribute to minimum flows downstream of Blewett Falls Dam.

This proposed operation was modeled using the OASIS model to predict the availability of water to support a target minimum flow of 1,500 cfs at the USGS gage at Rockingham. Under the proposed operating regime, the releases from Falls, when combined with the accretions and net evaporative losses at Tillery and Blewett Falls reservoirs, would provide water to support an average daily flow at the Rockingham gage of greater than or equal to 1,500 cfs more than 85 percent of the time and greater than or equal to 1,200 cfs more than 87 percent of the time. This volume of water would be available at Rockingham with no contribution from storage from either the Tillery or Blewett Falls developments (FERC No. 2206)[6].

The periods when the volume of flow at Rockingham is less than 1,500 cfs are typically only one or two days in duration. With the exception of periods of extended low inflow periods when it is likely that the Low Inflow Protocol would be implemented, the maximum multiple-day deficit is approximately 6,200 acre-ft. Thus, it appears that these two-day deficits could be eliminated by contributions from storage at Tillery and/or Blewett Falls. This 6,200 acre-ft is equivalent to approximately 1 foot of storage at Tillery Reservoir.

Further discussion of the effects of flows and APGI's proposed minimum flow for the Yadkin Project on downstream aquatic habitat can be found in Exhibit E.3.13.

To monitor flows from the Yadkin Project, APGI proposes to develop and implement a Flow Monitoring Plan for the Yadkin Project. The Flow Monitoring Plan will be developed in consultation with Progress Energy and resource agencies, and will be filed with FERC within two years of the effective date of a new license.

[6] The analysis is based upon the inflows to the Rockingham gage (the sum of the Falls discharge as regulated by the proposed project operations, plus accretions and net evaporation at Tillery and Blewett Falls reservoirs) and so it makes no assumption relative to the operation of PE's Yadkin-Pee Dee River Project.

B.6.2 Headwater Benefits

The amended 1926 headwater benefits contract between APGI and PE, which was originally entered into before either project was licensed, by its terms remains in effect until 2067 and does not expire with the FERC license. However, APGI believes that the contract's status as a headwater benefits settlement does not extend beyond the term of the existing Yadkin Project license. To be specific, the use of Project storage is inherently one of the issues to be passed upon by FERC in the process of issuing a new license. And in its March 29, 1968 Order, FERC approved the amended contract as a HWB settlement "until further order of the Commission [FERC] should be required by changes in conditions," thereby making the agreement subject to further regulatory approvals. Therefore, FERC's decision on the new license for the Yadkin Project will determine the extent to which PE's developments downstream are benefited by Yadkin Project storage, which in turn will form the basis for a new determination of headwater relicensing negotiations that relate to the use of Project storage. If the terms of the new license, whether arrived at through negotiations or otherwise, are inconsistent with the current agreement with PE, APGI will seek to renegotiate the terms of any revised HWB settlement directly with PE with the intent of submitting it to FERC for approval. Should direct negotiations with PE prove unsuccessful, APGI will seek FERC assistance in reaching a new agreement.

B.6.3 Low Inflow Protocol

APGI is proposing to develop a Low Inflow Protocol (LIP) for the Yadkin Project. The proposed LIP will serve as a guide for operating the Project reservoirs under extended periods of low inflow or drought conditions, including coordination with the PE-owned and operated Yadkin-Pee Dee River Project (FERC No. 2206), located downstream of the Yadkin Project. The LIP would recognize different levels of downstream flow targets to be maintained under low inflow or drought conditions and guidance for managing the drawdown of High Rock, Narrows, and Tillery reservoirs in a way to balance economic, habitat, aesthetic and recreational needs. The LIP will also include defined membership (including APGI, Progress Energy, the States of North Carolina and South Carolina, along with certain other interested groups) and procedures to monitor conditions, notify membership, reduce releases or withdrawals, participate and to communicate with the public. Until such time as an LIP has been developed, signed, and implemented, APGI will continue to operate the Yadkin Project in accordance with the existing Drought Contingency Plan.

B.6.4 Hydro Project Maintenance and Emergency Protocol

APGI is proposing to develop a Hydro Project Maintenance and Emergency Protocol (HPMEP) for the Yadkin Project. Under certain emergency, equipment failure and maintenance situations, certain license conditions may be impractical or even impossible to meet and may need to be suspended or modified temporarily to avoid taking unnecessary risks. The objectives of the HPMEP would be to define the most likely situations of this type expected to be encountered by APGI in operating the Yadkin Project, to identify the potentially impacted license conditions, to outline the general approach that APGI will take to mitigate the impacts to license conditions, and to establish procedures to communicate with the resource agencies and other affected parties.

The HPMEP will be developed in consultation with resource agencies and will be filed with FERC within one year of the effective date of a new license.

B.6.5 Utilization of Power

The utilization of power from the Yadkin Project is discussed in Exhibit H.2.

Exhibit C

Construction History and Proposed Schedule

Exhibit C – Construction History and Proposed Schedule

C.1 Construction History

In 1912, L'Aluminum Francais, later organized as a corporation named the Southern Aluminum Company, became interested in the development of hydroelectric power on the Yadkin River. The Aluminum Company of America, now Alcoa Inc., purchased the entire holdings of the Southern Aluminum Company and L'Aluminum Francais in North Carolina in 1915 and transferred them to Tallassee Power Company, a wholly owned subsidiary. The Tallassee Power Company was later renamed Carolina Aluminum Company.

The Narrows Development was the Southern Aluminum Company's first Project development to be built on the Yadkin River. Construction of the Narrows Dam, which consists of a concrete gravity structure and a bypass spillway section, began in 1913. Dam closure occurred in June 1917. At Narrows Powerhouse, Units 1, 2, and 3 went into commercial operation in 1917 and Unit 4 went into commercial operation in 1924.

In 1917, the Tallassee Power Company initiated work on the second of the Project developments to be built, Falls Development. Construction of Falls Dam, a concrete gravity structure, and powerhouse was completed in 1919. The powerhouse includes three units; Units 2 and 3 went into commercial operation in 1919, and Unit 1 went into commercial operation in 1922.

The High Rock Development was the third development to be built. Although Tallassee Power Company began land purchasing in 1916, construction of High Rock Dam, a concrete gravity structure, was not completed until 1927. The flood gates were closed, and Units 1, 2, and 3 were put in service in November 1927. The reservoir reached full capacity in April 1928.

On February 6, 1956, Carolina Aluminum Company applied to the Federal Power Commission (FPC) for a hydropower license. The application included the existing High Rock, Narrows, and Falls developments, and the proposed Tuckertown Development. On February 11, 1958 the FPC issued a license to Carolina Aluminum Company for a period of 50 years, effective as of May 1, 1958, for the continued operation and maintenance of High Rock, Narrows, and Falls developments, and for the construction, operation, and maintenance of the proposed Tuckertown Development.

The Tuckertown Development was the last of the Project developments to be built. Construction of Tuckertown Dam (which includes concrete gravity sections, a rockfill section, and an earthfill section) and powerhouse began in January 1960 and the reservoir started filling in April 1962. At Tuckertown Powerhouse, the three generator units went into commercial operation in April 1962.

The Yadkin Project is currently owned by Alcoa Power Generating Inc. (APGI) and is operated by its Yadkin Division.

As APGI is applying for a new license, and not an initial license, the requirements of 18 CFR §4.51(d)(1) are not applicable and as such a tabulated chronology of construction is not presented herein.

C.2 Proposed Development

APGI currently plans to complete the refurbishment and upgrade of Narrows Unit 2 under the existing license, consistent with the refurbishment and upgrade program discussed in Exhibits E.2.7 and H.1.1.

APGI currently plans to refurbish and upgrade the remaining two units at Narrows (Units 1 and 3), the three units at High Rock, the three units at Tuckertown, and the three units at Falls under the new license. The proposed work includes replacement of the existing turbine runners, re-winding of the generators, and refurbishment and upgrades of the electrical controls. The work at Narrows and High Rock is anticipated to be completed by the end of 2012. The Tuckertown and Falls units would follow with scheduled completion before the end of 2020 (see Table E.2-8).

Exhibit D

Statement of Costs and Financing

Exhibit D – Statement of Costs and Financing

D.1 Original Cost of the Project

The Yadkin Project (Project) was originally licensed with an effective date of May 1, 1958. Because this is not an initial license, a tabulated statement of original cost of Project land or water rights, structures, or facilities is not necessary.

D.2 Estimated Takeover Costs as per Section 14 of the Federal Power Act

Section 14 of the Federal Power Act (FPA) reserves to the United States the right to take over a non-publicly owned project upon expiration of its license. In the event that such take over is ordered by the Federal Energy Regulatory Commission (FERC), Alcoa Power Generating Inc. (APGI) would, pursuant to Section 14, be entitled to be reimbursed for its "net investment", not to exceed "fair value," plus any "severance damages" suffered (see 16 U.S.C. § 807). At the time of the filing of this License Application, there was no indication that any federal department or agency, state or municipality has or will recommend takeover or redevelopment of the Project. Nonetheless, APGI hereby submits the basic information required by FERC's regulations that would be needed to quantify the compensation to be paid to APGI pursuant to Section 14.

D.2.1 Fair Value

"Fair value" as that term is used in the FPA and for the purpose of this License Application, is calculated as the present cost of project reproduction less estimated depreciation. "Fair value" does not mean "fair market value" but rather is a specialized calculation of a company's unrecovered capital investment in today's dollars. The Handy-Whitman Cost Index (Index), a standard tool used in the utility industry to estimate the reproduction costs of utility assets, such as the project works, has been used to estimate the Project reproduction costs in 2005 dollars. For the purposes of this License Application, plant depreciation has been estimated for each development separately by dividing the value of the accumulated depreciation (Table D.2-2) by the total plant cost (Table D.2-2). Applying these percentages to each reproduction cost (Table D.2-1) for the Yadkin Project developments, developed using the Index, suggests that an estimate of the fair value of the Yadkin Project in 2005 dollars is $130,547,917.[1,2] No allowance has been made for external or functional obsolescence. Adding $130,547,917 to the original cost of the land within the Project, $6,791,638; produces a total fair value estimate for the Project of $137,339,555. It must be noted that the foregoing is a rough calculation of fair value and that more precise calculations using this methodology may be possible. The estimated fair value for the Yadkin Project, excluding Project land, is shown in Table D.2-1.

[1] Does not include the cost of equity.
[2] Note that this is not an appraisal value, and this calculation was not performed by a licensed appraiser.

Investments of $44,000,000 are anticipated in the Project through the expiration of the existing license on April 30, 2008.

Table D.2-1: Estimated Fair Value of the Yadkin Project[a,b]

Development	Reproduction Cost [c]	Estimated Physical Depreciation [d]	Estimated Fair Value
High Rock	$88,184,714	($50,845,542)	$37,339,172
Tuckertown	$54,849,726	($41,504,239)	$13,345,487
Narrows	$203,553,370	($135,747,707)	$67,805,663
Falls	$51,836,097	($39,778,502)	$12,057,595
Total	$398,423,907	($267,875,990)	$130,547,917

a. No attempt has been made to determine the current fair market value of real estate, including improvements, within the Project.
b. Anticipated capital investments into Project through expiration of existing license not included.
c. Based on Handy-Whitman Cost Index, all dollars are 2005. Value includes transmission equipment included within the Project as defined.
d. Does not include external or functional obsolescence.

D.2.2 Net Investment

The FPA generally defines a licensee's "net investment" in a project as the original cost of the project plus additions and betterments, minus depreciation and other amounts (See 16 U.S.C. § 796(13)). APGI's net investment in the Yadkin Project, as reflected in APGI's Fixed Asset Listing as of 2005, was $24,158,903 as shown in Table D.2-2.

Table D.2-2: Estimated Net Investment in the Yadkin Project [a]

Development	Total Plant Cost [b]	Accumulated Depreciation [c]	Net Investment
High Rock	$17,771,576	($10,246,813)	$6,524,763
Tuckertown	$16,979,919	($12,848,534)	$4,131,386
Narrows	$29,497,000	($19,671,270)	$9,825,730
Falls	$15,807,866	($12,130,843)	$3,677,024
TOTAL COST	$80,056,361	($55,897,460)	$24,158,903

a. Source: 2005 Fixed Asset Listing, from email from Lydia Gill dated 1/23/06.
b. For each development, the total plant costs includes: development specific total plant costs and a prorated amount of total Project (a) substation, (b) administrative (c) property and (d) non-utility accumulated depreciation.
c. For each development, the accumulated depreciation includes: development specific accumulated depreciation and a prorated amount of total Project (a) substation, (b) administrative (c) property and (d) non-utility accumulated depreciation.

D.2.3 Severance Damages

Under FPA § 14(a), "severance damages" are those "reasonable damages" to protect property not "caused by the severance there from of property taken" (See 16 U.S.C. § 807(a)). APGI believes that the severance damages inflicted by a takeover of the Yadkin Project would be significant. Given the inherent difficulties in attempting to quantify such speculative values, APGI reserves the right to submit additional evidence quantifying such severance damages should FERC consider ordering a takeover of the Project.

D.3 Estimated Cost of New Development Work

Per 18 CFR §4.30(b)(18), "new development costs" include any construction, installation, repair, reconstruction, or other change in the existing state of project works or appurtenant facilities, including any dredging and filling in project waters. For the purpose of this License Application, this includes the costs of turbine and generator upgrades and refurbishments as well as costs required to provide environmental mitigation or enhancement during the term of a new license.

APGI has conducted studies evaluating the turbine/generator refurbishment potential, as well as upgrades at the Project developments. APGI plans to refurbish and upgrade all Project units at High Rock, Tuckertown, and Falls under the new license, along with Narrows Units 1 and 3[3].

The estimated capital costs of the planned refurbishments and upgrades are presented in Table D.3-1.

Table D.3-1: Estimated Capital Costs of Planned Refurbishments and Upgrades

Development	Total Estimated Cost[a]
High Rock Units 1 - 3	$ 36,000,000
Tuckertown Units 1 – 3	$ 33,000,000
Narrows 1 and 3	$ 32,000,000
Falls 1 - 3	$ 29,000,000
Total	$ 130,000,000

a. All dollars are 2005.

D.4 Estimated Average Annual Cost of the Project

The estimated annual costs of operating the Yadkin Project are presented in Table D.4-1. These cost are based on the existing operation of the Project with the planned refurbishments and upgrades, as described in Exhibit D.3, and do not include any estimates for anticipated changes in the future operation of the Project.

[3] The upgrade of Narrows Unit 4 was completed in 2001, and Unit 2 will be completed prior to the expiration of the existing license in 2008.

Table D.4-1: Estimated Annual Project Operating Costs[a]

Item	Amount
Cost of Capital (equity and debt)[b,c]	$ 8,615,579
Property Taxes	$ 849,043
Depreciation[b,c]	$ 9,083,141
Operation & Maintenance[c]	$ 9,296,093
FERC Administrative Fee[d]	$ 466,241
Total	$28,310,097

a. All dollars are 2005. The Draft License Application Estimated Annual Operating Cost was $13,000,000 and did not include the Cost of Capital (equity and debt). The Estimated Annual Operating Cost presented here includes the Cost of Capital (equity and debt) and increased depreciation due to proposed capital investments.
b. Includes the cost of the refurbishment/upgrade of generating units (see Exhibit D.3, Estimated Cost of New Development Work).
c. Does not include the additional cost due to APGI's proposed alternative (see Exhibit D.9, Estimated Average Annual Change in Project Generation and Value of Project Power Due to Changes in Project Operations).
d. Average of Annual Charges for Fiscal Years 2003, 2004 and 2005 under 18 CFR Part 382; Annual Charges include FERC administrative charges and other federal agencies administrative charges, less FERC administrative charge adjustments.

D.5 Estimated Annual Value of Project Power

APGI estimates that the annual value of Project power produced is approximately $43,600,000. To develop this estimate, APGI modeled the existing Project operations with the addition of proposed generating unit upgrades (see Exhibit D.3) in the Yadkin Project Operations Model, OASIS, for the 1930 to 2003 period of record using the average monthly on and off-peak energy values for 2004 presented below in Exhibit D.8. APGI does not represent in this estimate any indication of the future value of wholesale electric energy or Project production levels.

D.6 Sources and Extent of Financing and Annual Revenues

Because the proposed refurbishment and upgrade will extend over a twelve year period from 2009 through 2020, APGI expects that the Project's capital requirements will be financed internally.

D.7 Estimate of the Cost to Develop License Application

The approximate cost to develop the License Application for the Yadkin Project was $20,000,000.

D.8 On-Peak and Off-Peak Values of Project Power

APGI calculated average monthly on-peak and off-peak energy values using a third-party developed index for southeast power sales. APGI has selected to use “Southern, Into” energy values. The “Southern, Into” energy values represent a compilation of daily values of peak and off-peak energy sold into the Southern Company Region for 2004, as reported by market participants to Platts, a McGraw-Hill company. Platts uses standard price reporting methodology, including FERC’s 2003 standards. From this daily data, APGI calculated average monthly on-peak and off-peak energy values as shown in Table D.8-1. Platts, as publisher of this index, has approved the use of the data in this License Application.

Table D.8-1: Monthly Average Energy Values

Month	On-Peak Value of Project Power ($/MWh)	Off-Peak Value of Project Power ($/MWh)
January	$45.11	$29.31
February	$41.67	$28.89
March	$43.10	$29.41
April	$47.24	$29.51
May	$52.78	$31.00
June	$56.41	$27.35
July	$55.52	$26.28
August	$50.61	$28.26
September	$44.43	$28.02
October	$51.35	$30.82
November	$48.25	$31.84
December	$48.84	$34.39
Average	$48.78	$29.59

D.9 Estimated Average Annual Change in Project Generation and Value of Project Power Due to Changes in Project Operations

In order to estimate the average annual decrease in Project generation and average annual decrease in value of Project power related to the proposed protection, mitigation and enhancement (PME) measures, APGI modeled the existing Project operations and proposed Project operations in OASIS. Separate calculations were performed to determine the generation losses associated with dissolved oxygen enhancements proposed for the High Rock and Narrows developments. Both operating scenarios were run for the 1930 to 2003 period of record using the average monthly on and off-peak energy values presented above in Exhibit D.8. The estimated average annual decrease in Project generation is 2,100 megawatt hours (MWh). The estimated average annual decrease in the value of Project power is $770,000.

The estimated annual cost of operating the Project including the additional costs due to APGI's proposals for continued Project operation are presented in Table D.9-1.

Table D.9-1: Estimated Annual Project Operating Costs[a]

Item	Amount
Cost of Capital (equity and debt)[b]	$ 8,650,090
Property Taxes	$ 849,043
Depreciation[b]	$ 9,185,541
Operation & Maintenance[b]	$ 9,856,576
FERC Administrative Fee[c]	$ 466,241
Total	$29,007,491

a. All dollars are 2005
b. Includes the additional cost due to APGI's proposed operations
c. Average of Annual Charges for Fiscal Years 2003, 2004 and 2005 under 18 CFR Part 382; Annual Charges include FERC administrative charges and other federal agencies administrative charges, less FERC administrative charge adjustments.

Exhibit E

Environmental Report

Exhibit E.1

General Description of the Locale

Exhibit E - Environmental Report

E.1 General Description of the Locale

E.1.1 Description of Project Environment and Immediate Vicinity

The Yadkin Project (Project) is located on the Yadkin River in central North Carolina, approximately 60 miles northeast of Charlotte (Figure E-1). The Yadkin River and its tributaries are part of the Yadkin-Pee Dee River Basin, which extends from the eastern slopes of the Blue Ridge Mountains to the Atlantic Coast near Georgetown, South Carolina. The Yadkin-Pee Dee watershed has a drainage area of 4,190 square miles above Falls Dam (the most downstream Project development). Below the Yadkin Project, the Yadkin River's name changes to the Pee Dee River at its confluence with the Uwharrie River. The Pee Dee River continues its southeastern flow to the Atlantic Ocean.

The area immediately surrounding the Project is predominantly rural and suburban, although several smaller cities, including Albemarle, Lexington, Salisbury and towns, including Badin, Mocksville and Troy, are located within 30 miles of the Project. Several of North Carolina's largest cities, including Charlotte, Winston-Salem, and Greensboro, are located within an hour drive of the Project. The predominant land use type around the reservoirs was historically agricultural or forested. Farms and timberland are still common in this area, but residential development in the region, particularly along the reservoir shorelines, has increased significantly since the mid-1990s.

E.1.2 Climate

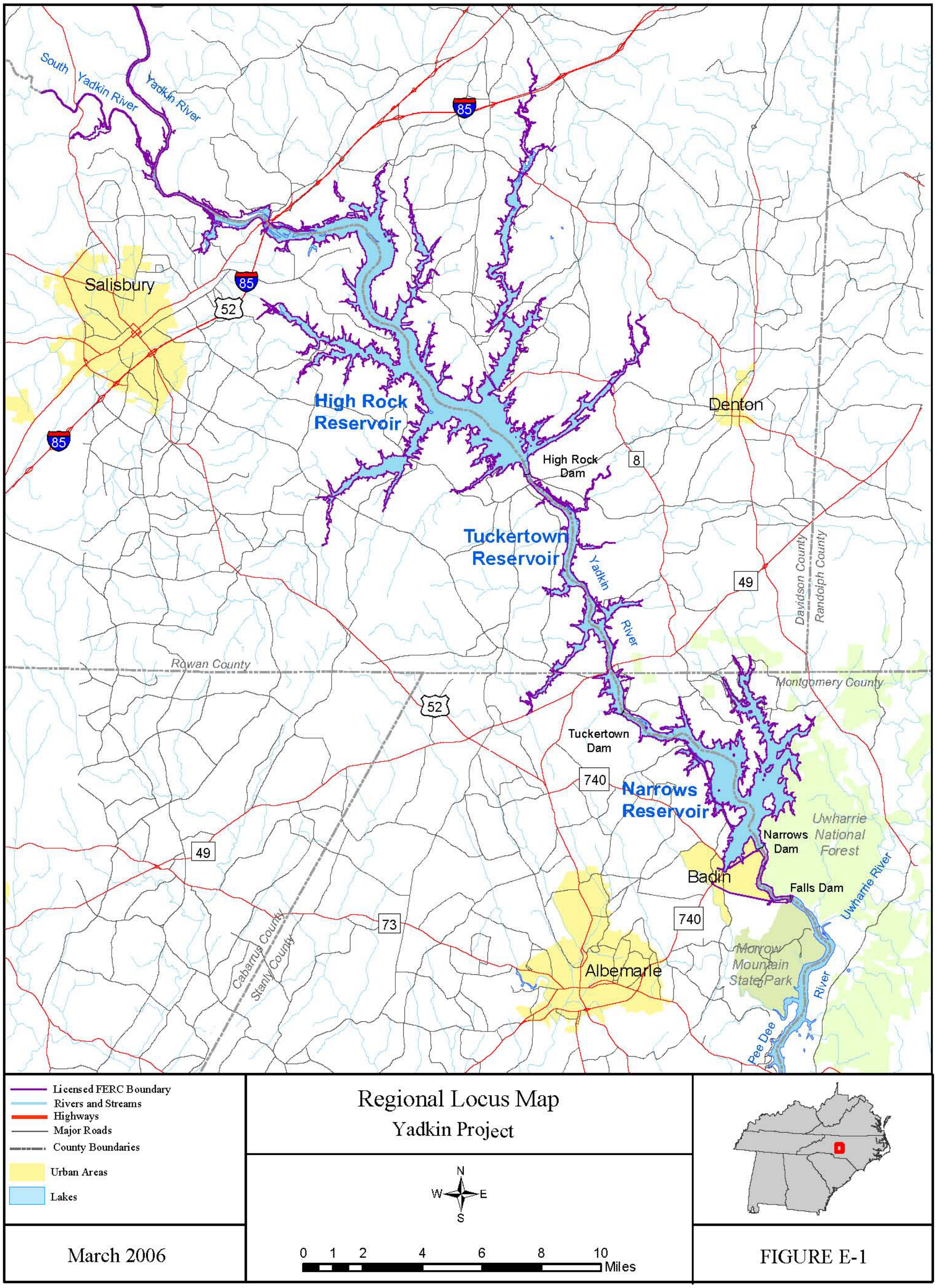
Average rainfall in the North Carolina portion of the Yadkin-Pee Dee watershed ranges between 44 to 56 inches per year, about one-third of it occurring during the summer. The growing season is 120 to 180 days in length. During the winter, the monthly average high temperature is generally in the 40s and low 50s with a monthly average low temperature generally in the upper 20s to low 30s with average temperatures being higher toward the south (State Climate Office of North Carolina, NC CRONOS database website). Summertime monthly average high temperatures generally are in the upper 70s to low 90s.

E.1.3 Topography

The Project lies in the upper part of the Piedmont physiographic region of North Carolina. The Piedmont Region is a rolling peneplain lying to the east and southeast of the Appalachian Mountains at elevations of about 1,200 to 1,500 ft above sea level and extending down to the Fall Line. The Region extends from above the Potomac River at nearly sea level to Alabama and the Coastal Plain Region in the south at elevations of 300 to 600 ft above sea level.

The Project area is characterized by a large network of generally east-flowing streams in terrain that is mostly gently rolling and hilly with narrow floodplains, low flat ridges, monadnocks, and

Figure E-1: Yadkin Project Regional Locus Map



high ridges. Topographic relief is generally greatest near the Uwharrie Mountains (Baranski, 1993).

The land around High Rock Reservoir is generally flat to rolling. Around Tuckertown Reservoir there are high, steep banks along the east side, and low rolling terrain around the other areas. The land adjacent to Narrows Reservoir is a mix of gently rolling terrain with some steep sides. Around Falls Reservoir in the Uwharrie Mountains, the land is steep with a rugged terrain.

E.1.4 Wetlands

Vegetated wetlands are some of the most productive and important habitats found in the Yadkin Project reservoir system. Vegetated wetlands are vital habitats for many fish and wildlife species that provide fishing and hunting opportunities to area residents and visitors. Wetlands serve as nursery and spawning areas for fish and macroinvertebrates, feeding and resting areas for migratory waterfowl and shorebirds, nesting grounds for waterfowl and wading birds, feeding areas for white-tailed deer, and homes for muskrat, beaver, and river otter.

Wetland soils and vegetation also help remove impurities from water, reduce sediment and nutrient loads, and bind soil to help prevent erosion. Wetlands temporarily store flood water and slowly release it downstream, thereby reducing flood flows and peaks. The position of wetlands between uplands and the reservoirs greatly facilitates their flood protection and water quality maintenance functions.

Wetlands surrounding the Project reservoirs, as well as the shoreline within 200 ft of the reservoirs, were mapped and delineated using aerial photography and field surveys during 2003 and 2004 (NAI, 2005i Appendix E-12). Wetlands were categorized into six categories: forested wetland, forested floodplain wetland, scrub-shrub wetland, sparse scrub-shrub wetland, emergent wetland, and aquatic bed.

Forested wetlands support primarily deciduous forest trees (20 ft or taller). This wetland type occurs above full pool and is typically associated with small streams and the upper reaches of larger streams (often bordering the stream). The forested wetlands surrounding the Project reservoirs have fairly uniform dominant tree species, a sparse shrub layer, and a highly variable herb layer.

Forested floodplain wetlands occur in two distinct types in the Project area. The most abundant is found along the upper portion of High Rock Reservoir where sediment transported by the river from farther up in the basin has been and continues to be deposited. In these areas, black willow is the sole dominant species in both the tree and shrub layers, as a young sprout, with an occasional sycamore or red maple and a limited herb layer. A second type of the forested floodplain wetland occurs along low-lying lands adjacent to the Project reservoirs. This type of wetland is often associated with historic stream terraces that still flood during high flow events and frequent overbank flooding of larger streams which has formed levees (most pronounced along the upper Yadkin mainstem and the South Yadkin River). Plant species diversity in this type of forested floodplain wetland is higher, with invasives being most abundant in this cover type and a variable herbaceous layer dependent on the level of disturbance and moisture regime.

Scrub-shrub wetlands are dominated by woody vegetation less than 20 ft tall and are dynamic due to the nature of their substrate source and type. This type of wetland occurs throughout the Project reservoir system, with the exception of Falls Reservoir. Scrub-shrub wetlands are most abundant in the delta area in the upper reaches of High Rock Reservoir, where they colonize slightly deeper sediment deposits than the forested floodplain wetlands. In these areas, young black willow form large stands of scrub-shrub wetlands immediately downstream of the forested wetlands. Black willow, buttonbush, and silky dogwood dominate the remaining smaller scrub-shrub wetlands around the reservoirs. Larger streams, such as Abbotts Creek and Cranes Creek, support more scrub-shrub wetland than the smaller tributaries.

The sparse scrub-shrub wetlands are the more tenuous of the scrub-shrub communities described above and include beds of scattered woody seedlings that occur on sediment deposits below the full pool elevation of High Rock Reservoir. With additional sediment trapping, these sparse scrub-shrub wetlands may evolve into typical scrub-shrub wetlands, and when adequate height is attained, into forested floodplain wetlands. This cover type is the second most abundant wetland cover type around High Rock Reservoir.

Emergent wetlands are wetlands that remain covered with water or have completely saturated soils nearly year round. The distribution of emergent wetlands at the Project is generally defined by the slope and substrates of the littoral zones and water level fluctuations of the reservoirs. In the Yadkin Project reservoirs, the upland extent of the emergent wetland is often generally limited by a shoreline structure (retaining wall, riprap) or a natural bluff at the full pool elevation. In areas where the slope of the shoreline is gradual, the emergent wetlands frequently grade into a scrub-shrub wetland or a forested wetland.

Aquatic bed wetlands occur in abundance in two of the Yadkin Project reservoirs, Tuckertown and Narrows. In Tuckertown, the aquatic beds typically occur adjacent to emergent wetlands in the calmer coves and tributary arms. In Narrows, aquatic beds are found in four backwater ponds created by the railroad bed on the west side of the reservoir. Gradual slopes and fine substrates provide habitat for aquatic beds. The lowest depth to which aquatic beds occur in both reservoirs is 5-6 ft below full pool.

The wetlands that occur in and around the Project reservoirs are discussed in further detail in Exhibit E.3.3.

E.1.5 Vegetative Cover

The vegetative cover surrounding the Yadkin Project is generally a mixture of hardwood and softwood forests. According to the ecoregion classification of the U.S. Forest Service (1994), the Yadkin Project area lies within the Southern Appalachian Piedmont Section of the Southeastern Mixed Forest Province, Subtropical Division of the Humid Temperate Domain. Timberland covers about 753.6 thousand acres in the five counties surrounding the Yadkin Project: Davidson, Davie, Montgomery, Rowan, and Stanly (Brown and Sheffield, 2003). Typical forest vegetation in the Project area conforms closely with the Dry-to-Mesic Oak-Hickory Forest (Piedmont Subtype) (NAI, 2005i Appendix E-12). This forest type represents conditions midway between relatively dry and moist extremes of upland vegetation. It occupies mid-slope positions of an intermediate gradient, and seldom faces either full south or north. Oak-hickory covers about 46.5 percent of the timberland area in the five counties surrounding the Yadkin Project (Brown and Sheffield, 2003). Loblolly-shortleaf pine is the second most abundant forest type in the Project area (29.2 percent of the timberland area), followed by oak-pine (22.5 percent), elm-ash-cottonwood (1.47 percent), and oak-gum-cypress (0.42 percent) (Brown and Sheffield, 2003). The acidic soil in the Project area promotes dominance by heath species (blueberries and sourwood) in the shrub understory; while white oak, northern red oak, pignut hickory, and mockernut hickory generally comprise the tree canopy (NAI, 2005i Appendix E-12).

On the drier ridge tops and south-facing slopes, southern red oak replaces northern red oak, and black gum becomes more frequent among the hickories and heaths (NAI, 2005i Appendix E-12). On exceptionally dry sites, blackjack oak, post oak and short-leaf pine may predominate. In the moister areas, American beech is common and often a dominant species, along with sugar maple, tulip poplar, and water oak. Steep, north-facing bluffs often promote the dense growth of heath shrubs, e.g., mountain laurel and blueberry species under chestnut oak, American beech and white oak.

When the natural upland forest succession is set back by disturbances, such as logging, pines (loblolly, short-leaf and Virginia) are among the first forest trees to emerge. Naturally occurring areas dominated by grasses and forbs (most other herbaceous species with typically broader leaves) occur primarily due to vegetation management, wherever woody plant growth has to be routinely discouraged (often along electric power transmission lines). Grassland-Shrubland is found in the Project area only in areas where routine disturbance is maintained for long periods, e.g., under powerlines (NAI, 2005i Appendix E-12).

Since 1990, forest cover in the Piedmont Province of North Carolina has decreased by 7 percent with forests covering 5.4 million acres (52 percent) of the land area in 2002 (Brown and Sheffield, 2003). Oak-hickory was the predominant forest type in the Piedmont Province of North Carolina in 2002, covering about 2.7 million acres (a 3 percent decrease since 1990), while oak-pine increased by 31 percent to cover about 1.1 million acres (Brown and Sheffield, 2003). About 74 percent (4.0 million acres) of the timberland area is comprised of hardwoods, an increase of 2 percent. Softwood forest types decreased about 25 percent to cover about 25 percent of timberland area, less than 1.4 million acres, in Piedmont North Carolina. Loblolly pine is the predominant softwood type (decreasing 6 percent to 798,000 acres), followed by Virginia pine (decreasing 30 percent to 404,000 acres), and shortleaf pine (decreasing 63 percent to 132,000 acres).

E.1.6 Land Development

Within the North Carolina portion of the Yadkin-Pee Dee River watershed, approximately 50 percent of the land is forested, and more than 95 percent is privately owned (NCDENR, 2003). Approximately 30 percent of the land is agricultural (including cultivated and uncultivated cropland and pastureland), about 13 percent is developed (urban and built-up), about 6 percent is "other" lands (roads, railroads, rights of way), and about 1.5 percent is Federal lands located within the Pee Dee National Wildlife Refuge, the Uwharrie National Forest, and the Blue Ridge Parkway.

Cultivated cropland and forested land decreased significantly between 1982 and 1997 (decreases of 37 percent and 4.5 percent, respectively) while there were increases in uncultivated cropland, pastureland, and the "other" categories (about 50 percent, 16 percent, and 7 percent respectively) (NCDENR, 2003). Within the North Carolina portion of the Yadkin-Pee Dee River watershed, the developed category exhibits the most dramatic increase (about 64 percent) during the 15-year period, with 43 percent of the increase occurring between 1992 and 1997.

Specifically, rapid growth and development is occurring in the Winston-Salem, Salisbury, and Charlotte areas of the Yadkin-Pee Dee watershed. Based on the most recent U.S. Census (2000), the most populated areas in the watershed are in and near Winston-Salem and Charlotte (NCDENR, 2003), with the largest increases projected over the next 25 years for four counties located near Charlotte (North Carolina State Data Center, State Demographics Unit website). Of the five counties surrounding the Project, Davie County, located near Winston-Salem, is expected to experience the most rapid growth over the next 25 years (64 percent from 2000-2030) followed by Rowan County (48.2 percent from 2000-2030).

In the upper portion of the Yadkin-Pee Dee watershed, the counties with the largest, densest and most urbanized populations are adjacent to the major urban centers of the Piedmont Triad (Greensboro, Winston-Salem and High Point) and Charlotte/Mecklenburg County. These two large urbanized areas are part of the Piedmont Crescent, a rapidly developing region stretching across the middle of the state from Charlotte to Raleigh and one of the most rapidly developing regions in the entire country (Northwest Piedmont Council of Governments, 1996 and NCDENR, 2003).

Overall, the shoreline of the Project reservoirs is made up predominantly of forest land (65.3 percent) followed by developed land (28.5 percent) and a small amount of agricultural land (6.2 percent) (NAI, 2005i Appendix E-12). The most recent shoreline land use estimates are based on aerial photography of each cover type within 200 ft of the Project reservoirs (see Exhibit E.6.1).

Along the High Rock Reservoir shoreline, the predominant land use category is forest, accounting for approximately 61 percent of the shoreline. Forested areas occur primarily in the upper, more riverine portion of the reservoir. Development is the second largest land use category, accounting for approximately 32 percent of the shoreline land use. There is very little agricultural land adjacent to High Rock Reservoir.

Both the Tuckertown and Falls reservoir shorelines are largely undeveloped. Forested land accounts for 91 percent and 95 percent of the Tuckertown and Falls shorelines, respectively. Agricultural and developed land uses along the shoreline are minimal.

Narrows Reservoir has the highest percentage of residential shoreline development of the Project reservoirs, although the predominant land use category around the reservoir is forested (60.7 percent). Development is the second largest land use category at Narrows Reservoir, accounting for 36.7 percent of the shoreline. Similar to the other Project reservoirs, there is very little agricultural land adjacent to Narrows Reservoir.

E.1.7 Population Size and Density

Based on the most recent U.S. Census (2000), the population of the North Carolina portion of the Yadkin-Pee Dee watershed was close to 1.5 million people, nearly a 25 percent increase from the 1990 U.S. Census of approximately 1.2 million people (NCDENR, 2003). The most populated areas are in and near Winston-Salem and Charlotte. The population of the five counties surrounding the Yadkin Project area, Davidson, Davie, Montgomery, Rowan, and Stanly counties, experienced growth between 1990 and 2000 ranging from 12.2 percent (Stanly) to 25 percent (Davie) (Table E.1-1).

Table E.1-1: Demographic Characteristics of Counties Surrounding the Yadkin Project

County	Land Area (square miles)	Population (2000)	Population Density (2000)	Total Population Change (1990-2000)	Population Estimate (2003)
Davidson	552	147,246	267	16.2%	151,935
Davie	265	34,835	132	25%	37,222
Montgomery	492	26,822	55	14.8%	27,332
Rowan	511	130,340	255	17.8%	133,134
Stanly	395	58,100	147	12.2%	59,060

Source: North Carolina State Data Center, State Demographics Unit website

Population estimates for 2010, 2020, and 2030 (compared to the 2000 U.S. Census) estimate that the county-wide population for counties located wholly or partially in the North Carolina portion of the Yadkin-Pee Dee watershed will steadily increase over the next 25-year period. The largest increases are projected for Union, Mecklenburg, Cabarrus, and Iredell counties, all located near Charlotte (North Carolina State Data Center, State Demographics Unit website). The projected population growth levels for the five counties surrounding the Yadkin Project are shown in Table E.1-2. Based on the growth rate of North Carolina as a whole, modest growth levels are expected in the counties surrounding the Project, i.e., Davidson, Davie, Montgomery, Rowan, and Stanly counties through the year 2030, with Davie County expected to experience the most rapid growth.

Table E.1-2: Population Growth Projections of Counties in Yadkin Project

County	Population (2000)	Projected Population (2010)	Projected Population (2020)	Projected Population (2030)	Percent Growth (2000-2010)	Percent Growth (2000-2020)	Percent Growth (2000-2030)
Davidson	147,246	165,751	185,606	205,386	12.6%	26.1%	39.5%
Davie	34,835	42,235	49,564	57,124	21.2%	42.3%	64.0%
Montgomery	26,822	29,797	33,321	37,006	11.1%	24.2%	38.0%
Rowan	130,340	147,800	170,167	193,201	13.4%	30.6%	48.2%
Stanly	58,100	63,454	69,936	76,056	9.2%	20.4%	30.9%

Source: North Carolina State Data Center, State Demographics Unit website

The overall population density (persons per square mile) of the North Carolina portion of the Yadkin-Pee Dee watershed is approximately 203 persons per square mile versus a statewide average of about 165 persons per square mile (North Carolina State Data Center, State Demographics Unit website). While much of the watershed contains rural areas surrounding small towns, many of the small to large cities have high population density areas. Population densities in counties located wholly or partially in the Yadkin-Pee Dee watershed range from 46 persons per square mile in Allegheny County (9 percent of the county is located in the watershed) to about 1,321 persons per square mile in Mecklenburg County surrounding Charlotte (26 percent of the county is located in the watershed) (North Carolina State Data Center, State Demographics Unit website, and NCDENR, 2003). The population densities for the five counties surrounding the Project are: 55 for Montgomery County, 132 for Davie County, 147 for Stanly County, 255 for Rowan County, and 267 for Davidson County (Table E.1-1). Of the four Project reservoirs, the area surrounding High Rock Reservoir is the most densely populated, with seven towns or cities located in close proximity to the reservoir and many subdivisions adjacent to the reservoir shoreline.

In the upper portion of the basin, the counties with the largest, densest and most urbanized populations are adjacent to the major urban centers of the Piedmont Triad (Greensboro, Winston-Salem and High Point) and Charlotte/Mecklenburg County. These two large urbanized areas are part of the Piedmont Crescent, a rapidly developing region stretching across the middle of the state from Charlotte to Raleigh. This area is one of the most rapidly developing regions in the entire country, and is an extension of the Atlanta/Charlotte Corridor, which is the most rapidly developing region of the country. The development in the Crescent is reaching out from the major urban centers and basically follows Interstate 85. This growth will eventually result in a solid band of urbanized counties from Raleigh to Charlotte (Northwest Piedmont Council of Governments, 1996 and NCDENR, 2003).

As can be expected, the counties with the largest anticipated population growth are those adjacent to the major urban centers of the Piedmont Crescent. The significance of this pattern of growth is that the Piedmont Crescent (running roughly East-West) bisects the upper Yadkin River Basin, (which runs North-South). Increasing development will result in an increased demand for water, while at the same time increasing the threat to water quality (Northwest Piedmont Council of Governments, 1996 and NCDENR, 2003).

E.1.8 Floodplains and Flood Events

E.1.8.1 Floodplains

There are only limited areas of floodplain within or immediately adjacent to the Yadkin Project. Most of these are located along the upper, flowing, portions of High Rock Reservoir upstream of the I-85 Bridge. Most of the floodplains along the upper end of High Rock Reservoir are privately-owned, undeveloped properties that are currently managed as timberland. In some places, these floodplains provide significant habitat for fish and wildlife and support important biological communities (NAI, 2005i Appendix E-12).

The floodplains located along the upper end of High Rock Reservoir are mostly unaffected by the operation of High Rock Reservoir during large flood events (>20,000 cubic feet per second, [cfs]). Naturally occurring hydraulic controls located in the vicinity of the confluence of the Yadkin and South Yadkin rivers combined with high river flows can and do result in the periodic inundation of some areas of these floodplains (PB Power, 2006 Appendix E-3).

E.1.8.2 Flood Events

The Yadkin Project is not specifically operated as a flood control project. Nonetheless, existing operation of the Project does provide some benefit in controlling downstream flooding. In particular, the operation of High Rock Reservoir as a storage facility with a seasonal drawdown allows Alcoa Power Generating Inc. (APGI) to capture a portion of large flow events that are most likely to occur during the high flow winter and early spring months (January-April), which may reduce peak flows during or following large storm events.

Flooding at the upstream end of High Rock Reservoir was raised as an issue during the relicensing consultation process. Historically, the upper portion of High Rock Reservoir, particularly in the vicinity of the confluence of the Yadkin and South Yadkin rivers has been prone to periodic flooding. This is not a new issue. Over the years, a number of adjacent property owners have made complaints about this flooding and its possible link to the operation of High Rock Reservoir. In 1998, Stone and Webster Engineering Corporation (SWEC) conducted an independent evaluation of the causes of flooding in this area, and concluded that changes in reservoir elevations had almost no discernable effect on the elevations of the reservoir upstream of the I-85 Bridge. That study further concluded that natural hydraulic controls in the Yadkin River, combined with high inflows from the South Yadkin River, were the primary cause of flooding in this area, and that the flooding would not be ameliorated by lowering the elevation of High Rock Reservoir. The results of this study were subsequently confirmed by an independent analysis performed by the Federal Energy Regulatory Commission (FERC).

More recently, in response to the Draft License Application, the City of Salisbury (on behalf of Salisbury-Rowan Utilities) submitted additional information in the form of a Technical Report entitled City of Salisbury Technical Report: High Rock Dam and High Rock Lake Sedimentation Flooding Effects as Estimated Using HEC-RAS Modeling (January 2006).

The Technical Report indicates that sediment in the upper end of High Rock Reservoir is the cause of flooding at Salisbury's water and wastewater treatment facilities. APGI has reviewed the Technical Report and believes the study does not provide a basis for determination of the impact of flooding at the wastewater treatment facilities on Grants Creek. APGI believes that the flooding in the vicinity of the Salisbury water intake and pump station is caused by a number of hydraulic controls including the confluence of the South Yadkin and Yadkin Rivers, downstream river channel geometry, and downstream bends in the river. This is discussed further in Appendix E-3.

E.1.9 Other Factors Important to an Understanding of the Setting

E.1.9.1 Yadkin-Pee Dee River Watershed

The North Carolina portion of the Yadkin-Pee Dee River watershed extends from the Mountain physiographic region and includes the Piedmont, Sandhills, and Coastal Plain regions. The South Carolina portion of the watershed extends across the Piedmont, Sandhills, Upper Coastal Plain, Lower Coastal Plain, and Coastal Zone regions.

The Yadkin-Pee Dee River watershed originates on the eastern slopes of the Blue Ridge Mountains in North Carolina with a small portion of the Yadkin River headwaters originating in Virginia. The Yadkin River flows northeasterly for approximately 100 miles to near Winston-Salem, and then flows to the southeast, heading toward Salisbury, North Carolina. A major tributary is the South Yadkin River, which joins the Yadkin River mainstem north of Salisbury in Rowan County. Other major tributaries draining into the Yadkin Project reservoirs include Abbotts Creek, Swearing Creek, Dutch Second Creek, Crane Creek, Flat Swamp Creek, Cabin Creek, Flat Creek, Ellis Creek, Riles Creek, and Hunting Creek. The Yadkin River flows southeast until it is joined by the Uwharrie River, approximately 1.3 miles below Falls Dam, to form the Pee Dee River. Another major tributary, the Rocky River joins the Pee Dee River approximately five miles downstream of Progress Energy's Tillery Dam. After passing through a final reservoir, Blewett Falls, the Pee Dee River continues its southeastern flow through South Carolina where it is joined by the Lynches River, the Black River, and the Waccamaw River before it flows into Winyah Bay, where it meets the Atlantic Ocean.

The Yadkin-Pee Dee River watershed is the second largest river watershed in North Carolina, covering an area of approximately 14,989 square miles in North Carolina, South Carolina, and Virginia. The North Carolina portion of the watershed contains approximately 5,862 miles of freshwater streams and rivers and includes 93 municipalities and all or part of 21 counties (NCDENR, 2003). The South Carolina portion of the watershed includes a total of 8,075 stream miles, 15,984 acres of lake waters, and 25,195 acres of estuarine areas (SCDHEC, Watershed Management website).

Six major reservoirs are located on the mainstem of the Yadkin-Pee Dee River in North Carolina: the four Yadkin Project reservoirs (High Rock, Tuckertown, Narrows, and Falls) and two reservoirs operated by Progress Energy, Tillery and Blewett Falls reservoirs (discussed in Exhibit E.1.9.2). Additionally, a flood control reservoir (W. Kerr Scott) operated by the U.S.

Army Corps of Engineers (USACE) is located in the upper portion of the Yadkin River, approximately 132 river miles upstream of High Rock Dam.

A wide variety of habitat types, as well as a number of rare plants and animals, are found within the Yadkin-Pee Dee River watershed. The Yadkin-Pee Dee River serves as a corridor for migration between the mountains and the Coastal Plain. The watershed contains 38 aquatic species that are rare, threatened, endangered or of special concern by the North Carolina Natural Heritage Program (NCDENR, 2003).

E.1.9.2 Progress Energy Developments

Progress Energy's Yadkin-Pee Dee River Project (FERC No. 2206) is located downstream of APGI's Yadkin Project on the Yadkin and Pee Dee rivers in central North Carolina and consists of two developments, the Tillery Dam and Reservoir and the Blewett Falls Dam and Reservoir.

The Tillery Development is a four-unit, 86 megawatt (MW) hydropower plant located near Mt. Gilead, North Carolina. The Tillery impoundment is a 5,700-acre reservoir with 118 shoreline miles at the normal maximum operating level of 277.3 ft. Tillery Reservoir is located southeast of Albemarle in Stanly and Montgomery counties, North Carolina. The reservoir extends approximately 15 miles upstream to the tailwaters of APGI's Falls Development. Downstream is the Blewett Falls Development, a six-unit, 22 MW hydropower plant located near Lilesville, North Carolina. The Blewett Falls impoundment is a 2,900-acre reservoir at the normal maximum operating level of 177.2 ft. Blewett Falls Reservoir is located northwest of Rockingham in Richmond and Anson counties, North Carolina (Progress Energy, 2003).

The Tillery and Blewett Falls developments are operated in an integrated fashion. Tillery is operated as a "peaking" facility to provide electricity at peak times when ratepayer demand is the greatest. Tillery is also used to "adjust to rapid changes in system needs" which can result in rapid changes in discharge from the reservoir. Progress Energy operates Tillery Reservoir within a range of 4 ft during normal conditions. Much of the time, Tillery is operated within a range of 2 ft, except during times of maintenance. Maintenance periods require drawdowns of approximately 12 ft, and the Yadkin-Pee Dee River Project's FERC license allows drawdowns of up to 22 ft below full pool. From April 15 to May 15, Tillery is operated within one foot of full pool to enhance conditions for fish spawning (Progress Energy, 2003).

Progress Energy operates Blewett Falls as a "block loading" facility which means that the units are turned off when they are not operating at best efficiency. Blewett Falls is operated to regulate discharges from Tillery, thereby reducing flow fluctuations downstream of the dam. The normal operation of Blewett Falls results in a daily drawdown of approximately 2-3 ft below the normal maximum operating level, and the reservoir is refilled overnight (Progress Energy, 2003).

Water storage in the Yadkin Project and Yadkin-Pee Dee Project reservoirs during periods of normal stream flow allows a controlled release downstream to enhance energy generation. In accordance with a March 1968 FERC order, Progress Energy pays APGI an annual headwater benefits fee for this benefit. The existing headwater benefits agreement between APGI and

Progress Energy requires that the regulated weekly average streamflow, during the period March 1 through May 15 is not less than 1,500 cfs, during period May 15 through July 1 is not less than 1,610 cfs, and during the period July 1 through September 15 is not less than 1,400 cfs.

In addition to providing downstream hydropower benefits, the historic controlled release of stored water into the lower river from the Yadkin Project reservoirs, has resulted in a somewhat higher average summer flow than would occur under unregulated conditions. As discussed further in Exhibit E.2, monthly flow duration curves for the summer months at the Rockingham, North Carolina U.S. Geological Survey (USGS) gage station, demonstrate this effect. This increase in base flow conditions provided by the operation of the Yadkin Project storage facilities (primarily High Rock Reservoir) has benefited an array of downstream water users including industrial and municipal dischargers and municipal water supply intakes.

Exhibit E.2

Water Use and Water Quality

E.2 Water Use and Water Quality

E.2.1 Use of Project Waters

The primary use of the water in the Project reservoirs is for hydropower production at Alcoa Power Generating Inc.'s (APGI) hydroelectric generating facilities.

The reservoirs are also used for water withdrawals for municipal and industrial purposes. In accordance with the standard land use article of its current Federal Energy Regulatory Commission (FERC) license (Article 35) and the Yadkin Shoreline Management Plan (SMP), any new water intake from the Yadkin Project (Project) reservoirs must receive prior written permission from APGI. Any new water intakes, greater than one million gallons per day (MGD), must receive prior FERC approval. In addition, any new withdrawals, excluding agriculture, from the Project reservoirs of over 100,000 gallons per day must be registered with the North Carolina Department of Environment and Natural Resources' (NCDENR) Division of Water Resources (NCDWR).

Currently, several municipalities withdraw water from the Project for use as the local water supply, including drinking water. Water users, summarized in Table E.2-1, include the cities of Albemarle and Salisbury and the Town of Denton (NCDWR, Water Supply Planning website and NCDENR, 2003). The City of Albemarle withdraws water from Tuckertown and Narrows reservoirs while the Town of Denton has an intake in Tuckertown Reservoir a short distance below the High Rock Dam (NCDENR, 2003). Salisbury's water supply within the High Rock Development is located at the confluence of the Yadkin and South Yadkin rivers. Although Salisbury's water use has historically included substantial consumptive use (City of Salisbury, letter dated 1/4/06, Appendix E-25), the City of Salisbury contends that it returns nearly the same quantity of water to the Yadkin River that it has withdrawn. The point at which Salisbury returns water to the river is upstream of Grant Creek, more than 16 miles upstream of High Rock Dam. Additionally, there is one industrial withdrawal from the upper portion of High Rock Reservoir for process and cooling water by Duke Energy's Buck Steam Station (Table E.2-1).

Other users that withdraw minor quantities of water from the Project reservoirs include several agricultural and recreational property users, including the Uwharrie Point golf course and some adjoining property owners. In addition, occasional water users, such as local volunteer fire departments, withdraw water from the Project reservoirs for emergency purposes.

Table E.2-1: Summary of the Major Water Withdrawals from the Yadkin Project

Water User	Type of User	Source of Withdrawal	Total Amount Withdrawn Annually	Average Annual Daily Withdrawal (MGD)
City of Salisbury	Municipal	Confluence of Yadkin and South Yadkin rivers	2,279.7 million gallons[1]	6.246 MGD[1, 2] (total surface water supply available for regular use is 54 MGD)
City of Albemarle	Municipal	Tuckertown and Narrows	2,762.363 million gallons (total) [1]	7.568 MGD total[1] (3.524 MGD from Tuckertown and 4.040 MGD from Narrows)[3]
Town of Denton	Municipal	Tuckertown	503.492 million gallons[1]	1.379 MGD[1] (total surface water supply available for regular use is 2.300 MGD)
Duke Power's Buck Steam Station	Industrial – cooling water	Upper portion of High Rock Reservoir		233.3 MGD[4] (daily withdrawal capacity is 394.6 MGD)

[1] Data Source: 2002 Local Water Supply Plan on NCDWR Water Supply Planning website.
[2] Although Salisbury's water use has historically included substantial consumptive use (City of Salisbury, letter dated 1/4/06, the City of Salisbury contends that it returns nearly the same quantity of water to the Yadkin River that it has withdrawn.
[3] Total contract with APGI for water withdrawal is for a total of 18 MGD from Tuckertown and Narrows reservoirs.
[4] According to the Draft 2004 Water Withdrawal and Transfer Registration Form, the average daily amount (in 2004) of this water that was returned to the river basin was 230.3 MGD (the permitted amount is 394.6 MGD). Draft 2004 Water Withdrawal and Transfer Registration Form was obtained via personal communication with Peele, 2005.

Point source dischargers in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the NCDENR's Division of Water Quality (NCDWQ). Point source dischargers include wastewater point source discharges, including municipal and industrial wastewater treatment plants and small domestic wastewater treatment systems serving schools, commercial offices, and residential subdivisions; and stormwater point source discharges, such as stormwater collection systems for municipalities serving populations greater than 100,000 and stormwater discharges associated with certain industrial activities (NCDENR, 2003). NPDES permits are distinguished between individual and general (NCDWQ, NPDES Permits website). General permits are issued for a given state-wide activity such as the discharge of wastewaters associated with sand dredging or non-contact cooling; whereas, individual permits are developed and issued on a case-by-case basis for activities not covered by general permits.

There are 240 permitted discharges in the North Carolina portion of the Yadkin-Pee Dee River basin (NCDENR, 2003). Although a few of these are major facilities (municipal wastewater treatment plants and some industrial facilities with flows $\geq$ one MGD), the majority of the NPDES permitted discharges in the Yadkin-Pee Dee River basin are from small wastewater treatment facilities serving communities and schools. Many of these small wastewater facilities are minor facilities with less than one MGD of flow. Food processing, poultry, and industrial facilities are also present in the basin. The cumulative effect of these point source discharges along with other nonpoint source discharges on the water quality of the Project impoundments is substantial (APGI, 2002).

Table E.2-2 lists the point source dischargers, which are currently operated under NPDES permits issued by the State of North Carolina, that discharge wastewater directly into the Project reservoirs or to reservoir tributaries in the immediate proximity to the Project. Duke Power's Buck Steam Station discharges cooling water into the upper portion of High Rock Reservoir. In addition, Alcoa's Badin Works Plant[1] is permitted to discharge into Narrows Reservoir. Other major discharges, the City of Lexington and the Salisbury-Rowan Wastewater Treatment Plant (WWTP), are located in close proximity to High Rock Reservoir. Minor discharges into the Project waters include: discharges from Norfolk Southern Railway, PPG Industries Fiber Glass Products, American Concrete Products, Boral Bricks, Bill's Truck Stop, several Davidson County Schools, Swing Transport and Hilltop Living Center (into or in close proximity to High Rock Reservoir); discharges to Tuckertown Reservoir from the water treatment plant (WTP) for the Town of Denton, and the City of Albemarle Tuckertown Water Treatment Plant. Water from APGI's High Rock Powerhouse is released into Tuckertown Reservoir; water from APGI's Tuckertown Powerhouse is released into Narrows Reservoir; water from APGI's Narrows Powerhouse is released into Falls Reservoir; and water from APGI's Falls Powerhouse is released into the upper end of Progress Energy's Tillery Reservoir.

[1] As of mid-2002, Alcoa's Badin Works smelter operations have been curtailed.

Table E.2-2: NPDES Discharges to the Yadkin Project Reservoirs or in the Immediate Proximity of the Project Reservoirs

Reservoir	Facility	NPDES Permit No.	Receiving Water	Permitted Flow (MGD)
High Rock				
	Duke Power/ Buck Steam	NC0004774	Yadkin River (including upper portion of High Rock Reservoir below normal operating level)	Not limited
	Norfolk Southern Railway Company–Linwood Yard	NC0029246	Yadkin River (including upper portion of High Rock Reservoir below normal operating level)	0.317 MGD
	PPG Industries Fiber Glass Products Inc	NC0004626	North Potts Creek Arm (Second Potts Creek)	0.6 MGD
	American Concrete Products	NCG520009	High Rock Reservoir (confluence of Yadkin and South Yadkin Rivers)	Not limited
	Boral Bricks, Inc.	NCG020241	High Rock Reservoir	Not limited
	Boral Bricks, Inc.	NCG020239	High Rock Reservoir	Not limited
	Lexington Regional WWTP	NC0055786	Upper Abbotts Creek Arm of High Rock Lake	6.5 MGD
	Bills Truck Stop Inc	NC0040045	South Potts Creek (First Potts Creek)	0.006 MGD
	Davidson County Schools-Central Middle & Senior High School WWTP	NC0041599	UT to Abbotts Creek Arm of High Rock Reservoir	0.014 MGD
	Davidson County Schools-Southwood Elementary School WWTP	NC0042749	UT to Swearing Creek Arm of High Rock Reservoir	0.01 MGD
	Salisbury-Rowan WWTP	NC0023884	Yadkin River (including upper portion of High Rock Reservoir below normal operating level)	20 MGD[1]
	Hilltop Living Center	NC0059536	UT to upper High Rock Reservoir	0.003 MGD
	Swing Transport, Inc.	NCG080279	UT to High Rock Reservoir	Not limited
Tuckertown				
	Denton WTP	NC0082949	Tuckertown Reservoir	Not limited
	APGI High Rock Powerhouse	NC0081931	Tuckertown Reservoir	Not limited
	City of Albemarle Tuckertown WTP	NC0075701	Tuckertown Reservoir	Not limited
Narrows				
	Alcoa Badin Works[2]	NC0004308	Narrows Reservoir	Not limited
	APGI Tuckertown Powerhouse	NC0081949	Narrows Reservoir	Not limited
Falls				
	APGI Narrows Powerhouse	NC0081957	Falls Reservoir	Not limited

Table E.2-2: NPDES Discharges to the Yadkin Project Reservoirs or in the Immediate Proximity of the Project Reservoirs (continued)

Reservoir	Facility	NPDES Permit No.	Receiving Water	Permitted Flow (MGD)
Yadkin River				
	APGI Falls Powerhouse	NC0076775	Yadkin River	Not limited

Data Source: NCDWQ, NPDES Website and personal communication with Lau, 2004 and Weaver, 2004 and 2006.
Notes: UT =Unnamed tributary
Individual NPDES permits have the prefix NC while general NPDES permits have the prefix NCG.
[1] Per personal communication with NCDWQ (Weaver, 2006), the current permitted flow is 20 MGD based on a permit modification issued on February 13, 2004 for expansion beyond 12.5 MGD.
[2] As of mid-2002, Alcoa's Badin Works smelter operations have been curtailed.

In addition to these more traditional uses of Project waters, the Yadkin Project also supports a commercial dredging operation. Specifically, sand dredging occurs at the upper end of High Rock Reservoir near the confluence of the Yadkin and South Yadkin rivers.

In late 1987, APGI's predecessor company, Yadkin, Inc. filed an application with FERC requesting a change in land rights for the purpose of conveying an easement for sand dredging operations on the Yadkin River near its confluence with the South Yadkin River. The area proposed for the dredging operation was defined as on the Yadkin River approximately 2,100-2,600 feet upstream of the confluence of the rivers and approximately 2,400-2,500 feet downstream of the confluence of the rivers. Supplemental information to the application was filed in May 1988, including notice that a prior sand dredging operation had been in existence in the area and the City of Salisbury would benefit from the dredge operation.

After considering the environmental information in the application, including a copy of North Carolina Department of Natural Resources and Community Development's (NCDNRCD) mining and NPDES permits; comments from the resource agencies, including North Carolina Wildlife Resources Commission (NCWRC), U.S. Fish and Wildlife Service (USFWS), and North Carolina Department of Cultural Resources (NCDCR); and staff's independent assessment, on July 28, 1988, FERC issued an order approving the requested change in land rights to allow the dredge operation. Subsequently, a lease was executed between the dredge operator and Yadkin, Inc.

In early 1999, the City of Salisbury contacted the dredge operator expressing its appreciation if the operator would request a modification in its mining permit to allow dredging an additional 1,000 feet upstream on the Yadkin River. The City believed this would be beneficial to the operator and the City by keeping its raw water intake clear. The dredge operator sought and received the modification in its mining permit. No action was required by APGI since the area approved in the mining permit was within the area approved by FERC.

E.2.2 Use of Downstream River Waters

Because High Rock Reservoir serves as a primary storage facility on the Yadkin-Pee Dee River, its operation is also important to downstream river users who rely on releases from storage to augment river flows during the low flow summer period and during periods of drought. Several communities on the lower river (below the Falls Development) use the Yadkin-Pee Dee River for water withdrawals (Table E.2-3). In addition, there are wastewater discharges located in the North Carolina portion of the lower river (Table E.2-4).

Table E.2-3: Summary of the Major Water Withdrawals from the Yadkin-Pee Dee River in North Carolina Downstream of the Yadkin Project

Water User	Type of User	Source of Withdrawal	Total Amount Withdrawn Annually	Average Annual Daily Withdrawal (MGD)
Anson County, NC	Municipal	Blewett Falls Reservoir	2,397.320 million gallons[1]	6.568 MGD[1,2] (total surface water supply available for regular use is 16.000 MGD)
Montgomery County, NC	Municipal	Tillery Reservoir	1,132.369 million gallons[3]	3.106 MGD[3] (total surface water supply available for regular use is 6.000 MGD)
Norwood, NC	Municipal	Tillery Reservoir	135.415 million gallons[1]	0.371 MGD[1] (total surface water supply available for regular use is 2.000 MGD)
Richmond County, NC	Municipal	Blewett Falls Reservoir	1,169.60 million gallons[1]	3.4 MGD[1] (total surface water supply available for regular use is 8.000 MGD)

[1] Data Source: 2002 Local Water Supply Plan on NCDWR, Water Supply Planning website.
[2] Anson County plans to increase plant capacity to 32 MGD by 2010.
[3] Data Source: 2002 Draft Local Water Supply Plan obtained via personal communication with Peele, 2005.

Table E.2-4: NPDES Discharges to the Mainstem Yadkin-Pee Dee River in North Carolina Downstream of the Yadkin Project

Facility	NPDES Permit No.	Receiving Water	Approximate Rivermile	Permitted Flow (MGD)
Anson County, NC Regional WWTP	NC0041408	Pee Dee River	176	3.5 MGD
Ansonville, NC WWTP	NC0081825	Pee Dee River	210	0.1200 MGD
Mount Gilead, NC WWTP	NC0021105	Pee Dee River (including Blewett Falls Reservoir below normal operating levels)	218	0.8500 MGD
Rockingham, NC WWTP	NC0020427	Pee Dee River	181	9.0 MGD

Data Source: NCDWQ, NPDES Permits website and personal communication with Weaver, 2004 and 2006.

E.2.3 Water Quality

E.2.3.1 Existing Water Quality in Project Waters and Downstream

Limited historic water quality data were collected in the 1970s on High Rock Reservoir by the U.S. Environmental Protection Agency (USEPA), the North Carolina Division of Environmental Management, and the University of North Carolina. Since 1981, the State of North Carolina has collected a suite of physical and chemical data in the Project reservoirs, in most instances every three to four years. The sampling has been limited to the summer months and mostly to surface water. According to the most recent Yadkin River Basin Basinwide Assessment Report, symptoms of eutrophication, or high productivity (i.e., elevated pH values; chlorophyll *a,* an indicator of algal growth; nutrient concentrations; and algal blooms, which can result in depleted dissolved oxygen levels), have been documented in High Rock Reservoir since 1981 and are also evident in Tuckertown Reservoir (NCDENR, 2002). Both reservoirs also exhibited decreased Secchi depths at or less than one meter. Narrows Reservoir was determined to be eutrophic from 1981 to 1987 and mesotrophic (moderately productive) in 1990 and 1994.

Portions of High Rock Reservoir are on the 2006 North Carolina draft list[2] of impaired waters (the 303[d] List) and require the development of Total Maximum Daily Loads (TMDLs) (NCDENR, 2006). The upper portion of the reservoir[3] is listed as impaired due to violation of water quality standards for chlorophyll *a* and turbidity, the Abbotts Creek Arm due to violations for turbidity, and the lower portion of the reservoir[4] is listed as impaired for turbidity (NCDENR, 2006). Additionally, the Swearing Creek Arm of High Rock Reservoir is listed as impaired biological integrity, thereby requiring a TMDL stressor study to identify stressors to aquatic life. The tailwater below High Rock Dam to the mouth of Cabin Creek (the upper portion of Tuckertown Reservoir) is also impaired due to violations for dissolved oxygen. The section of Lick Creek draining into Tuckertown Reservoir is impaired due to dissolved oxygen violations. Other tributaries draining into the Project waters that are on the 303(d) List include: Grants Creek for fecal coliform, turbidity and impaired biological integrity; Abbotts Creek above the I-85 Bridge for impaired biological integrity; and the South Yadkin River for turbidity.

E.2.3.1.1 Water Quality Monitoring Study Conducted by APGI

Monitoring

In preparation for the relicensing effort, APGI began collecting baseline water quality data in the Project reservoirs and tailwaters in 1999. In response to comments on the Yadkin Project Relicensing Initial Consultation Document (ICD) filed with FERC in 2002, APGI developed a study plan with input from the Water Quality Issue Advisory Group (WQ IAG) and conducted water quality monitoring in the four Yadkin Project reservoirs and tailwaters for five years (NAI, 2005h Appendix E-1). The principal concerns related to water quality at the Project are the current status of water quality in the reservoirs and tailwaters and the effects of the Project operations on water quality.

APGI conducted monthly water quality sampling at 16 reservoir locations and at each of the four tailraces below the dams from June 1999 to December 2003 (Figures E-2 and E-3) and an

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[2] These same waters were listed as impaired on NCDENR's 2004 303(d) List.

[3] The upper portion of High Rock Reservoir is designated upstream from the mouth of Grants Creek to a line across High Rock Reservoir from the downstream side of mouth of Crane Creek to the downstream side of mouth of Swearing Creek.

[4] The lower portion of High Rock Reservoir is designated as the area from a line across High Rock Reservoir from the downstream side of the mouth of Crane Creek to the downstream side of mouth of Swearing Creek to High Rock Dam (except for the Abbotts Creek Arm of High Rock Reservoir upstream of Davidson County SR 2294 and the portion of Second Creek Arm of High Rock Reservoir from source to a point 1.7 miles upstream of Rowan County SR1004).

additional station was added in Lick Creek just above its confluence with Tuckertown Reservoir in July 2003 (Figure E-4). The tailraces of the Falls and Narrows developments were continuously monitored for dissolved oxygen (DO) and temperature for extended periods (May–November) from 2000 through 2005[5]; while the tailraces of the High Rock and Tuckertown developments were continuously monitored for dissolved oxygen and temperature for extended periods (May–November) in 2003 and 2004 (Figures E-2 and E-3). Additional dissolved oxygen and temperature measurements were collected at two sites in the Lick Creek Arm of Tuckertown Reservoir and at seven stations below the High Rock Dam tailrace (the upper portion of Tuckertown Reservoir) beginning in July 2003 (Figure E-4).

On each sampling date, temperature, pH, dissolved oxygen and specific conductance were measured in situ using a YSI field meter at one meter intervals from the surface to the bottom. For nutrients, solids, and metals, samples were collected monthly from the surface and the bottom at each station. In February 2001, a composite sample of the photic zone, defined as twice the Secchi transparency depth, replaced the surface grab sample for all chemical parameters except for metals. Secchi transparency was measured at each station and chlorophyll *a* samples were only collected from the photic zone. All sampling and analysis was conducted in accordance with North Carolina water quality monitoring protocols and procedures (NAI, 2005h Appendix E-1). Table E.2-5 lists the chemical parameters analyzed in the laboratories and detection limits.

Table E.2-5: Selected Water Quality Parameters, the USEPA Method, and Detection Limit

Parameter	USEPA Method	Detection Limit	Units
Chlorophyll *a*	SM 10200H #2	0.2	µg/l
Alkalinity, Total	SM 2320B		mg/l
Biological Oxygen Demand	405.1	2	mg/l
Cadmium	200.8/6020	0.5	µg/l
Carbon, Total Organic	SM 5310C/9060		mg/l
Chemical Oxygen Demand	410.4/7196	20	mg/l
Copper	200.8/6020	10	µg/l
Cyanide, Total	335.4/9012	0.005	mg/l
Lead	200.8/6020	2	µg/l
Mercury	245.1/7470A	0.2	µg/l
Nitrogen, Ammonia	350.1	0.05	mg/l
Nitrogen, NO3+NO2(as N)	353.2/9200	0.05	mg/l
Nitrogen, Total Kjeldahl	351.2	0.5	mg/l
Phosphorus, Total	SM4500-P-E2	0.02	mg/l
Residue, Total	160.3	20	mg/l
Residue, Filterable	160.1	20	mg/l
Residue, Nonfilterable	160.2	5	mg/l

[5] The information summarized in the License Application is based upon the relicensing Water Quality Monitoring Study that utilized data collected through 2004, and does not include continuous dissolved oxygen and temperature monitoring data collected in 2005.

Figure E-2: Water Quality Sampling Stations in High Rock and Tuckertown Reservoirs

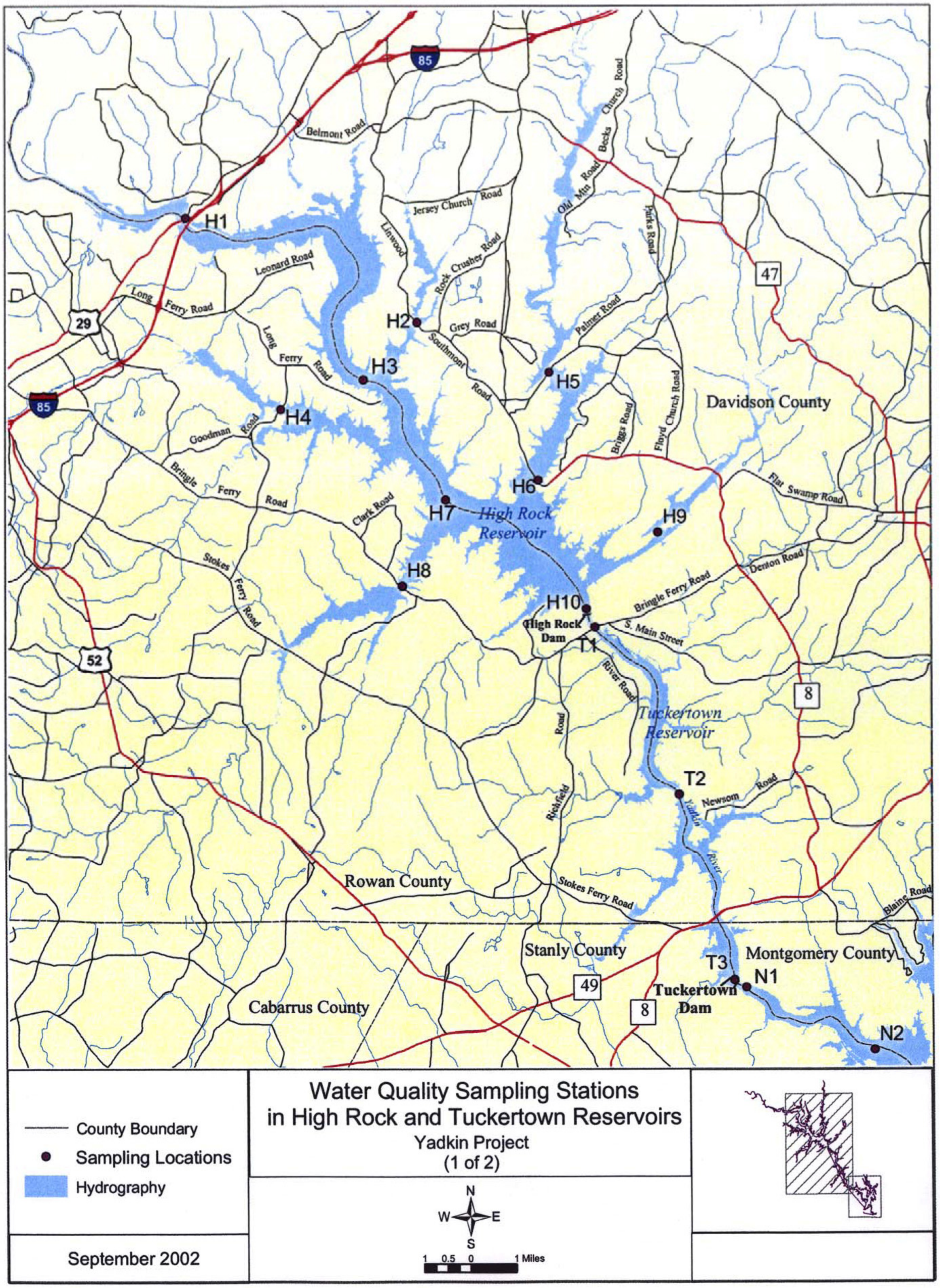


Figure E-3: Water Quality Sampling Stations in Falls and Narrows Reservoirs

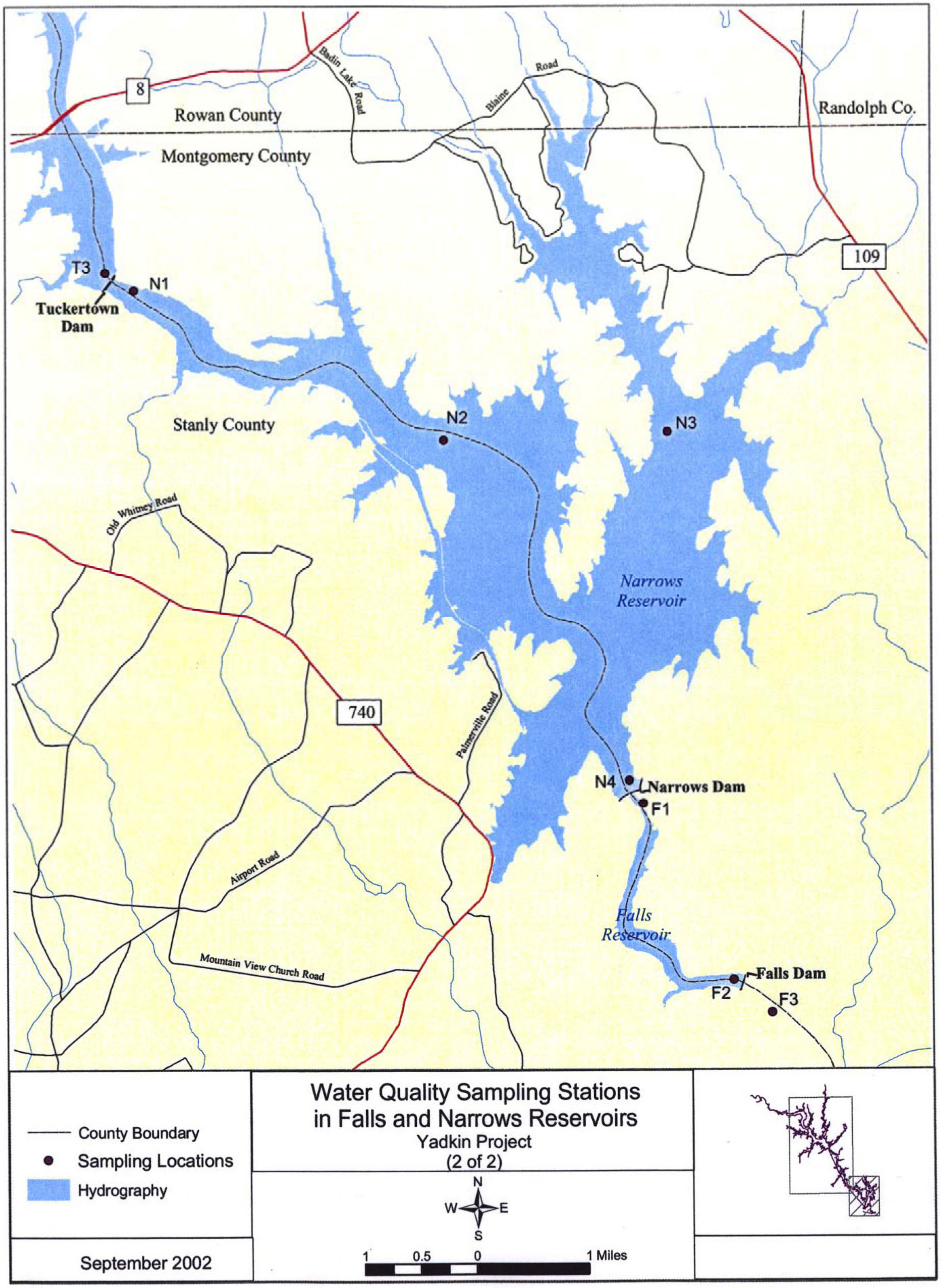
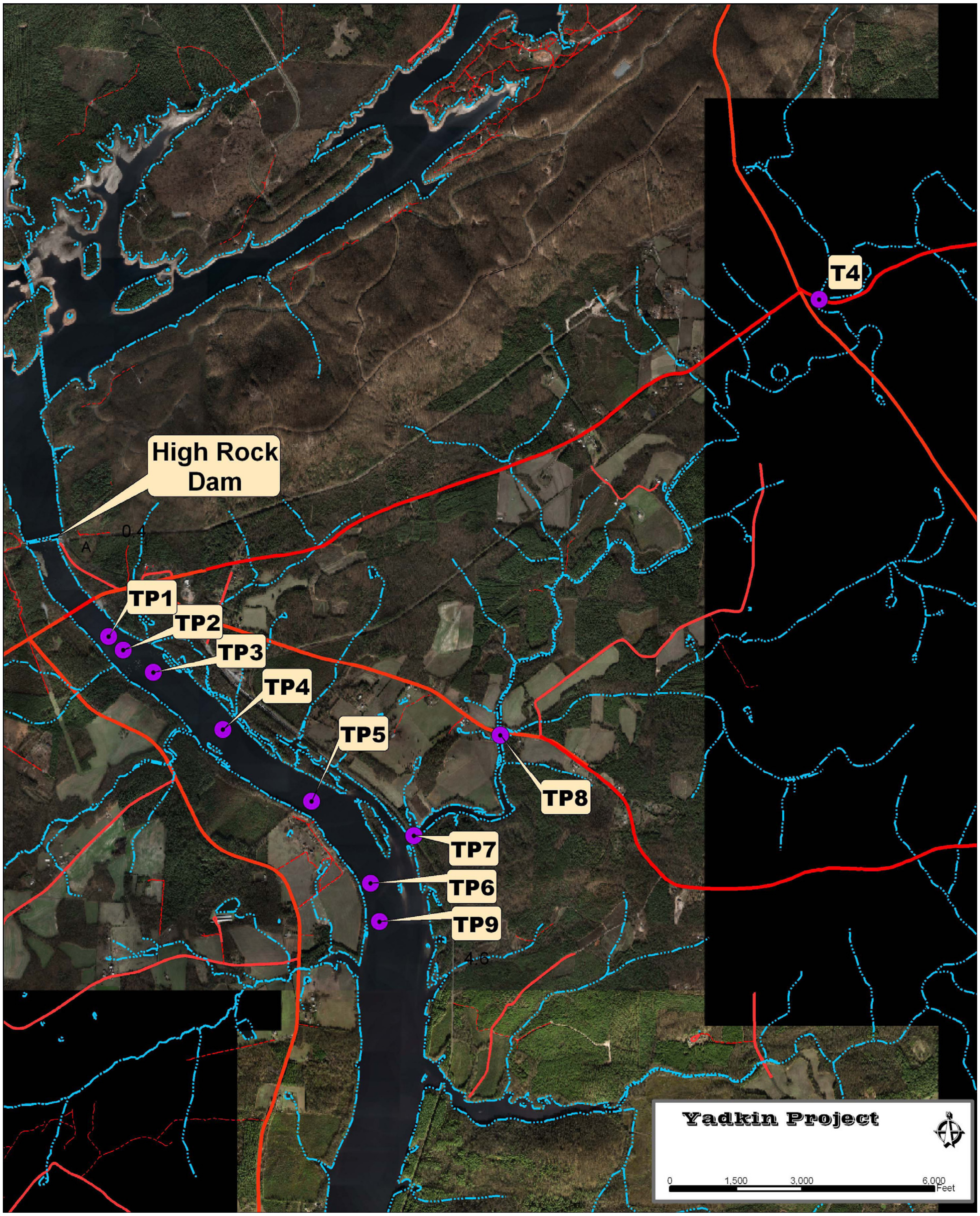


Figure E-4: Supplemental Water Quality Sampling Stations



The hydrometeorologic conditions throughout APGI's monitoring period are critical to understanding the water quality dynamics in the tailraces of the Project dams. Flows during 2000 and 2001 were below average, but 2002 was an extremely dry year, particularly during the summer. Conditions were abnormally wet in 2003 and flows returned to average in 2004, with the exception of two hurricanes in August and September that temporarily increased flows. Water levels in Tuckertown and Falls reservoirs fluctuated little throughout the monitoring period, while water levels in High Rock and Narrows reservoirs fluctuated significantly, particularly in the drought year of 2002.

Project-Wide Water Quality Conditions

The seasonal patterns in water quality observed in the Yadkin Project reservoirs were affected by the hydrometeorological conditions among the years of data collection. For the period of APGI's monitoring study (1999-2003), the annual minimum and maximum surface temperatures were relatively consistent among the reservoirs and among years with winter low temperatures of about 8ºC and summer highs of about 30ºC. Except for Narrows Reservoir, bottom temperatures exhibited a similar seasonal pattern. In High Rock, Tuckertown, and Falls reservoirs, weak thermal stratification of up to 4ºC occurred in the summer, generally from July to September. In Narrows Reservoir, a hypolimnion developed in spring and persisted until December or January below a depth of 25 meters. Dissolved oxygen concentrations measured near the bottoms of in High Rock, Tuckertown, and Narrows reservoirs were relatively consistent among the years of the study; whereas, dissolved oxygen concentrations in the photic zone experienced two periods of high levels (winter and summer) in 2002 and 2003 and to a lesser extent, 2000. The high concentrations in the summer were a result of algal production.

Chlorophyll *a* concentrations in the Project reservoirs followed a strong seasonal pattern in the lower mainstem and arms of High Rock, Tuckertown, and Narrows reservoirs, with the lowest concentrations in early winter and the highest in mid-summer. During the monitoring period, there was a fairly consistent seasonal trend in the lower mainstem and arm stations of High Rock Reservoir, where large algae populations developed, with low concentrations in late winter and early spring and high concentrations in summer. A very consistent seasonal cycle with low nitrate concentrations in summer and high concentrations in winter occurred in Tuckertown, Narrows, and the lower portion of High Rock reservoirs.

APGI's monitoring study showed that there are some differences in water quality characteristics in the bottom and surface waters of the Project reservoirs (NAI, 2005h Appendix E-1). During the summer, bottom water temperatures were generally cooler and had lower dissolved oxygen concentrations. In High Rock and Tuckertown reservoirs, summer bottom water samples were generally more turbid, with greater concentrations of suspended solids, total phosphorus, and ammonia. Ammonia levels were also high in the bottom samples of Narrows Reservoir. Large differences between surface and bottom concentrations of nitrate were only observed in Narrows Reservoir.

The Yadkin Project waters experienced varying degrees of eutrophication, with water quality generally poorest in High Rock Reservoir and best in Falls Reservoir (NAI, 2005h Appendix E-1). The principal flow source for High Rock Reservoir is the mainstem Yadkin River, draining a forested and agricultural region with some small towns and cities, and contributions from Swearing, Crane, Second, Abbotts, and Flat Swamp Creeks. Although Flat Swamp Creek has a relatively undeveloped watershed, the other major tributaries to High Rock Reservoir receive runoff from at least one municipality.

In general, the passage of water through the reservoirs can take weeks (the residence time of water in High Rock Reservoir ranges from 4 to 50 days, about 22 hours in Tuckertown, about 2 days in Narrows, and about 2 hours in Falls) resulting in improvement to the overall water quality due to the reduction of suspended sediments, the increase in water clarity, and the gradual reduction of algal biomass and nutrients (NAI, 2005h Appendix E-1).

Being the furthest upstream reservoir, High Rock receives a heavy load of solids with high concentrations of nutrients from the mainstem Yadkin River, the effects of which can be observed for at least six miles along the mainstem in upper High Rock Reservoir. As algal populations effectively began to utilize the nutrients provided by the Yadkin River, there was a large increase in chlorophyll *a* and a corresponding decrease of both total phosphorus and total nitrogen, mostly nitrate, in this stretch of the impoundment. High Rock Reservoir is a very turbid reservoir with large concentrations of suspended sediments and poor water clarity. The average Secchi depth in High Rock Reservoir was about a half meter which means that light penetration and algal productivity were probably limited to the top one meter. Most of the suspended solids settled in High Rock Reservoir and turbidity and suspended solids concentrations were much lower in Tuckertown Reservoir. There was further reduction of suspended solids in Tuckertown and suspended solids were near the detection limit in Narrows and Falls reservoirs. Secchi depth was considerably higher in Narrows and Falls reservoirs where the photic zone generally extended to a depth of over 3 meters.

Heavy sediment loads are likely to carry greater concentrations of nutrients and other substances. Both total phosphorus and total nitrogen concentrations were greatest in High Rock Reservoir (NAI, 2005h Appendix E-1). Phosphorus concentrations decreased in the downstream reservoirs, but concentrations remained at levels that are capable of supporting considerable algal growth. Total nitrogen concentrations decreased only slightly as water passed through the four reservoirs. The availability of nutrients in High Rock Reservoir created a large standing crop of algae as indicated by the large chlorophyll *a* concentrations. Algal biomass decreased in the downstream reservoirs in a pattern that was similar to the reduction in phosphorus concentrations. Severe algal bloom conditions, generally >30 µg/l, were typically not observed in Narrows and Falls reservoirs. A large algal standing crop and a shallow photic zone, similar to High Rock Reservoir, tended to produce near-saturated to supersaturated oxygen levels in the photic zone, but as the micro-organisms died and settled into the underlying water, dissolved oxygen concentrations were quickly depleted.

Although most of the sediment and nutrients were likely delivered to High Rock Reservoir from upstream sources during precipitation and runoff events, this effect was not necessarily translated downstream. Results of a correlation analysis between flows at each of the Yadkin Project dams with various water quality parameters suggested that in general water quality conditions were weakly correlated with Project flows.

APGI's monitoring also looked for the presence of metals and certain other toxins in the reservoirs. Generally, the study found that cadmium, cyanide, copper, lead and mercury occurred at the Project in concentrations below the detection level of the test method (NAI, 2005h Appendix E-1). Cyanide was detected occasionally at every sampling station in all four reservoirs; however, differences among stations were small in terms of the frequency of detectable cyanide. Detectable levels of cyanide occurred most frequently in the arms of High Rock Reservoir and in Falls Reservoir. Low, but detectable levels of metals, including lead and copper were found occasionally, particularly in the upper portions that are the most affected by runoff. Lead was the most commonly occurring toxic substance that was detected. Detectable levels of mercury occurred on almost half of the sampling dates in Narrows Reservoir near the dam, the only station with a hypolimnion, which was probably a source of dissolved forms of mercury.

The question of mercury in fish tissue was also examined by APGI by collecting fish tissue samples in the upper-most portion of Narrows Reservoir, just below Tuckertown Dam (NAI, 2005h Appendix E-1). Mercury concentrations in all of the fish samples collected were below the detection limit of 0.145 mg/kg, which is well below the USDA's action level of 1 mg/kg.

Concerns about levels of fecal coliform in the Project waters were also addressed in APGI's water quality monitoring study. Monitoring for fecal coliform in the Project reservoirs is handled by both the NCDWQ and, as needed, by the local county health departments. APGI's study compiled fecal coliform data that had been collected in High Rock, Tuckertown and Narrows reservoirs for 1999 through 2001. For the most part fecal coliform counts were generally less than 10 per 100 ml. All of the samples had concentrations which met the state water quality standard.

High Rock Water Quality

High Rock Reservoir is an extremely diverse waterbody that demonstrated large differences between the upper and lower mainstem stations and among the arms.

Relatively low chlorophyll *a* concentrations in the upper High Rock mainstem indicated that phytoplankton populations had not had sufficient time to develop and that this stretch may be more like a river than a lake (NAI, 2005h Appendix E-1). Nitrate concentrations were greater at the upper High Rock mainstem stations, before it was assimilated by phytoplankton while ammonia levels were greatest in the tailraces due to the blending of surface water (with low concentrations) and bottom water, where ammonia concentrations were seasonally greater.

APGI's monitoring study found that nutrient concentrations throughout High Rock Reservoir were at levels that supported nuisance algal blooms and algal biomass often at high levels (>30 µg/l). In general, conditions in the upper portion of High Rock Reservoir, as measured at two mainstem stations and the arm stations of Swearing and Crane Creeks, were more turbid and had greater nutrient concentrations than the lower portion of the reservoir. The major arms of High Rock Reservoir typically had greater algal biomass than the mainstem and there were also differences among the major arms.

When compared to the mainstem, the arms of High Rock Reservoir typically had greater alkalinity, biological oxygen demand (BOD), chlorophyll *a*, total Kjeldahl nitrogen, total organic carbon and total dissolved solids (NAI, 2005h Appendix E-1). These are all measures that are directly or indirectly affected by algal productivity and suggest that productivity in the arms was very high. The average chlorophyll *a* concentration for all arm stations was 29 µg/l, which was almost double the average concentration in the mainstem of the reservoir. Nitrate concentrations in the arms were much lower than in the mainstem, indicative of assimilation of nitrate by algae.

From the limited number of stations sampled in High Rock Reservoir's arms, some differences among the major arms were observed (NAI, 2005h Appendix E-1). The Flat Swamp Creek Arm, which has a relatively undeveloped watershed, had the best water quality observed in High Rock Reservoir and was considerably different from the other arms. The Flat Swamp Creek Arm had the greatest water clarity and the lowest concentrations of dissolved and suspended solids, chlorophyll *a* and the nutrients, total phosphorus and total nitrogen. Chlorophyll *a* concentrations were similar to concentrations seen in the lower mainstem stations, and much lower than in the other arm stations. Differences among the remaining arm stations were relatively small. The Swearing Creek and Crane Creek arms had higher concentrations of suspended solids and algae, and the photic zone averaged about 0.75 meters in these two arms. The Crane Creek Arm had the greatest BOD of all the arms. Based on a single station, the Crane Creek Arm, due to its higher nutrient, algae and sediment concentrations, probably had the worst water quality of all the arms, but Swearing Creek was only slightly better.

Thermal stratification was typically absent near the dam in High Rock Reservoir, except for a slight warming of the surface during the summer (NAI, 2005h Appendix E-1). The surface layer was only a few meters thick and surface temperatures were typically about 2 to 4 °C warmer than at the bottom. Despite the lack of thermal stratification at this station, there was oxygen depletion, especially at lower depths during the warmer months. Here, oxygen depletion was independent of thermal stratification and extended from the reservoir bottom up to the lower limit of the photic zone. Reduced flows and warmer water temperature during the extreme low reservoir levels of 2002 promoted intense algal production creating supersaturated dissolved oxygen conditions in the photic zone. In 2003, high flows and a full pool during the summer reduced the effects of oxygen depletion in High Rock Reservoir, resulting in dissolved oxygen concentrations greater than 5 mg/l in the top four meters and anoxic conditions only in the near bottom depths from July to September.

Dissolved oxygen characteristics vary spatially in High Rock Reservoir. The monitoring study conducted by APGI showed that low dissolved oxygen concentrations were more likely to occur in the arms rather than the mainstem of High Rock Reservoir (NAI, 2005h Appendix E-1). The upper mainstem stations generally had adequate dissolved oxygen concentrations, but low surface DO was a chronic problem in the Swearing Creek and Crane Creek arms of High Rock Reservoir. The large algal standing crop and high BOD in these two arms suggest these were very productive areas and that oxygen was consumed quickly through microbial respiration. The shallow water also allowed more frequent mixing of the photic zone with the oxygen depleted water below resulting in an overall decrease in dissolved oxygen concentrations at the surface.

Tuckertown Water Quality

Tuckertown Reservoir has two small tributary arms and receives almost all of its flow from High Rock Reservoir. With water quality similar to that found in the lower portion of High Rock Reservoir, Tuckertown Reservoir was generally turbid with a shallow photic zone (NAI, 2005h Appendix E-1). Nutrient concentrations were at levels that can promote nuisance algae blooms and algal biomass remained at high levels. Chlorophyll *a* concentrations in the reservoir were slightly greater than those observed in the High Rock Dam tailrace indicating that additional productivity was occurring in the reservoir. Although the suspended solids concentrations were generally much lower than those observed in High Rock Reservoir, they were still greater than levels typically seen in North Carolina lakes and reservoirs. As in High Rock, weak thermal stratification of the water column occurred during the summer months with the few degree difference between surface and bottom temperatures the top five meters. Most of this temperature difference occurred in the top five meters of the reservoir.

APGI's monitoring study showed that dissolved oxygen depletion in deeper water at Tuckertown Reservoir typically extended from May through October or November, but anoxic conditions were usually limited to the summer months and to depths below five meters (NAI, 2005h Appendix E-1). Dissolved oxygen in the upper five meters of the water column varied considerably among the sampling years. Low dissolved oxygen concentrations (<5 mg/l) at the surface were observed from July to September 1999, August to October 2000, July to August 2001 and briefly in October 2002.

Narrows Water Quality

Although Narrows Reservoir receives most of its flow from Tuckertown Reservoir, the Gladys Fork Arm is a major tributary to the reservoir. APGI's monitoring study found that Narrows had greater water clarity and lower concentrations of suspended solids, nutrients and algal biomass than the two upstream reservoirs, High Rock and Tuckertown, and better surface dissolved oxygen conditions than Falls Reservoir which is downstream (NAI, 2005h Appendix E-1). Although surface waters are less turbid than the upstream reservoirs, the photic zone is still relatively shallow, with averages ranging from about 2.4 to 3.4 meters. Average suspended solids concentrations at Narrows were near the detection limit. Nutrient concentrations were lower than in High Rock and Tuckertown reservoirs; however, they were still at levels that can produce nuisance algal blooms.

Narrows, with its deeper water, is the only reservoir that truly stratified and where a true hypolimnion (cool lower layer) developed (>4 °C difference between surface and bottom temperatures). Water quality conditions across the reservoir were homogeneous and the differences among stations were very small (NAI, 2005h Appendix E-1). A strong and persistent thermocline developed near the dam in Narrows Reservoir. Thermal stratification typically began to develop in May and persisted, in some years, into December. By mid-summer, a well developed epilimnion (warm upper layer) extended from the surface to a depth of about 15 to 20 meters and a well defined metalimnion (transitional layer) separated the epilimnion from the hypolimnion. Epilimnetic waters reached a maximum of about 30 °C in summer. Throughout the fall, the metalimnion thinned as the epilimnion cooled and deepened. Reservoir turnover occurred in late summer or early fall.

Dissolved oxygen concentrations in the upper four or five meters were usually greater than 5 mg/l (NAI, 2005h Appendix E-1). Below five meters, low dissolved oxygen concentrations (<5 mg/l) persisted from June through September. Oxygen depletion was independent of thermal stratification. Complete mixing of the reservoir usually occurred in December or January and dissolved oxygen concentrations were similar throughout the water column until stratification returned in late spring.

Falls Water Quality

Falls Reservoir has no tributaries of any size and receives almost all of its water from Narrows Reservoir. The monitoring study conducted by APGI found that Falls Reservoir had the lowest concentrations of solids, nutrients, and algal biomass of the four Project reservoirs (NAI, 2005h Appendix E-1). The levels were generally similar to the concentrations observed in Narrows Reservoir near the dam. Nutrient concentrations were still at levels that could promote algal blooms. However, algal biomass was low because a portion of the water leaving Narrows was deep epilimnetic water that had low algal biomass and the residence time in Falls Reservoir was not sufficient for algae populations to develop. Average Secchi depth was 1.6 meters indicating a photic zone of about 3 meters.

The mid-water release from Narrows Reservoir included cooler anoxic water that contributed to low temperature, pH, and dissolved oxygen levels throughout Falls Reservoir. The monitoring conducted by APGI found no thermal stratification in Falls Reservoir, with temperatures ranging from about 8 to 28 °C. Dissolved oxygen concentrations observed at the surface range from 3 to 11 mg/l. In a typical year, low dissolved oxygen concentrations extended from the bottom to within a meter or two of the surface from June to October, but anoxic conditions were not observed. Low dissolved oxygen water (<5 mg/l) was occasionally observed at the surface.

Tailwater Water Quality

The water quality monitoring study conducted by APGI also looked at tailwater water quality (NAI, 2005h Appendix E-1). In general, monitoring results demonstrated that nutrient and solids concentrations in the four development tailraces were generally similar to conditions in the reservoirs immediately upstream of them, but that temperature, pH, dissolved oxygen, nitrate and ammonia differed considerably.

Based on the study results, a downstream trend in median water quality values was apparent through the tailraces. Water quality of High Rock and Tuckertown tailraces was fairly similar. These two tailraces were turbid, nutrient rich, and contain moderate amounts of algal biomass. Between Tuckertown and Narrows tailraces, there was a moderate reduction of ammonia, chlorophyll *a*, nutrients, and solids. Water clarity improved somewhat in the downstream tailraces. The water quality of Narrows and Falls tailraces was almost identical. Although median concentrations were above the state standard, all four tailraces experienced low dissolved oxygen concentrations. Despite the downstream trend, overall water quality did not differ much among the four tailraces and the water clarity, turbidity, and the concentrations of solids and total nutrients in each tailrace were generally similar to the surface water near the dam in the upstream reservoir.

Tailrace water quality differed most from the reservoirs in temperature, pH, dissolved oxygen, algal biomass, nitrate and ammonia, which are parameters that exhibit differences in the reservoirs between surface and bottom waters. The mixing of water entrained over the wide depth range of the dam intakes influenced the quality of water leaving each reservoir. As differences between surface and bottom water occurred seasonally, the effects on released water also varied seasonally.

Tailwater temperature and dissolved oxygen were monitored continuously (every 15 minutes) during late spring through fall below Narrows and Falls dams from 2000 through 2004 and below Tuckertown and High Rock dams in 2003 and 2004 (NAI, 2005h Appendix E-1). More limited monitoring occurred below High Rock and Tuckertown prior to 2003 (two 3-day periods).

The typical pattern at the High Rock tailrace showed reduced dissolved oxygen concentrations through the summer period, which was a direct result of low dissolved oxygen in High Rock Reservoir. When river flows were high, water in the reservoir was exchanged more rapidly, translating into relatively higher dissolved oxygen concentrations in the tailrace. The Tuckertown tailrace exhibited patterns similar to High Rock. In the Narrows tailrace, the summer daily change in dissolved oxygen was usually about 3 mg/l, with frequent occurrences below 4 mg/l from June to October. The study was unable to discern a clear relationship between hydrometeorologic conditions and the frequency of low dissolved oxygen levels in Narrows tailrace. Since Falls Reservoir does not stratify and the residence time is so short, the water in the Falls tailrace was generally similar to that observed in the Narrows tailrace. Temperature in both tailraces reached a summer maximum of 26-28ºC.

Dissolved oxygen concentrations in the Narrows tailrace were generally higher than conditions observed in either the High Rock or Tuckertown tailrace. These higher dissolved oxygen concentrations in the Narrows tailwater were partially the result of the operation of the Narrows Unit 4 turbine, which has two air injection valves to introduce air into the flow during generation. The aeration valves on Unit 4 began operating in early 2001. An initial study of Narrows tailwater DO was conducted by APGI in 2001 and reported to FERC (NAI, 2002)[6]. Tests of the effect of the two aeration valves on Unit 4 generally demonstrated that with both valves operating and only Unit 4 operating, about 2-4 mg/l of dissolved oxygen was added to the tailwater.

Dissolved oxygen duration plots for all four Project tailwaters are provided in Figures E-5a through E-5d. These plots demonstrate the frequency that DO in each of the Project tailwaters

[6] The 2001 testing focused on the Narrows tailwater recording dissolved oxygen concentrations under various operating regimes, with and without Unit 4 air valve operation. Subsequent to the 2001 testing, the normal operating policy at Narrows in 2002, 2003, and 2004 was revised to operate with both air valves open whenever Unit 4 is operated between May and November in an attempt to increase dissolved oxygen downstream (NAI, 2005h Appendix E-1).

was below the instantaneous minimum standard of 4 mg/l during the months of May through November through the monitoring period for the years of continuous DO monitoring (2000-2005 for Narrows and Falls, 2003-2005 for Tuckertown and High Rock).

Figure E-5a: Dissolved Oxygen Duration Plot for High Rock Tailrace May - November 2003-2005

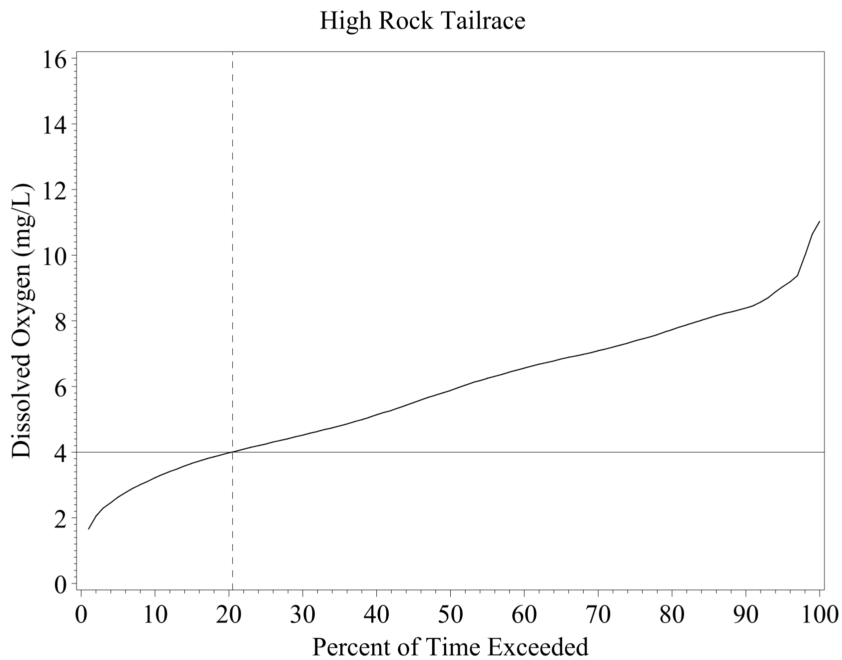


Figure E-5b: Dissolved Oxygen Duration Plot for Tuckertown Tailrace May - November 2003-2005

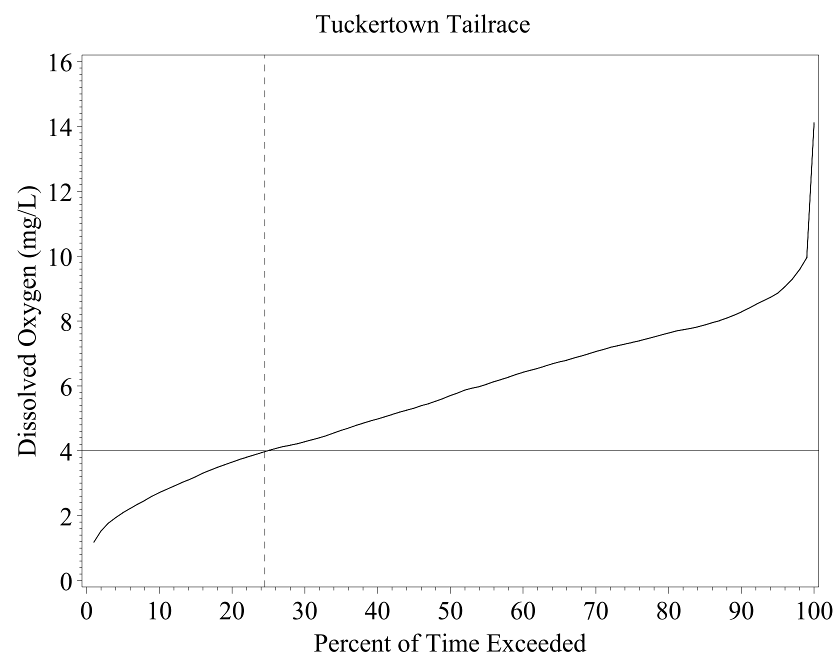


Figure E-5c: Dissolved Oxygen Duration Plot for Narrows Tailrace
May - November 2000-2005

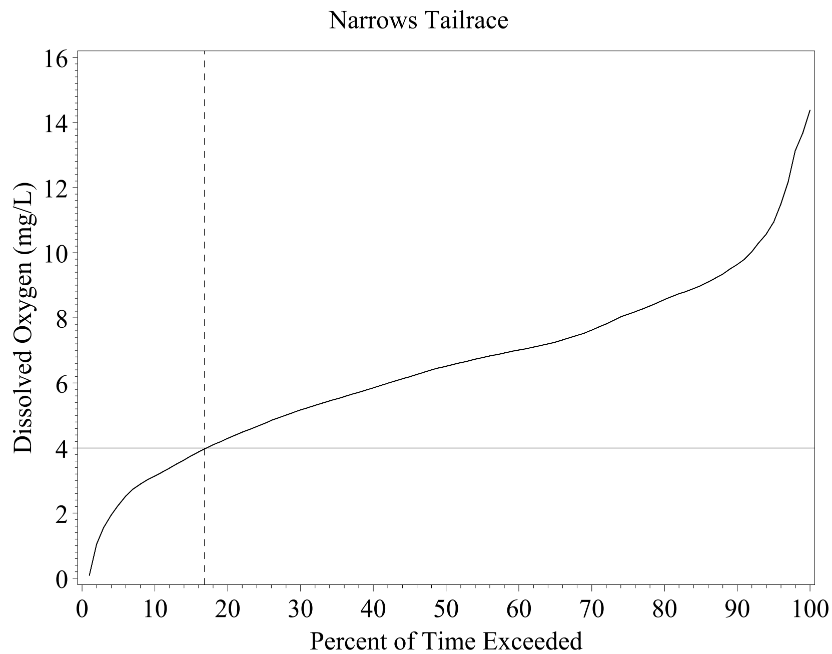
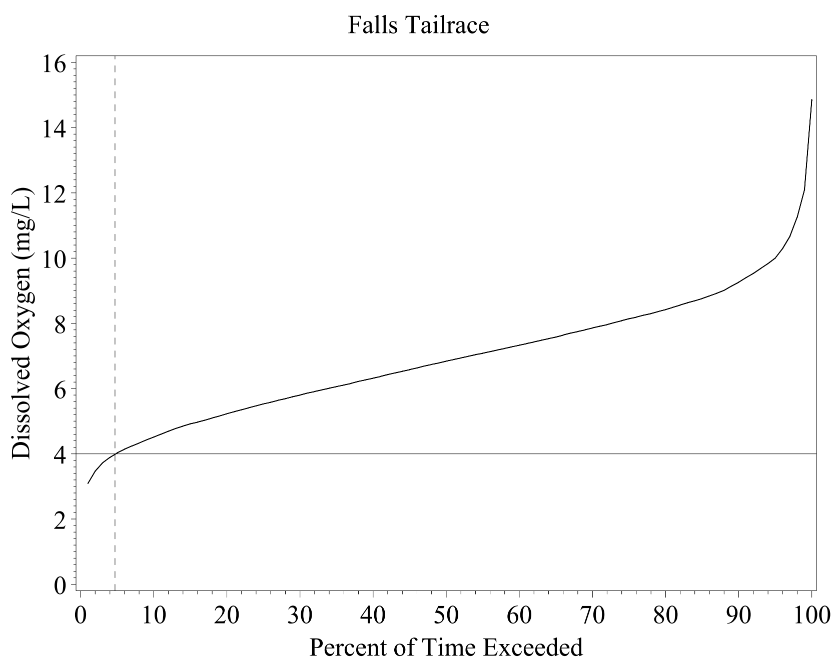


Figure E-5d: Dissolved Oxygen Duration Plot for Falls Tailrace
May - November 2000-2005



As part of the Water Quality Monitoring Study, APGI conducted a more detailed examination of dissolved oxygen conditions in the Project tailwaters. Operational testing was performed in 2004 to further examine the effect of Narrows Unit 4 air injection on tailwater dissolved oxygen. The primary focus of this investigation was the potential for the Narrows Unit 4 air injection valves (2) to increase dissolved oxygen in the flow passing through the unit during generation.

The 2004 test of the effect of the two aeration valves on Unit 4 generally confirmed earlier results in 2001 that with both valves operating and just Unit 4 operating, about 2 mg/l of dissolved oxygen was added to the tailwaters. The test also led to the conclusion that operation of Unit 4 and a combination of Units 1, 2 and 3 operating at either best efficiency or at 30 percent gate will not maintain the Narrows tailwater at or above state water quality standards; however, similar air valves on all four Narrows units would likely maintain tailwater dissolved oxygen at or above 5 mg/l when the units are running. The tests also demonstrated that increases in Narrows tailwater dissolved oxygen levels were generally translated to similar increases in DO concentrations below Falls Dam.

Effects of Project Operations on Water Quality

APGI's Water Quality Monitoring Study also examined whether flow through the Project's developments affected reservoir or tailwater water quality. Results of the analysis demonstrated that throughout the Yadkin Project system, higher flows were associated with lower concentrations of alkalinity, pH, algal biomass (chlorophyll *a*), total dissolved solids, BOD, and total organic carbon, all parameters that are influenced to some extent by biological processes. Greater flow reduced retention time in the reservoirs, allowing less time for microbial and phytoplankton populations to develop. The relationships between flow and BOD, chlorophyll *a*, and total organic carbon were found to be strongest in the lower mainstem and arms of High Rock Reservoir and in Tuckertown Reservoir. Strong relationships between alkalinity, pH and flow were found to exist in all locations. Algae were found to often reach high concentrations during low flow periods throughout the system, but represented a larger percentage of total suspended solids lower in the system. Nitrogen concentrations were found to be poorly correlated with flow. Nitrate concentrations tended to increase with greater flows, probably a result of reduced time for microbial populations to exploit the nutrient. Also, nitrate concentrations were lowest during the summer, when flows tend to be lower. Not surprisingly, greater turbidity was found to be associated with higher flows, especially downstream of High Rock Dam, and temperature was slightly cooler during high flow periods (NAI, 2005h Appendix E-1).

APGI's study also evaluated the effect of the reservoir water level on surface water quality in each respective reservoir using the monthly surface water quality data collected from 1999 through 2003 and reservoir water level data (NAI, 2005h Appendix E-1). Under existing operations, during periods of extreme drought, High Rock and Narrows reservoirs can experience substantial drawdown in the summer, as occurred in 2002; whereas, Tuckertown and Falls reservoirs maintain relatively stable pools most of the time.

Surface water quality in the reservoirs was found to be poorly correlated, if at all, with reservoir water level. Significant correlations were absent in Falls Reservoir and rare in Tuckertown, the two reservoirs where water levels remain constant. In general, where correlations were observed they were negative, indicating that as reservoir water levels drop concentrations of the water quality parameter tend to increase, an effect that may also be caused by seasonal changes in reservoir water quality and reservoir water levels (NAI, 2005h Appendix E-1).

In High Rock Reservoir, which experiences the greatest changes in reservoir water levels, the strongest correlations to water levels were seen in total dissolved solids and total phosphorus concentrations, which were both negatively correlated with reservoir water levels.

The correlation of water quality of the tailraces with the reservoir level of the upstream reservoir was also found to be poor. In High Rock Reservoir, low reservoir levels were associated with greater levels of biological oxygen demand, chlorophyll *a* and total dissolved solids, parameters that reached high concentrations during the extreme low reservoir levels during the drought of 2002. In the Narrows tailrace, some parameters were correlated with the level of Narrows Reservoir. The strongest correlations at Narrows occurred between reservoir water level and tailwater temperature, dissolved oxygen and nitrate, which are all highly seasonal parameters. Since lower reservoir levels at Narrows typically occur in the summer and fall, tailwater temperatures would be expected to be greater during periods of low reservoir level. Conversely, both dissolved oxygen and nitrate were seasonally at low levels in summer and were found to be positively correlated with reservoir water level (NAI, 2005h Appendix E-1).

Correlation coefficients in Tuckertown and Falls Reservoirs were all low indicating no effects of reservoir water level on the water quality of the downstream tailrace. Since, during normal operations, neither Falls or Tuckertown experience much change in water levels, this is as expected.

E.2.3.1.2 Sediment Study

As part of the relicensing study process, APGI conducted a literature-based review of sediment fate and transport at the Yadkin Project (NAI, 2005e Appendix E-2). In general, the study used publicly available information and literature on sediment fate and transport in the Yadkin-Pee Dee River basin. The study involved two separate components; 1) a literature search performed by Normandeau Associates Inc. (NAI) to identify the body of research completed in this area, and 2) a review of historic survey data used to evaluate patterns of sediment deposition that have occurred in High Rock Reservoir since High Rock Dam was constructed.

The Sediment Fate and Transport Study reviewed over a dozen articles and technical papers that have examined the issue of sediment and sedimentation in parts of the Yadkin-Pee Dee River Basin. As discussed in the reports and articles reviewed, the input of sediment, its transport, and its storage are dependent upon both natural conditions such as regional geology, hydrology and soils, along with man's alteration of the landscape by development. The input, output and storage of sediment within parts of the Yadkin-Pee Dee River basin has been shown to vary both spatially and temporally in response to changes in both naturally occurring and imposed conditions. Understanding the relationship between naturally occurring conditions and the potential impacts associated with any imposed changes (naturally or by man's actions) in the basin is essential for putting the sediment issue into context.

The literature reviewed identified that the major inputs of sediment to the Yadkin-Pee Dee River include soil erosion, streambank and channel erosion, and urban runoff. The reviewed literature indicated that the main source of sediment in the Yadkin-Pee Dee River is soil erosion. The rates of soil erosion in the Yadkin-Pee Dee River basin vary in response to the type of soil material and land use. In general, the soils found in the Piedmont physiographic province are typically fine grained (silt) and can be readily eroded when exposed to wind and water. Other natural factors contributing to the erosion of these soils include the humid climate and topographic relief found within the Piedmont physiographic province. Although many other rivers in North Carolina also have serious sedimentation problems, the Yadkin River's combination of these factors together with land use patterns in the watershed, results in some of the highest erosion rates and sediment yields in North Carolina. The majority of the authors of the publications reviewed as part of the study concluded that the decline in agricultural land use for crop production since the eighteenth and early nineteenth centuries has resulted in a substantial decline in soil erosion and sediment input to the Yadkin-Pee Dee River. They also note that for those lands remaining in agricultural use soil erosion can be further reduced by implementing agricultural best management practices (BMPs).

Several of the authors also noted that increasing development and urbanization may have caused a recent increase in sediment input to the Yadkin-Pee Dee River and may in the long-term exceed the reductions associated with decreased cropland. Research has shown that development can result in increased runoff, higher soil erosion and sediment transport. Utilization of urban BMPs may reduce some of these impacts, but the benefits associated with implementation of urban BMPs may not be measurable for some time due to the time lag between land use changes and the basin's response. Recognizing this trend in its Basinwide Water Quality Plan for the Yadkin-Pee Dee River (NCDENR, 2003), the NCDENR has emphasized the need for the continued implementation of appropriate urban BMPs to reduce this growing source of sediment.

Overall, the findings of the reviewed research indicate that sediment transport in the Yadkin-Pee Dee River has decreased over the last several decades. The principal reason for this trend is the decline in the land area used for crop production and possibly the implementation of BMPs to reduce soil erosion and stormwater runoff. Although this trend appears to be continuing, several of the streams and rivers within the Yadkin-Pee Dee River basin have been impaired by high sediment and turbidity levels (NCDENR, 2003). Furthermore, several of the authors warn that the production of sediment associated with land development may ultimately cause sediment transport in the Yadkin-Pee Dee River to increase. If this occurs, any gains made in reducing sediment transport in the last decade could be reduced along with the continued impairment of the basin's waters.

The study also concluded that storage of sediment in the basin naturally occurs within its streams and rivers and on their associated floodplains. The construction of dams and the operation of their associated reservoirs on the Yadkin-Pee Dee River have had an impact on the transport of sediment through the lower portion of the basin. The impoundment of water by High Rock, Tuckertown, Narrows, Falls, Tillery and Blewett Falls dams and the resulting reduction in water velocity at each reservoir have reduced the capacity of the Yadkin-Pee Dee River to transport sediment, thereby leading to deposition in the six impoundments.

The amount of sediment deposited in the reservoirs depends upon the amount of sediment supplied and the storage or residence time of the water in the impoundment. Several of the studies reviewed estimated the amount of sediment accumulated in the impoundments. The U.S. Department of Agriculture (USDA) (1979) estimated annual sediment accumulation in the Yadkin Project reservoirs ranging from 1,354,500 tons/year (903 ac. ft/yr) for High Rock Reservoir to 21,000 tons/year (14 ac. ft/yr) for Falls Reservoir, while the estimated annual loss in total storage capacity ranged from 0.36 percent in High Rock Reservoir to 0.05 percent in Narrows Reservoir (Table E.2-6) (cited in NAI, 2005e Appendix E-2).

Table E.2-6: Estimated Annual Sediment Accumulation and Annual Capacity Loss for Yadkin Project Reservoirs

Reservoir	Annual Sediment Accumulation (ac. ft.)	Annual Capacity Loss (%)
High Rock	903	0.36
Tuckertown	86	0.20
Narrows	131	0.05
Falls	14	0.23

The lower capacity loss for Narrows and Falls reservoirs is due to the reduction in sediment transport by the accumulation in High Rock Reservoir. The analysis of the survey data available for High Rock Reservoir reveals that sedimentation has occurred since the construction of the dam in 1927. The bathymetry of the reservoir shows that sediment has accumulated in the upstream areas of the reservoir from Crane Creek upstream to the confluence of the Yadkin and South Yadkin rivers. The effect of 80 years of sediment accumulation has been quantified as a reduction of approximately six percent of the total usable storage capacity in the upper 12 ft of the reservoir (NAI, 2005e Appendix E-2).

The Sediment Study conducted by APGI also attempted to examine the effect of Project operations on the rate of deposition and the distribution of sediment that settles in High Rock Reservoir. This issue was raised during consultation by the City of Salisbury, which was concerned that operation of High Rock Reservoir was causing sediment to settle in the vicinity of their water intake facilities and adding to the cost of operating and maintaining those facilities. Although the study plan was not originally designed to look at sedimentation patterns or the potential effects of High Rock operations on sedimentation rates, after receiving comments on the draft study report, APGI made an effort to examine both of these issues and to include this additional information in the final study report (NAI, 2005e Appendix E-2).

Regarding sediment deposition rates, APGI was asked to estimate the amount of sediment that would be transported downstream during spill events, rather than deposited in High Rock Reservoir, if High Rock were operated in a run-of-river mode. To do this, several assumptions had to be made. First, total suspended solids concentrations were used as an estimate of the amount of sediment that would be suspended in the water spilled at High Rock Dam. Second, it was assumed that the concentration of total suspended solids (TSS) in every high inflow event that created a spill event a High Rock Dam was similar and ranged between 17 mg/l and 189 mg/l (NAI, 2005e Appendix E-2).

The volume of water spilled under both existing Project operations and run-of-river operations was estimated using the OASIS project simulation model. Under existing operations, approximately 13,700 tons/yr to 152,000 tons/yr of sediment would be passed downstream during spill events, based on the assumed range of sediment concentration. If High Rock were operated in a run-of-river mode, approximately 16,900 tons/yr to 188,000 tons/yr of sediment would be passed downstream during spill events. Thus, it is estimated that between 3,200 tons/yr to 36,000 tons/yr less sediment would be deposited in High Rock Reservoir under run-of-river operations. Over the course of a 40-year license term, this would equate to a total reduction in sediment deposition volume of between 85 acre-ft and 944 acre-ft.

Sedimentation patterns in High Rock Reservoir were evaluated by comparing 1917 and 1997 topographic surveys (NAI, 2005e Appendix E-2). When compared, these maps, combined with bathymetry data available for 1997 reveal a general pattern of sediment deposition during that period (see Figures 4-1 through 4-6 of Appendix E-2). Some of the specific observations made in the report from these maps include:

- From Abbotts Creek to Crane Creek, the area of the reservoir with water depths greater than 10 ft remained similar between 1917 and 1997.

- From Swearing Creek to just downstream of the I-85 Bridge, the area of the reservoir with water depths greater than 10 ft was less in 1917 than in 1997, indicating that water depths in this area have increased. In addition, sedimentation in the bend of the mainstream, upstream of Swearing Creek has shifted the deepest portion of the reservoir to the western shoreline.
- From just downstream of the I-85 Bridge to the South Yadkin River confluence, reservoir depths have remained greater than 10 ft in the center of the stream channel and less than 10 ft in the remaining stream channel. The deepest portion of the river has narrowed.

In addition to APGI's efforts to use existing information to try to address the issues raised by the City of Salisbury regarding sediment, the City conducted its own study to examine the issues of sedimentation and flooding at the upper end of High Rock Reservoir. Salisbury submitted its Technical Report to APGI as part of its comments on the Draft License Application (included in Appendix E-25) and requested that APGI consider this additional information in the Final License Application.

APGI has reviewed that additional study work performed by the City of Salisbury regarding sedimentation in the vicinity of the water intake and the pumping station. The concentration of sediment in the river at this location is controlled by upstream sources so the sediment in the water withdrawn is not caused by High Rock Reservoir or its operation. Natural river sections also meander and have sediment deposition occurring as a natural phenomenon in heavily sediment laden rivers. This is discussed further in Appendix E-3.

E.2.3.2 Applicable Water Quality Standards and Stream Segment Classifications

Water quality in North Carolina is regulated by the NCDWQ under the North Carolina Administrative Code Subchapter 2B (15A NAC 02B.0100, .0200, and .0300). All surface waters are assigned classifications that determine protected uses and set standards for water quality constituents to support the designated uses. The water bodies that collectively make up the Yadkin Project are reserved as water supplies and as such have been designated Water Supply (WS) classifications.

More specifically, the upper portion of High Rock Reservoir[7] is classified WS-V while the lower portion to a point 0.6 miles upstream of High Rock Dam is classified as WS-IV and B (NCDENR, BIMS website). The Yadkin River from a point 0.7 miles upstream of the mouth of the South Yadkin River to the mouth of the South Yadkin River at Salisbury's water supply intake is classified as WS-IV Critical Area. The area immediately above High Rock Dam (from a point 0.6 miles upstream of the dam), Tuckertown Reservoir, Narrows Reservoir, and the area immediately surrounding Falls Dam (from a point 0.5 mile upstream of Falls Dam to the Uwharrie River) are classified as WS-IV Critical Area and B; while Falls Reservoir to a point 0.5 mile upstream of Falls Dam is classified as WS-IV and B. The Abbotts Creek (below Davidson County SR 2294) and Second Creek (from a point 1.7 miles downstream of Rowan County SR 1004) arms of High Rock Reservoir are WS-IV and B waters; while Abbotts Creek from Davidson County SR 2294 to the source at I-85 is classified as WS-V and B.

Waters within the Project boundary classified as Class C waters include the very lower portion of Grants Creek at the confluence with the Yadkin River (upper portion of High Rock Reservoir). The lower portions of many of the tributaries to the Project reservoirs are classified as WS IV Critical Area, including Lick Creek (from a point 0.1 miles upstream of Davidson County SR2 2501 to Tuckertown Reservoir), Cabin Creek (from a point 0.1 miles downstream of Davidson County SR 2536 to Tuckertown Reservoir), and the lower portions of Garr Creek, Reynolds Creek, Gladys Fork, Reeves Spring Branch, Flat Creek, Cedar Creek and Riles Creek. Many of the tributaries feeding into the Project waters are Class C waters, including Buddle Branch, Crane Creek, North Potts Creek, South Potts Creek Second Creek, Church Creek, and Flat Swamp Creek.

Class B waters are used for primary recreation and uses suitable for Class C waters, including secondary recreation, fishing, aquatic life propagation and survival, and wildlife (North Carolina Administrative Code, 2004). Primary recreational activities include swimming, diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis; whereas, secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development or types of discharges in Class B or C waters. The North Carolina General Assembly enacted a state law in 1989, the Water Supply Watershed Classification and Protection Act, mandating minimum statewide water protection requirements for all surface water supplies used for raw drinking water (North Carolina General Statute 143-214.5).

Class WS-IV waters are protected as water supplies that are generally in moderately to highly developed watersheds (North Carolina Administrative Code, 2004). Uses associated with the

[7] The upper portion of High Rock Reservoir is designated as from the mouth of the South Yadkin River to a line across the reservoir from the downstream side of the mouth of Crane Creek to the downstream side of the mouth of Swearing Creek.

WS-IV classification include source of water supply for drinking, culinary, or food processing purposes for those users where a more protective WS-I, WS-II, or WS-III classification is not feasible. Point source discharges of treated wastewater are permitted pursuant to specific rules and local programs to control nonpoint sources and stormwater discharges of pollution are required.

Minimum land use regulations have been established for areas within WS-IV waters. More stringent regulations have been established for the critical area which is within 0.5 miles upstream and draining to a water supply intake or within 0.5 miles and draining to the normal pool elevation of water supply reservoirs. Land use regulations affect discharge into the water source, land uses, development densities, and landfills. The state's minimum requirements for WS-IV drainage basins are summarized as follows:

1. Lands within 5 miles of the full pool elevations of reservoirs are classified as WS-IV.
2. Critical areas include the following restrictions:
    a. Under the low density option, a 30-foot vegetative buffer is required from the banks of all perennial streams or other waters.
    b. In areas where new development exceeds the low density requirements, a 100-foot buffer is required.
    c. A maximum density of one dwelling unit per one-half acre and 24 percent built-upon area is permitted.
    d. No new landfills are allowed.
3. In the remainder of the WS-IV drainage basin:
    a. In areas where curbs and gutters are used, a maximum density of one dwelling unit per one-half acre and 24 percent built-upon area is permitted.
    b. In areas without a curb and gutter street system a maximum density of one dwelling unit per one-third acre and 36 percent built-upon area is permitted.
4. The density requirements in the WS-IV drainage basin apply only to developments requiring a Sediment Control Plan (i.e., one or more acres of land disturbing activity).

Local governments are required to adopt and administer water supply protection requirements, drainage basin management procedures, and density and built-upon area regulations using the minimum requirements established by the state described above. Four of the five counties surrounding the Yadkin Project reservoirs (Davie, Montgomery, Rowan, and Stanly) have adopted drainage basin protection ordinances that accept the state-recommended requirements for WS-IV and Critical Areas, as outlined above. The fifth county, Davidson, has adopted a more stringent drainage basin protection ordinance for WS-IV areas that requires a minimum vegetative buffer width of 50 ft along the banks of all perennial streams or other waters for low density development.

The WS-V zones in the Abbotts Creek Arm and upper portion of High Rock Reservoir are so designated because they are upstream of and draining to Class WS-IV waters. Class WS-V waters have no categorical restrictions on watershed development or wastewater discharges but management requirements may be applied as deemed necessary for the protection of downstream Class WS-IV waters.

The appropriate water quality standards applicable to Class C waters also apply to Class B, WS-IV, and WS-V waters. A partial list of the numeric water quality standards that apply to these classifications is presented in Table E.2-7.

Table E.2-7: Partial List of North Carolina Water Quality Standards that Apply to the Yadkin Project Reservoirs

Parameter	Class C Waters	Class B Waters	Water Supply (WS) Waters
Chlorophyll *a*	≤40 µg/l	≤40 µg/l	≤40 µg/l
Dissolved Oxygen	>5.0 mg/l daily average >4.0 mg/l instantaneous	>5.0 mg/l daily average >4.0 mg/l instantaneous	>5.0 mg/l daily average >4.0 mg/l instantaneous
pH	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
Temperature	≤32ºC and ≤ 2.8ºC above natural temperature	≤32ºC and ≤ 2.8ºC above natural temperature	≤32ºC and ≤ 2.8ºC above natural temperature
Turbidity	≤25 NTU	≤25 NTU	≤25 NTU
Cadmium	≤2.0 µg/l	≤2.0 µg/l	≤2.0 µg/l
Cyanide	≤5.0 µg/l	≤5.0 µg/l	≤5.0 µg/l
Lead	≤25 µg/l	≤25 µg/l	≤25 µg/l
Mercury	≤0.012 µg/l	≤0.012 µg/l	≤0.012 µg/l
Copper	7 µg/l Action Level	7 µg/l Action Level	7 µg/l Action Level
Total Dissolved Solids			≤500 mg/l
Nitrate Nitrogen			≤10.0 mg/l
Fecal Coliform	Geometric mean ≤200/100ml (membrane filtration) based on at least five consecutive samples examined during any 30 day period or ≤400/100ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution	Geometric mean ≤200/100 ml (membrane filtration) based on at least five consecutive samples examined during any 30-day period or ≤400/100 ml in more than 20 percent of the samples examined during such period	Geometric mean ≤200/100ml (membrane filtration) based on at least five consecutive samples examined during any 30 day period or ≤400/100ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution

E.2.3.2.1 TMDL Process and Water Quality Data Review for High Rock Reservoir

Section 303(d) of the federal Clean Water Act (CWA) enacted in 1972 requires states, territories and authorized tribes to identify waters not in compliance with water quality standards and develop a list of impaired waters. NCDENR has listed portions of High Rock Reservoir on its 303(d) List of impaired waters in the state of North Carolina. High Rock Reservoir appears on the 2006 North Carolina draft 303(d) List[8] for turbidity and chlorophyll *a* violations in the upper reservoir; turbidity in the lower reservoir; turbidity violations in the Abbotts Creek Arm; and impaired biological integrity in the Swearing Creek Arm (see Exhibit E.2.3.1).

As required under Section 303(d), NCDENR is required to develop TMDLs for the pollutants causing impairment in those waterbodies on the 303(d) List (NCDENR, 2006). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources. NCDENR has initiated a TMDL process for turbidity and chlorophyll *a* to address High Rock Reservoir, but the completion of the process by NCDENR for High Rock Reservoir is not anticipated until around 2012. APGI expects to be an active participant in the High Rock TMDL process.

As a first step in the TMDL process, NCDENR's contractor (Tetra Tech) reviewed existing water quality data. Tetra Tech's review of the data found water quality conditions consistent with APGI's monitoring study. In general, the Tetra Tech review found nutrient enrichment in High Rock Reservoir, with elevated chlorophyll *a* in the arms and elevated turbidity in the upper portion of the reservoir. Tetra Tech's review concluded that the source of water quality problems in High Rock Reservoir is upstream loadings of solids and nutrients, and the resulting growth of algae in the reservoir. The review further suggested that the algal response in High Rock Reservoir is controlled primarily by light availability and flushing, with a diminished response to nutrients (Tetra Tech, 2004).

E.2.4 Minimum Flow Releases

In the current FERC license, there are no license articles that require a minimum flow at the Yadkin Project. However, there is a FERC-approved headwater benefits agreement between APGI and Progress Energy under which APGI provides a weekly average minimum flow from the Project of 1,500 cubic feet per second (cfs) March 1 through May 15, 1,610 cfs May 15 through July 1, and 1,400 cfs July 1 through September 15.

As outlined in Exhibit B.6.1, APGI is proposing to operate the Yadkin Project with a year round, weekly average minimum flow of 900 cfs from the Falls Development. As discussed previously in Exhibit B, under this minimum flow proposal, the releases from Falls, when combined with the accretions and net evaporative losses at Tillery and Blewett, would provide water to support an average daily flow at the Rockingham gage of greater than or equal to 1,500 cfs more than 85 percent of the time and greater than or equal to1,200 cfs more than 87 percent of the time.

[8] These same waters were included on NCDENR's 2004 303(d) List.

E.2.4.1 Rate of Flow in cfs and Duration

APGI used the OASIS project simulation model to simulate the change in flow and flow duration that would be expected to result from its proposed operation of the Project, with a 900 cfs weekly average minimum flow requirement at Falls. This simulation assumed that the reservoirs would be operated in accordance with the revised guide curve for High Rock also being proposed by APGI and without the flows required under the existing headwater benefits agreement. The simulated daily discharge from Falls for the period 1930-2003 is shown in annual and monthly flow duration curves provided in Figures E-6a – E-6m. The simulated flow duration curves for the proposed operation of the Yadkin Project (Proposed Operations) are shown in comparison to the operation of the Project under the existing reservoir operating guides and without the flows required under the current headwater benefits agreement (Existing Operations).

As shown, implementation of APGI's proposed minimum flow, in combination with the proposed operating guides for the four Project reservoirs (see Exhibit B) will produce little change in the average daily flow duration curve at Falls. Under APGI's proposal, weekly average flows during the summer will often exceed inflow to the Project, resulting in a higher downstream river flow than would be expected under current Project operations, in the absence of the headwater benefit agreement flows.

Figure E-6a

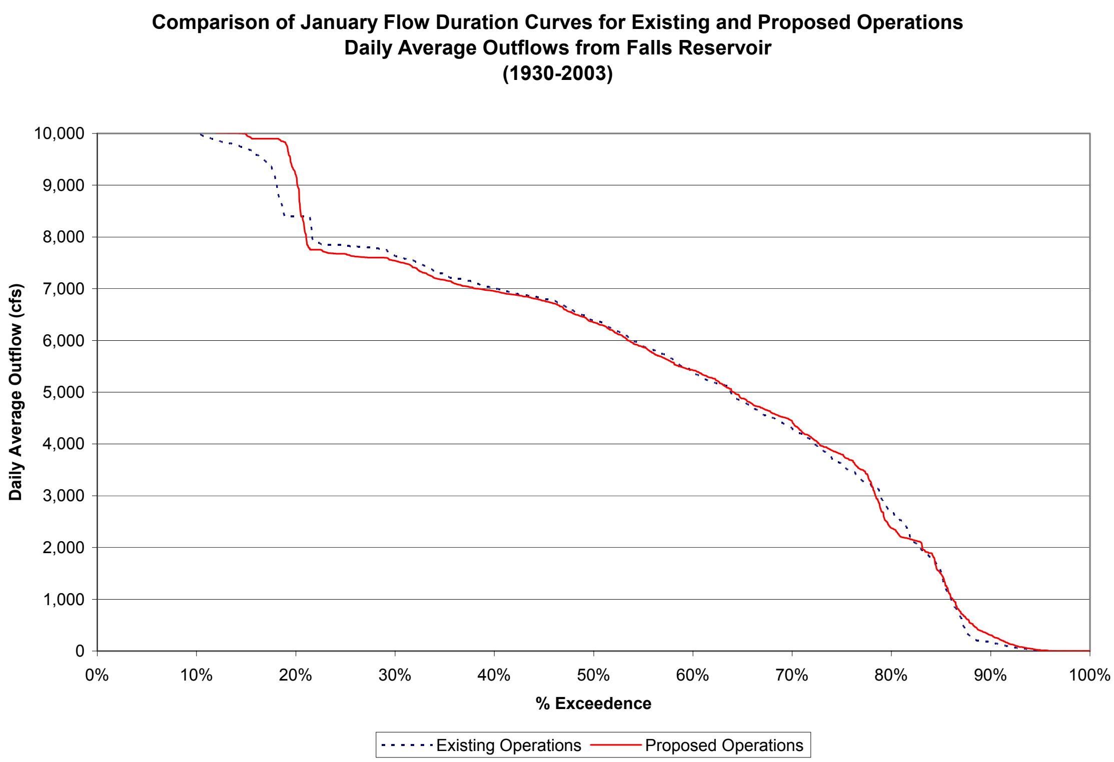


Figure E-6b

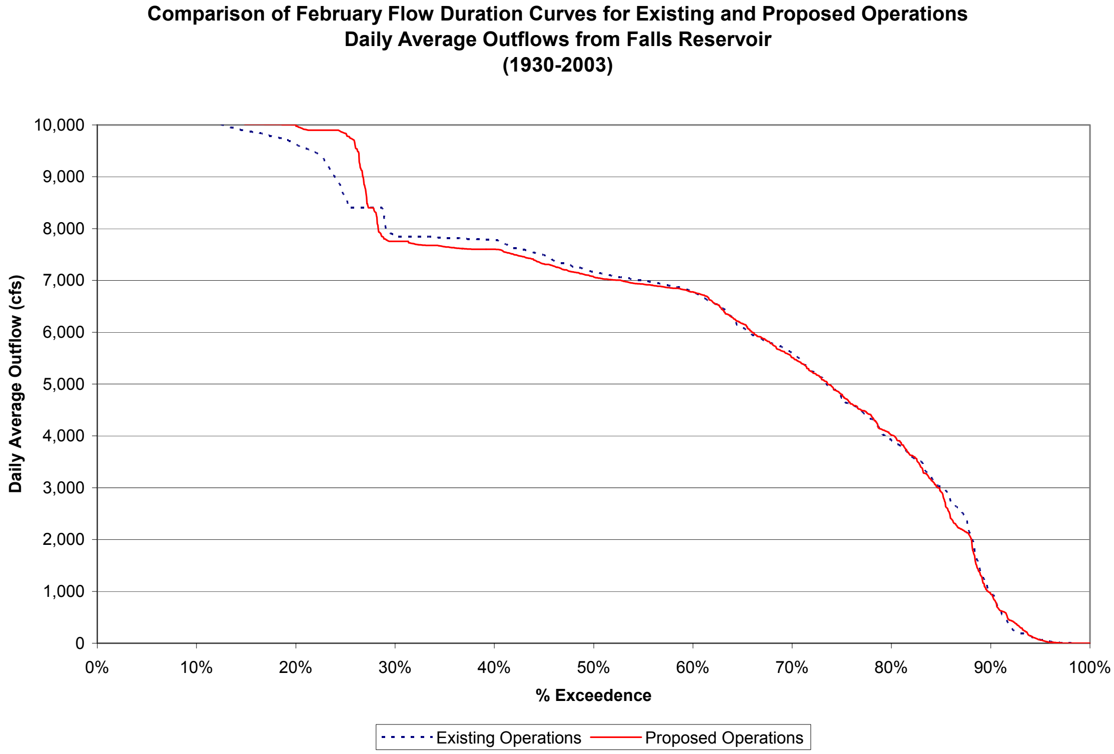


Figure E-6c

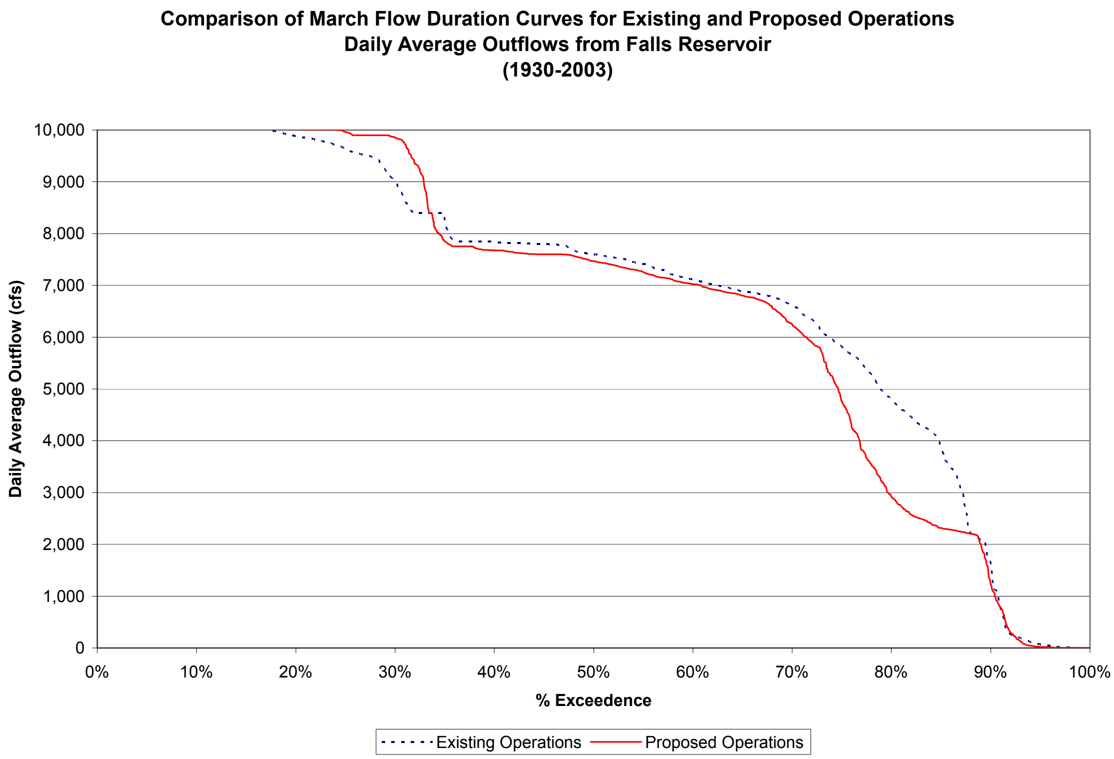


Figure E-6d

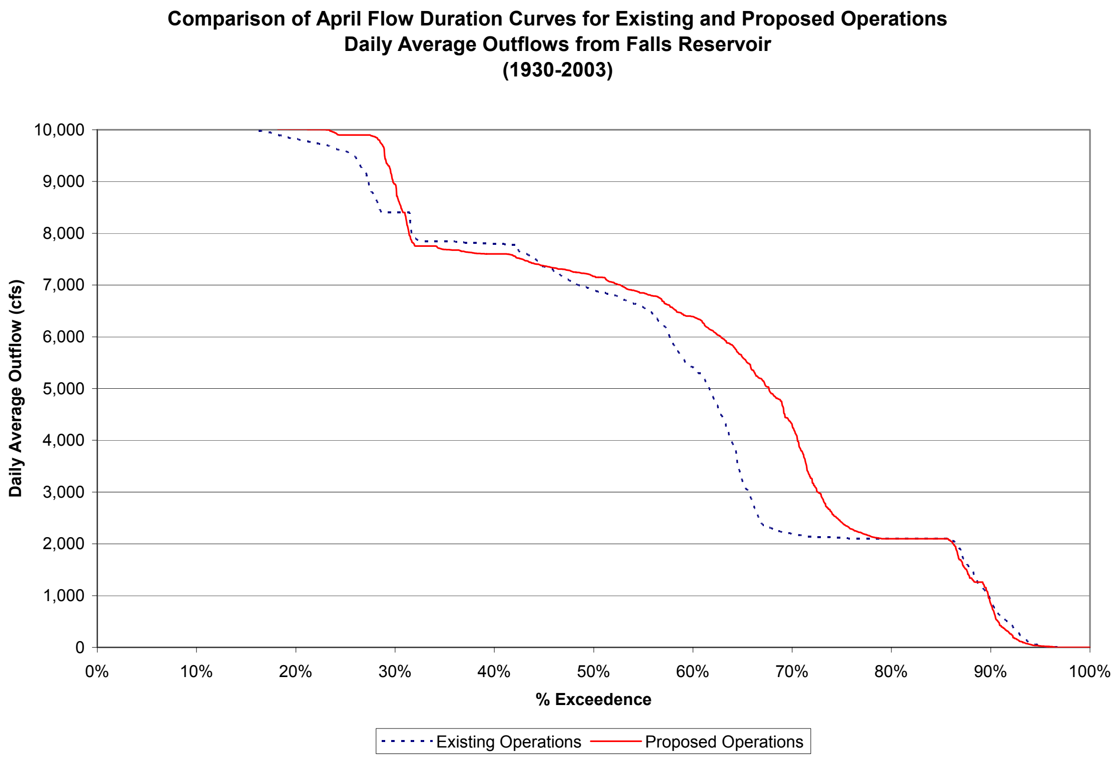


Figure E-6e

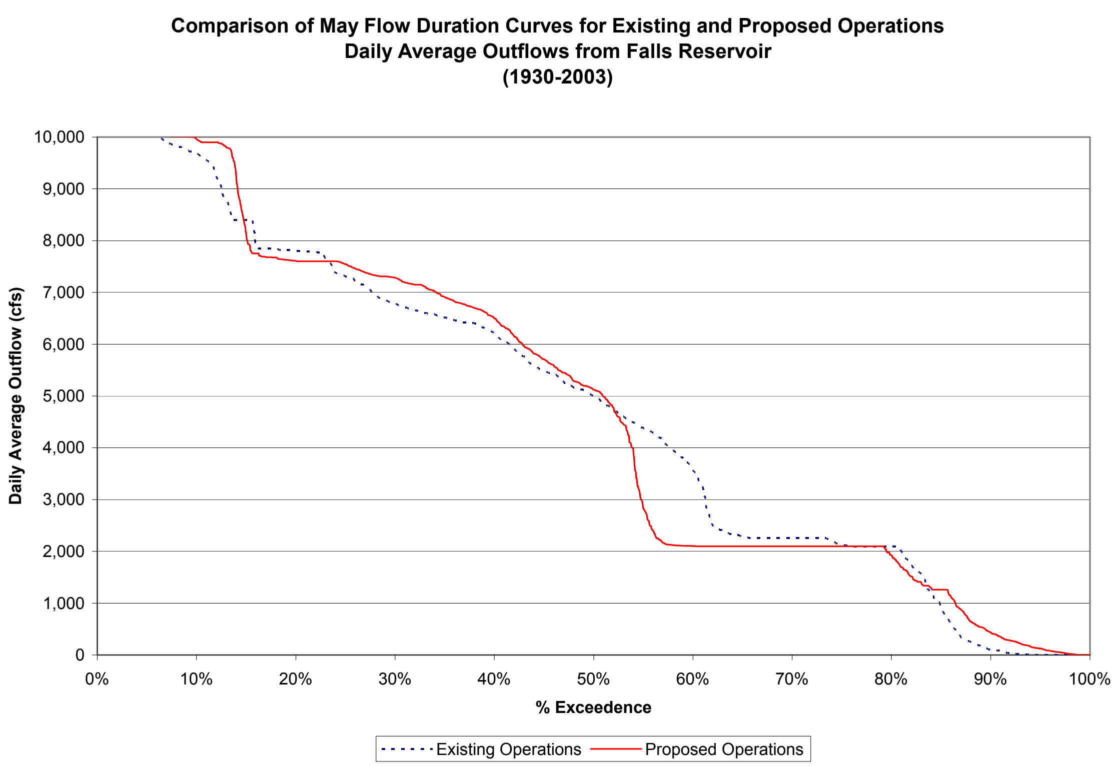


Figure E-6f

Comparison of June Flow Duration Curves for Existing and Proposed Operations
Daily Average Outflows from Falls Reservoir
(1930-2003)

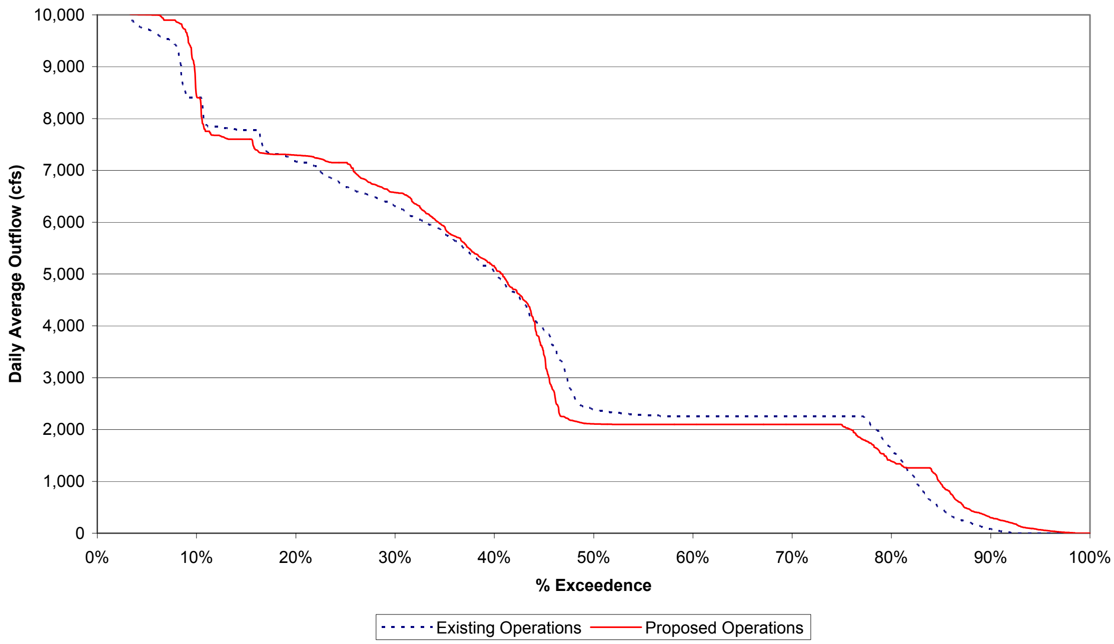


Figure E-6g

Comparison of July Flow Duration Curves for Existing and Proposed Operations
Daily Average Outflows from Falls Reservoir
(1930-2003)

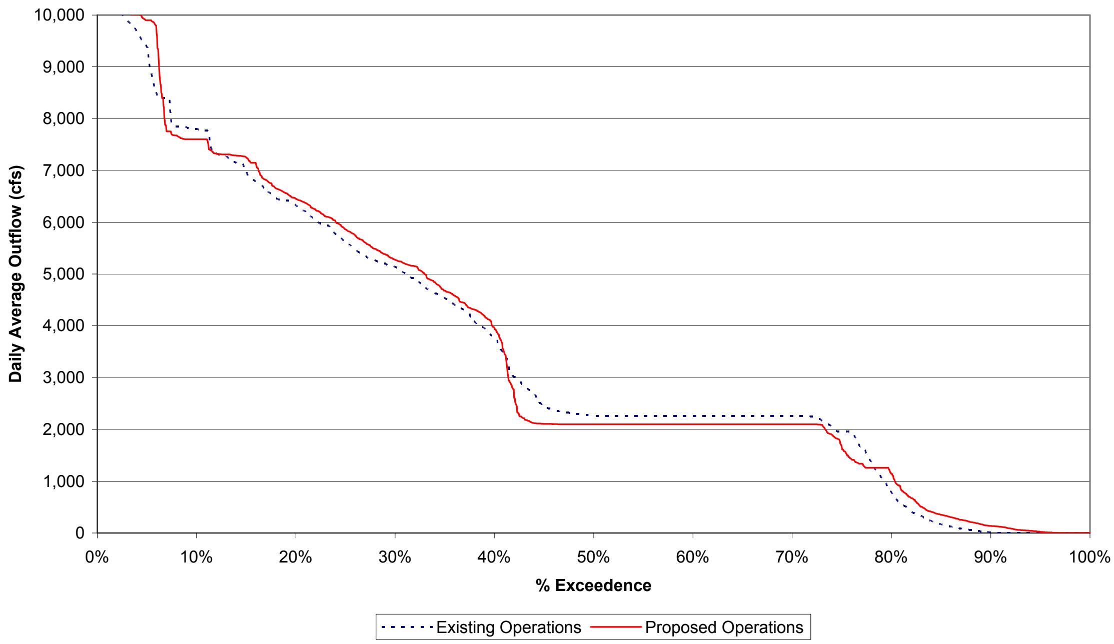


Figure E-6h

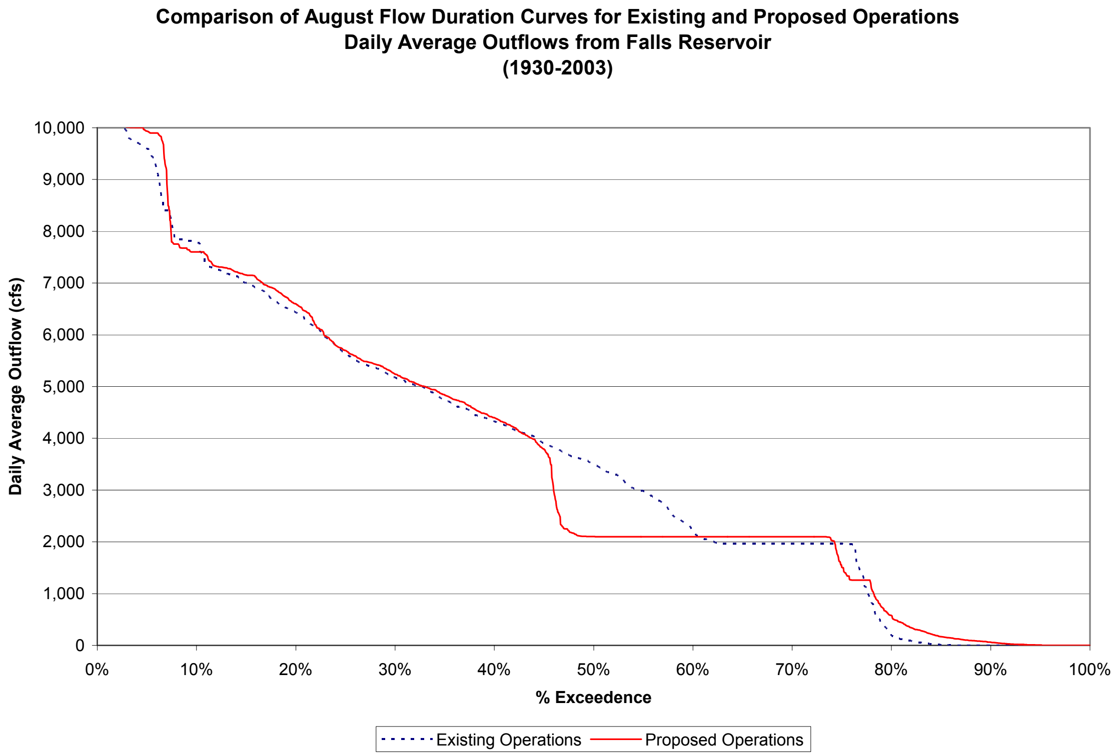


Figure E-6i

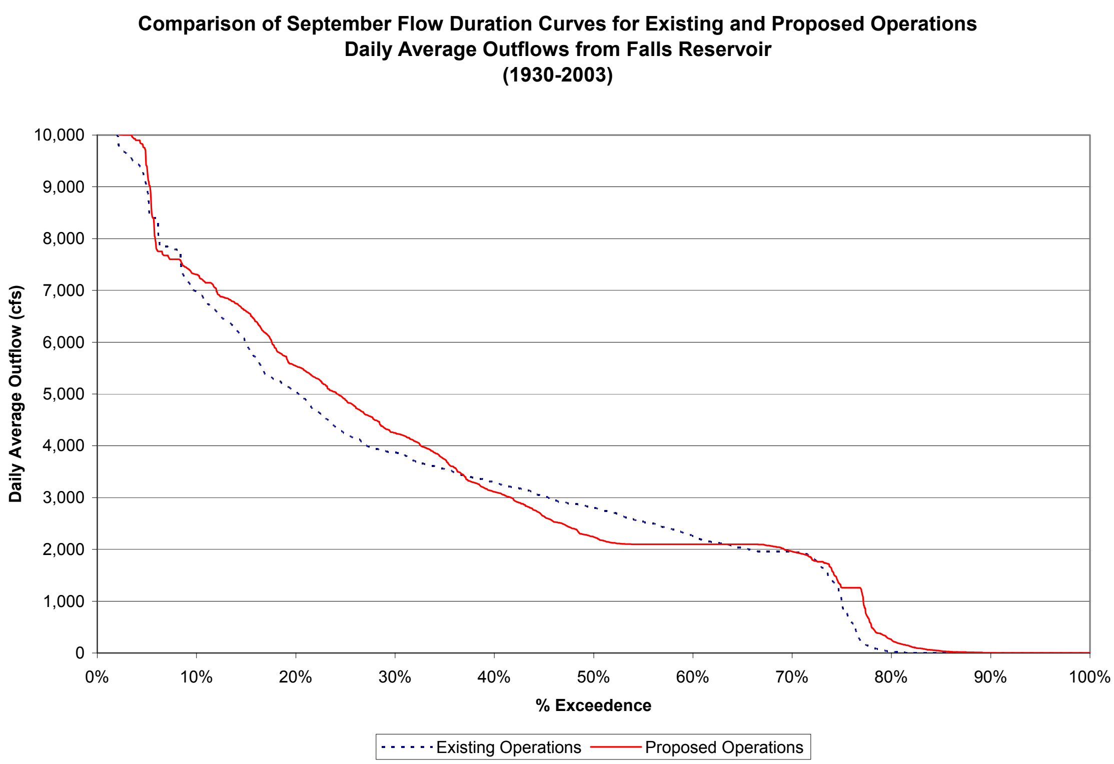


Figure E-6j

Comparison of October Flow Duration Curves for Existing and Proposed Operations
Daily Average Outflows from Falls Reservoir
(1930-2003)

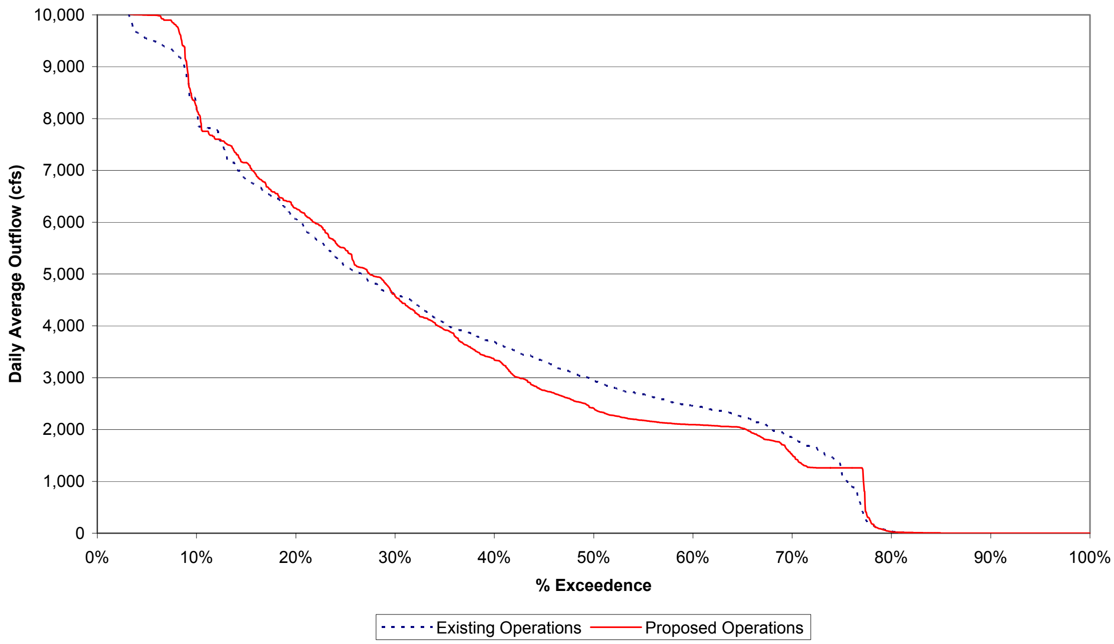


Figure E-6k

Comparison of November Flow Duration Curves for Existing and Proposed Operations
Daily Average Outflows from Falls Reservoir
(1930-2003)

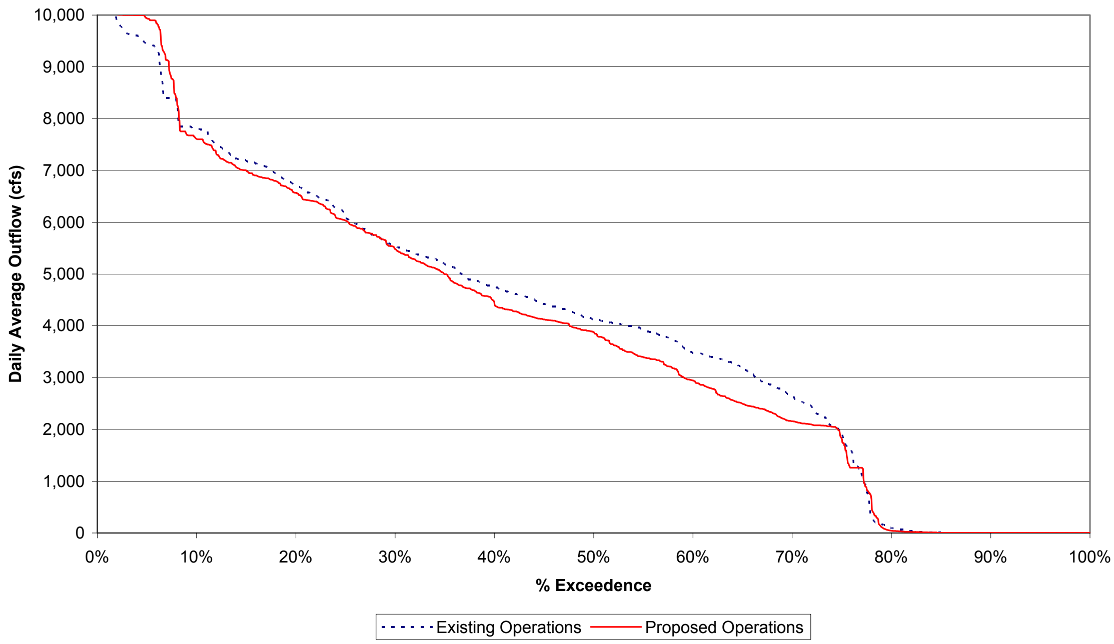


Figure E-6l

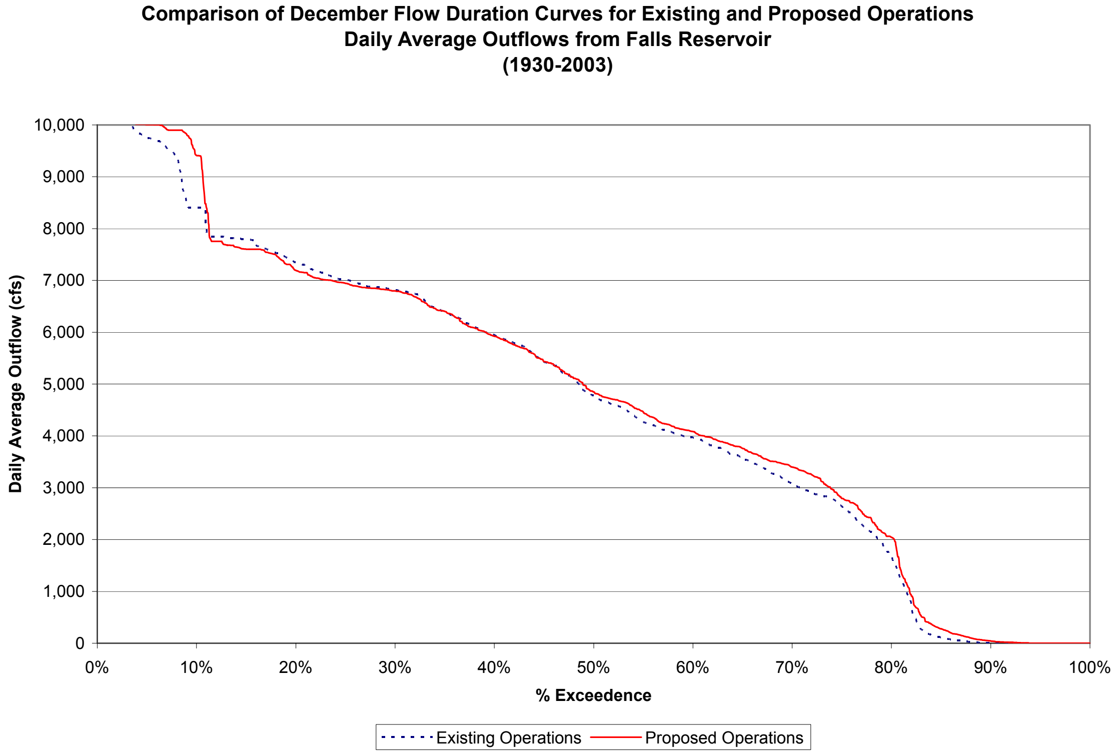
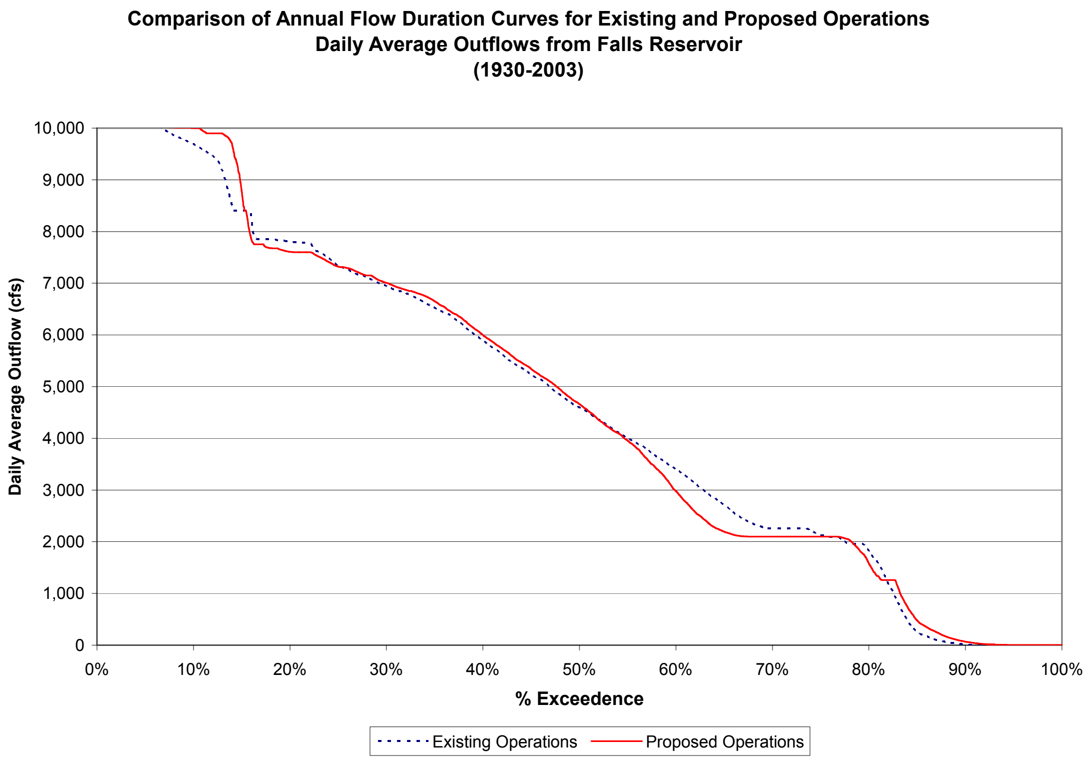


Figure E-6m



E.2.5 Changes in Project Operation or Works Recommended by the Agencies to Protect or Improve Water Quality

During initial consultation, several agencies and organizations provided comments concerning Project water quality and the effects of Project operations on water quality. At that time there were no specific recommendations made regarding Project operations or works to protect or improve water quality. However, there were several recommendations for water quality studies to be conducted by APGI. In response to those requests, APGI conducted two studies designed to address water quality issues:

1. Yadkin Project Water Quality Monitoring Study - Appendix E-1

2. Sediment Fate and Transport Study - Appendix E-2

The resulting final study reports for both of these studies are provided in Appendices E-1 and E-2, respectively, and were summarized earlier in this section.

Prior to the issuance of the Draft License Application (DLA), there were no formal recommendations from agencies regarding measures to be taken to address water quality at the Project. However, the NCDWQ has noted its concern with two aspects of Project water quality: 1) the non-compliance of High Rock Reservoir with water quality standards for turbidity and chlorophyll *a* (and its subsequent listing of portions of the reservoir under Section 303(d)), and 2) below standards dissolved oxygen concentrations that occur frequently in each of the four Project tailraces during periods of warm water temperature and low river flows.

Regarding High Rock Reservoir, portions of the reservoir appear on the 2006 North Carolina 303(d) draft list[9] for turbidity, and chlorophyll *a* violations (upper reservoir); turbidity (lower reservoir); and turbidity violations (Abbotts Creek Arm). Since the turbidity and eutrophication problems currently being experienced in High Rock Reservoir are a direct result of pollutant loadings from upstream sources, NCDWQ has initiated a TMDL process to address this issue. NCDWQ has recommended that APGI be an active participant in the High Rock Reservoir TMDL process. Accordingly, APGI is participating in the TMDL process and expects to be an active participant throughout the multi-year process.

Regarding tailwater dissolved oxygen conditions, NCDWQ and USEPA have recommended that APGI undertake a program to improve tailwater dissolved oxygen conditions. Specifically, NCDWQ has requested that APGI develop a schedule for installing and operating aeration technology at each of the Project developments designed to increase tailwater dissolved oxygen concentrations to the required standards (4.0 mg/l instantaneous, 5.0 mg/l average). NCDWQ has further recommended that APGI initiate a dissolved oxygen monitoring program, that will allow APGI and NCDWQ to assess changes to tailwater DO concentrations that are anticipated to occur as aeration technology is installed and brought on-line at each Project development.

[9] These same waters were listed on NCDENR's 2004 303(d) List.

In response to the DLA, several agencies made specific comments or recommendations regarding water quality at the Yadkin Project.

In a letter dated 1/4/06, NCDWQ (Appendix E-25) commented that the language regarding the concept for dissolved oxygen enhancement included in the DLA was in agreement with the final water quality study plan of August 2005. NCDWQ further noted that while there are still many details to discuss and resolve, NCDWQ is in general agreement with the concepts put forward by APGI in its proposed DO enhancement schedule. NCDWQ did note that there remain some potential areas of discrepancy between APGI's concept for tailwater DO enhancement and NCDWQ's concept. NCDWQ suggested that further discussions are needed surrounding timing of enhancements and total length of time for enhancement completion, as well as potential upgrades to Tuckertown and Falls developments.

In their respective comments on the DLA, the NCWRC (letter dated 1/4/06, Appendix E-25), and the USFWS (letter dated 1/27/06, Appendix E-25) also indicated concern with the conceptual dissolved oxygen enhancement schedule proposed by APGI in the Draft License Application, but deferred to NCDWQ to provide specific recommendations on a final DO enhancement plan and schedule for the Yadkin Project.

In its comment letter on the DLA dated 1/4/06 (Appendix E-25), USEPA had several comments and recommendations regarding APGI's DO enhancement proposals. First, USEPA stated that it supported the overall approach for the DO enhancement program outlined in the DLA but recommended an expedited improvement schedule that would include the installation of aeration technology at High Rock and Narrows by 2011, with continued monitoring below Tuckertown and Falls. USEPA further recommended that if it is determined that additional DO enhancements are needed at Tuckertown and Falls, these should be completed by 2014. USEPA stated that water quality DO standards should be met at all developments by 2014.

USEPA also commented that the proposed future operation of the aeration technology at High Rock and Narrows described in the DLA was unclear since the operational description included the phrase "as needed". USEPA went on to state that it concurs with APGI's proposal to operate Narrows Unit 4 with both valves open between May 1 and November 30 of each year but recommended a stronger commitment than "endeavor to use as practicable" to operate Unit 4 on a "first on-last off" basis. Instead, USEPA recommended that operation of Unit 4 and any subsequently upgraded units on a "first on-last off basis" become a regular part of the operations plan for the Project.

In the same 1/4/06 letter (Appendix E-25), USEPA commented that the DLA made no mention of any specific timeframes for DO improvements at Tuckertown or Falls, other than on an as needed basis, depending on the outcome of monitoring. USEPA went on to say that they assumed that those improvements would occur in accordance with the proposed refurbishment and upgrade schedule included in Exhibit C (Tuckertown and Falls upgrades before the end of 2020). However, it noted that there was no information in the DLA that suggested how this schedule was developed, and asked that this information be included in the Final License Application (FLA), including the capital costs of the planned upgrades. Finally, USEPA recommended that APGI develop and implement an approved Quality Assurance Project Plan (QAPP) as part of the overall long-term Dissolved Oxygen Monitoring Plan.

In addition to agency comments, APGI received several comments and recommendations from other participants in the relicensing process regarding water quality at the Yadkin Project.

In a letter dated 1/3/06 (Appendix E-25), The Nature Conservancy (TNC) noted that it supports the conceptual proposal contained in the DLA to increase tailwater dissolved oxygen levels below the High Rock and Narrows facilities through installation of aerating turbines and aeration valves, respectively. TNC further noted its support for the concept of subsequent installations at Tuckertown and Falls facilities only if prior improvements fail to produce desirable results throughout the system. TNC commended APGI for its aggressive approach to this issue.

In its comments on the DLA (letter dated 1/3/06, Appendix E-25), High Rock Lake Association (HRLA) commented that with respect to Project water quality, APGI has completely ignored many positive benefits that could result from a change in operations at High Rock. HRLA noted its concern that APGI has elected to promise future modifications to the turbines, just focusing on tailwater quality rather than make changes in operation to stabilize High Rock Reservoir water levels to improve reservoir water quality.

Regarding the issue of sediment and sedimentation, the City of Salisbury made several comments and recommendations in its comment letter on the DLA (letter dated 1/4/06, Appendix E-25). The major concerns expressed by Salisbury included the following: 1) APGI's Sediment Fate and Transport Report does not satisfy the study objectives related to Yadkin Project's effects on sediment deposition patterns and resulting sediment and flooding impacts on Salisbury's municipal water supply intakes; 2) APGI's License Application should incorporate and rely on additional available studies that are necessary to allow a license decision to be based on an adequate understanding of the present and future effects of the Yadkin Project on Salisbury's water and wastewater systems including the City of Salisbury Technical Report: High Rock Dam and High Rock Lake Sedimentation Flooding Effects as Estimated Using HEC-RAS Modeling (January 2006); and 3) APGI should mitigate for Project effects due to sedimentation and flooding of Salisbury's water supply and wastewater systems.

E.2.6 Existing Measures to be Continued

APGI proposes to continue to operate the Yadkin Project, with certain enhancements designed to improve Project water quality. In 2001, Narrows Unit 4 was refurbished and upgraded by APGI. At that time, aeration valves were installed on the Unit 4 draft tube cone. Opening these valves when Unit 4 is operating has been shown to significantly increase tailwater dissolved oxygen concentrations (see Exhibit E.2.3.1.1 and Appendix E-1). In a series of investigations done by APGI, it was demonstrated that the aeration valves at Unit 4 were capable of adding approximately 2 mg/l of dissolved oxygen to the water being released from Unit 4, when both valves were open (NAI, 2005h Appendix E-1). Since 2001, APGI's standard operating procedure for Narrows Unit 4 has been to operate the unit with the aeration valves open from May 1 through November 30 each year, and to generally use Unit 4 on a "first on-last off" basis, when available.

APGI proposes to continue to operate Narrows Unit 4 with both aeration valves open between May 1 and November 30 of each year to enhance tailwater dissolved oxygen conditions. Moreover, until such time as similar aeration valves are installed on the other generating units at Narrows, APGI will continue to endeavor to use Unit 4 on a "first on-last off" basis, when available, so as to maximize the dissolved oxygen benefit in the tailwater area.

Since 2001, APGI has been operating continuous dissolved oxygen and temperature monitors in the Narrows and Falls tailrace areas from May 1 through November 30 of each year. The monitors were located to provide a representative sample of dissolved oxygen concentrations throughout both tailwaters. To confirm the representativeness of the current monitor locations, APGI conducted several field surveys designed to examine the lateral and longitudinal change in tailwater dissolved oxygen conditions, and to determine if the continuous monitor locations were indicative of overall tailwater conditions (NAI, 2005h Appendix E-1). Results of these studies demonstrated that both monitors are located in areas of the tailwater that are generally representative of overall tailwater conditions.

Beginning in 2003, continuous tailwater dissolved oxygen and temperature monitors were added to the Tuckertown and High Rock tailwaters, as well. The representativeness of these monitor locations within the tailwaters was also evaluated through field investigations carried out by APGI (NAI, 2005h Appendix E-1).

APGI proposes to continue to operate the continuous dissolved oxygen and temperature monitors in each of the four Project tailwaters between May 1 and November 30 of each year. Monitors will be installed, operated and maintained according to the manufacturer's specifications and following NCDWQ protocols. Resulting dissolved oxygen and temperature data will be recorded and periodically reported to NCDWQ as part of a proposed Dissolved Oxygen Monitoring Plan.

E.2.7 New Measures Proposed by the Applicant to Protect or Improve Water Quality

APGI proposes to undertake a series of Project modifications designed to increase dissolved oxygen concentrations and enhance water quality in the four Project tailwaters. The fundamental concept of APGI's proposed dissolved oxygen enhancement program will be to first increase DO concentrations below Narrows and High Rock dams, and then monitor to ascertain what DO enhancement might still be needed at Tuckertown and Falls dams.

Over the term of the new license, APGI plans to undertake certain refurbishments and upgrades to the generating units at the four Yadkin Project developments (see Exhibit B for details). Unit refurbishment and upgrade provides APGI with an opportunity to install aeration technology at the dams in a cost effective manner. Therefore, APGI proposes to install appropriate aeration technology at Narrows and High Rock dams in accordance with its unit refurbishment/upgrade schedule for a new FERC license and 401 Water Quality Certification application.

APGI is proposing to refurbish and upgrade Narrows Units 1and 3 and High Rock Units 1, 2 and 3 between 2008 and 2012 (see Exhibit B.2)[10]. At the time of this work, appropriate aeration technology will be added to each unit. At Narrows, APGI anticipates the most appropriate and cost-effective technology will be the installation of aeration valves on the draft tube cones (similar to those already installed on Unit 4). At High Rock, APGI anticipates that the best aeration technology will be the installation of new aerating turbines, with "through-the-runner" aeration capability.

The Unit Refurbishment/Upgrade and Dissolved Oxygen Enhancement Schedule being proposed by APGI is shown in Table E.2-8. Under this proposed schedule, APGI will first add DO enhancements (draft tube aeration valves) to Narrows Units 1-3. Installation of aeration technology at all Narrows Development units will be completed by 12/31/10. This will be followed by a two-year DO monitoring study (2011-2012) to assess the effectiveness of the aeration valves in increasing DO concentrations in both the Narrows and Falls tailwaters. At the end of the two-year study, APGI will prepare a study report and file the report with NCDWQ and FERC. The study report will include a determination as to whether DO enhancements are required at the Falls Development in order to increase Falls tailwater DO concentrations. If it is determined that DO enhancement is required at Falls, APGI will prepare an action plan for DO enhancement at the Falls Development. The action plan will outline the aeration technology to be installed at Falls, or other actions APGI will take to increase Falls tailwater DO concentrations, and will provide a schedule for the completion of the proposed enhancements. The action plan will be filed with NCDWQ no later than 12/31/13.

After completing the refurbishment of the Narrows units, APGI will refurbish the units at the High Rock Development. At High Rock, APGI anticipates installing aerating turbines as part of each of the unit refurbishment and upgrades. Installation of aeration technology at all three High Rock development units (Units 1-3) will be completed by 12/31/12. This will be followed by a two-year dissolved oxygen monitoring study (2013-2014) to assess the effectiveness of the aerating turbines in increasing DO concentrations in both the High Rock and Tuckertown tailwaters. At the end of the two-year study, APGI will prepare a study report and file it with NCDWQ and FERC. The study report will include a determination as to whether DO enhancement is required at the Tuckertown Development in order to increase Tuckertown DO concentrations. If it is determined that DO enhancement is required at Tuckertown, APGI will prepare an action plan for DO enhancement at the Tuckertown Development. The action plan will outline the aeration technology to be installed at Tuckertown, or other actions APGI will take to increase Tuckertown tailwater DO concentrations, and will provide a schedule for completion of the proposed enhancements. The action plan will be filed with NCDWQ no later than 12/31/15.

APGI is committed to improving Yadkin Project tailwater water quality. Technologies to increase tailwater dissolved oxygen conditions are available, but such technologies are expensive to install and operate and result in a loss in the efficiency of the generating units, and therefore a loss in power generation. Also, to be effective, aeration technologies have to be designed and installed specific to the dam, powerhouse, penstock, turbine and tailwater conditions that are

[10] Refurbishment and upgrade of Narrows Unit 2, including the installation of draft tube cone aeration valves, is expected to be completed under the existing Project license.

unique to each development. In other words, to be effective, each development will likely require a different type of aeration technology. The best time to do such installations is in conjunction with other facility sustainability work being planned for the various developments and units. APGI's plan to refurbish and upgrade the generating units at its four developments over several years represents a prime opportunity to most cost effectively install aeration technology, as needed, at the Project. In conjunction with the proposed DO enhancement program, APGI is also proposing to develop a Dissolved Oxygen Monitoring Plan for the Yadkin Project. The DO Monitoring Plan will be developed in consultation with resource agencies and will be filed with NCDWQ and FERC within one year of the effective date of a new license. As part of the DO Monitoring Plan, APGI will also prepare a Quality Assurance Project Plan (QAPP) for the Yadkin Project, which will also be filed with NCDWQ.

NCDWQ has initiated a TMDL process to address turbidity and chlorophyll *a* violations in High Rock Reservoir and has recommended that APGI be an active participant in the High Rock Reservoir TMDL process. Accordingly, APGI is participating in the TMDL process and expects to be an active participant throughout the multi-year process.

Table E.2-8: Yadkin Project Proposed Unit Refurbishment/Upgrade and DO Enhancement Schedule

Year	High Rock	Tuckertown	Narrows	Falls	Monitoring/Reporting
Actions Completed					
2000-2005	- Engineering studies and model tests for refurbishment/ upgrade of High Rock Units 1, 2 and 3.		- Refurbishment/upgrade of Unit 4 with addition of two aeration valves to unit draft cone.		
Existing License					
2006	- Engineering studies and model tests for refurbishment/ upgrade of High Rock Units 1, 2 and 3.	- Engineering studies and model tests for refurbishment/ upgrade of all three Tuckertown units.	- Engineering studies and model tests for refurbishment/ upgrade of Narrows Units 1, 2, and 3.		- Continuous DO/temp monitoring 5/1-11/30 at existing stations in all four tailwaters.
2007				- Engineering studies and model tests for refurbishment/ upgrade of all three Falls units.	- Continuous DO/temp monitoring 5/1-11/30 at existing stations in all four tailwaters.
2008			- Complete refurbishment/ upgrade of Unit 2 with addition of two aeration valves to the unit draft cone similar to those on Unit 4 by 03/31/08. - During refurbishment, APGI will continue to operate the other Narrows units such that Unit 4 is operated with both aeration valves open 5/1-11/30 and operated on a first on, last off basis, subject to unit availability.	- Engineering studies and model tests for refurbishment/ upgrade of all three Falls units.	- Continuous DO/temp monitoring 5/1-11/30 at existing stations in all four tailwaters.

Table E.2-8: Yadkin Project Proposed Unit Refurbishment/Upgrade and DO Enhancement Schedule (continued)

Year	High Rock	Tuckertown	Narrows	Falls	Monitoring/Reporting
New FERC License					
2009			- Complete refurbishment/ upgrade of Unit 1 with addition of two aeration valves to the unit draft cone similar to those on Unit 4 by 12/31/09. - During refurbishment, APGI will continue to operate the other Narrows units such that Units 4 and 2 are operated with aeration valves open 5/1-11/30 and operated on a first on, last off basis, subject to unit availability.		- Prepare a Dissolved Oxygen Monitoring Plan (including a QAPP) for approval by NCDWQ - Continuous DO/temp monitoring 5/1-11/30 at existing stations in all four tailwaters. - File annual DO monitoring data report with DWQ by March 1 of the following year.[1]
2010	- Complete refurbishment/ upgrade of Unit 3. As part of this refurbishment, APGI will install a "through the blade" aerating turbine by 12/31/10.		- Complete refurbishment/ upgrade of Unit 3 with addition of two aeration valves to the unit draft cone similar to those on Unit 4 by 12/31/10. - During refurbishment, APGI will continue to operate the other Narrows units such that Units 4, 2 and 1 are operated with aeration valves open 5/1-11/30 and operated on a first on, last off basis.		-Implement NCDWQ-approved DO Monitoring Plan - Monitoring in accordance with NCDWQ-approved DO monitoring plan -File annual DO monitoring data report with DWQ by March 1 of the following year.
2011	- Complete refurbishment/ upgrade of Unit 2. As part of this refurbishment, APGI will install a "through the blade" aerating turbine by 12/31/11. - During work on Unit 2, Unit 3 will be operated such that turbine aeration is "on" 5/1-11/30 and the unit is operated on a first on, last off basis, subject to unit availability.				- Monitoring in accordance with NCDWQ-approved DO Monitoring Plan - Initiate special 2-year study to evaluate the effectiveness of the aeration at Narrows on DO levels being discharge from Falls (2011-2012)

Table E.2-8: Yadkin Project Proposed Unit Refurbishment/Upgrade and DO Enhancement Schedule (continued)

Year	High Rock	Tuckertown	Narrows	Falls	Monitoring/Reporting
2012	- Complete refurbishment/ upgrade of Unit 1. As part of this refurbishment, APGI will install a "through the blade" aerating turbine by 12/31/12. - During work on Unit 1, Units 2 and 3 will be operated such that turbine aeration is "on" 5/1-11/30.				- Monitoring in accordance with NCDWQ-approved DO Monitoring Plan - Complete 2-year study of effectiveness of aeration at Narrows on DO at Falls by 12/31/12 and file report with DWQ by 3/1/13. - If 2-year study does not demonstrate compliance at Falls, file an action plan for DO enhancement at Falls by 12/31/13.
2012-2014		- Turbine refurbishment/ upgrade. No DO enhancement presently planned pending the effectiveness of DO enhancement at High Rock.			- Monitoring in accordance with NCDWQ-approved DO Monitoring Plan -Initiate special 2-year study to evaluate the effectiveness of aeration at High Rock on DO levels being discharged from Tuckertown (2013-2014) - Complete 2-year study by 12/31/14 and file report with DWQ by 3/1/15.
2015-2020				- Unit refurbishment/upgrade. No DO enhancement presently planned pending the effectiveness of DO enhancement at Narrows.	- Monitoring in accordance with NCDWQ-approved DO Monitoring Plan - If 2-year study does not demonstrate compliance at Tuckertown, file an action plan for DO enhancement at Tuckertown by 12/31/15.

Notes:

1 Beginning in 2009, APGI will conduct water quality monitoring in the four Project tailwaters in accordance with a NCDWQ-approved QAPP as part of the proposed Dissolved Oxygen Monitoring Plan. Results of each calendar year of monitoring will be provided to NCDWQ in the form of an annual report which will be filed with NCDWQ no later than March 1 of the following year.

2 This schedule is based upon the assumption of a new FERC license being issued in 2008.

E.2.8 Estimate of the Costs of Construction, Operation, and Maintenance of Implementation of Any Proposed Measures

APGI is making several significant proposals designed to improve water quality at the Yadkin Project. The estimated cost of both the operational and non-operational measures being proposed for water quality enhancement is outlined in Table E.2-9. The estimated annual cost associated with operation of aeration technology is due to a loss in unit efficiency that is anticipated to occur whenever the units are operating with the aeration technology (aeration valves or aerating turbines) "on." Such efficiency losses are estimated to cost $330,000, annually.

Table E.2-9: Estimated Cost of Measures Proposed for Water Quality Enhancement

PME Proposals for Water Quality	Estimated Annual Cost	Estimated One-Time Cost
In conjunction with refurbish/upgrade of generation units, installation of aeration technology at High Rock (aerating turbines) and Narrows (draft tube valves) to improve tailwater DO conditions. Operate units with aeration technology as needed during the period 5/1-11/30 each year.	$330,000[a]	$2,550,000
Prepare a Dissolved Oxygen Monitoring Plan that will include provisions to: • Operate four continuous DO/temperature monitors, one in each of the Project tailwaters. • Report DO data annually to NCDWQ. • Conduct two 2-year studies of DO conditions below Falls and Tuckertown dams.	$150,000	$50,000
Participate in NCDWQ High Rock TMDL Process	$20,000	

[a] This cost assumes that DO enhancement will not be required at Falls and Tuckertown. The added cost of operating DO enhancement at Tuckertown is estimated to be $300,000 per year. The added cost of operating DO enhancement at Falls is estimated to be $100,000.

E.2.9 Explanation of Why the Applicant Has Rejected Any Measures Recommended by an Agency

APGI has not specifically rejected any measures recommended by an agency. APGI is proposing significant measures to improve dissolved oxygen concentrations in the four Project tailwaters. Throughout the relicensing consultation process, APGI has been working with NCDWQ, USEPA, and other resource agencies to develop a plan for the installation of aeration technologies at the Yadkin Project developments on a schedule that is built around APGI's overall plans and schedule for refurbishing and upgrading Project generating units. Although resource agencies have expressed some concerns regarding the proposed schedule for the installation of aeration technology, they have generally agreed with the approach that APGI is proposing to address tailwater DO.

APGI has seriously considered an acceleration of the DO enhancement schedule, but believes that the schedule that is proposed is the most efficient and cost-effective means of installing aeration technology at the Project developments. Based on results of studies and the testing of the effectiveness of the existing aeration valves on Narrows Unit 4, APGI is convinced that similar aeration valves installed at Narrows Units 1-3 will allow the Narrows tailwater to meet state DO standards. Moreover, due to the very short residence times in Falls Reservoir (generally about 2-3 hours), APGI believes that the Falls tailwater will also be able to meet state standards as a result of installing and operating aeration valves on the four Narrows development units. Thus, by scheduling the refurbishment of the Narrows units first, DO in two tailwater reaches, will be improved early. Moreover, this schedule will help to ensure that waters leaving the Yadkin Project are in compliance with state standards sooner, rather than later.

Throughout the relicensing process, the City of Salisbury has repeatedly raised concerns that the operation of High Rock Reservoir contributes to the deposition of sediment in the vicinity of its water intakes. As a result, Salisbury has made recommendations for certain measures to be undertaken by APGI to reduce or mitigate for these impacts. APGI does not agree that it should be required to mitigate for effects on Salisbury's facilities from sedimentation. APGI believes that sedimentation that occurs in the vicinity of the Salisbury facilities is due to upstream loadings of sediment and is not a result of Project operations (see Appendix E-3).

E.2.10 Impact on Water Quality of Continued Project Operation

Continued operation of the Yadkin Project as proposed by APGI will significantly enhance Project water quality. Installation of aeration technology at the Narrows and High Rock developments will provide significant improvement in High Rock and Narrows tailwater dissolved oxygen conditions over existing conditions. As aeration technology is added to Narrows and High Rock, it is anticipated that there will also be improvement in downstream reservoir water quality and improvements in dissolved oxygen conditions in the Tuckertown and Falls tailwaters, as well. After aeration technology has been added to all the units at High Rock and Narrows, if monitoring demonstrates that dissolved oxygen concentrations below Falls and Tuckertown are still below state water quality standards, then aeration technology may be added, as needed, at these other developments.

APGI is proposing to operate High Rock Reservoir in accordance with a revised guide curve. The proposed guide curve will extend the season of higher water levels by three months and will reduce the winter drawdown of the reservoir from the current average maximum of 12-15 ft, to an average maximum of 12 ft, and in general produce a somewhat narrower band of elevations within which the reservoir will fluctuate over the year. Operation of High Rock in this manner should have no impact on reservoir or Project water quality. Operation of Tuckertown, Narrows and Falls reservoirs in a manner similar to how they have been operated in the past will have no impact on Project water quality.

In addition, APGI is planning to participate in North Carolina's TMDL process for High Rock Reservoir. When completed, the TMDL process is expected to result in changes in pollutant inputs to High Rock Reservoir and a long-term improvement in reservoir water quality.

The other three reservoirs currently meet state water quality standards, and continued operation of the Project as proposed would ensure that the Tuckertown, Narrows and Falls reservoirs continue to meet water quality standards.

E.2.11 Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. The following table summarizes the consultation record related to water resources at the Yadkin Project. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.2-10: Summary of Consultation Record Related to Water Resources

Agency/Party	Date	To	Description
North Carolina Division of Water Resources, John Morris	January 9, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
High Rock Lake Association, Larry Jones	January 9, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
North Carolina Watershed Coalition, Scott Jackson	January 9, 2003	APGI	Initial relicensing comments
U.S. Forest Service, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
City of Salisbury, North Carolina, David Treme	January 10, 2003	APGI, Gene Ellis	Letter re: initial relicensing comments and request for studies
U.S. Fish and Wildlife Service, Garland Pardue,	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments and study requests
North Carolina Wildlife Resources Commission, Chris Goudreau	January 12, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments and "Hydropower Relicensing Issues, Standards, and Mitigation"
South Carolina Coastal Conservation League and American Rivers, Gerrit Jobsis and David Sligh	January 12, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
APGI, Jody Cason	May 14, 2003	WQ IAG	Water Quality Monitoring Draft Study Plan (email)
SC Coastal Conservation League, Gerrit Jobsis	May 20, 2003	APGI, Wendy Bley	Comments on Water Quality Monitoring Draft Study Plan (email)
APGI	May 20, 2003	WQ IAG	Sediment Fate and Transport Draft Study Plan distributed at May 20, 2003 WQ IAG Meeting
High Rock Lake Association, Larry Jones	June 4, 2003	WQ IAG	Comments on water quality issues for Water Quality Monitoring Draft Study Plan (email)
APGI, Jody Cason	June 5, 2003	WQ IAG	Final summary for March 13, 2003 Water Quality IAG meeting (email)
City of Salisbury, David Treme	June 17, 2003	APGI, Gene Ellis	Letter requesting appropriate monitoring and studies
APGI, Jody Cason	July 2, 2003	WQ IAG	Final summary for May 20, 2003 Water Quality IAG meeting (email)
APGI, Jody Cason	September 6, 2003	WQ IAG	Sediment Fate and Transport Final Study Plan (email)
APGI, Jody Cason	September 6, 2003	WQ IAG	Water Quality Monitoring Final Study Plan (email)
APGI, Jody Cason	September 23, 2003	WQ IAG and F&A IAG	Agenda for October 7, 2003 Water Quality IAG and Fish & Aquatics IAG joint meeting (email)
APGI, Jody Cason	December 2, 2003	WQ IAG and F&A IAG	Final summary for October 7, 2003 Water Quality IAG and Fish & Aquatics IAG joint meeting (email)

Table E.2-10: Summary of Consultation Record Related to Water Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	April 19, 2004	WQ IAG and F&A IAG	Final summary for February 3, 2004 Water Quality IAG and Fish and Aquatics IAG joint meeting (email)
APGI, Jody Cason	April 22, 2004	WQ IAG	Agenda for May 4, 2004 Water Quality IAG meeting (email)
NC Division of Water Quality, John Dorney	May 3, 2004	WQ IAG	Memo summarizing 401 Water Quality Certification Issues
APGI, Jody Cason	July 27, 2004	WQ IAG	Draft study plan outlining additional tailwater dissolved oxygen investigations (email)
U.S. Fish and Wildlife Service, John Ellis	July 28, 2004	APGI, Jody Cason	Email request for additional information in order to comment on Tailwater Dissolved Oxygen Testing Study Plan
High Rock Lake Association, Larry Jones	August 3, 2004	APGI and WQ IAG	Comments on Tailwater Dissolved Oxygen Testing Study Plan (email)
High Rock Lake Business Owners Group, Mark Oden	August 3, 2004	APGI, Jody Cason	Comments on the Tailwater Dissolved Oxygen Testing Study Plan (email)
NC Wildlife Resources Commission, Todd Ewing	August 10, 2004	APGI, Jody Cason	Comments on the Tailwater Dissolved Oxygen Testing Study Plan (email)
APGI, Jody Cason	September 2, 2004	WQ IAG	Final summary for May 4, 2004 Water Quality IAG meeting (email)
APGI, Jody Cason	September 2, 2004	WQ IAG	Final Tailwater Dissolved Oxygen Testing Study Plan (email)
APGI, Jody Cason	October 8, 2004	WQ IAG	Email update on water quality monitoring studies at the Yadkin Project
APGI, Gene Ellis	December 10, 2004	WQ IAG	Distribution of Sediment Fate and Transport Draft Study Report (letter)
APGI, Jody Cason	December 12, 2004	WQ IAG	Email informing IAG of the distribution of the Sediment Fate and Transport Draft Study Report on CD
High Rock Lake Association, Larry Jones	December 15, 2004	WQ IAG	Comments on the Sediment Fate and Transport Study Draft Report (email)
City of Salisbury	January 6, 2005	APGI, Gene Ellis and Jody Cason	Comments on the Sediment Fate and Transport Study Draft Report (email)
City of Salisbury (Hazen and Sawyer), Don Cordell	March 17, 2005	Salisbury-Rowan Utilities, Matt Bernhardt	Comments on the Sediment Fate and Transport Study Draft Report (letter)
APGI, Jody Cason	March 21, 2005	WQ IAG	Agenda for the April 6, 2005 Water Quality IAG Meeting (email)
APGI, Gene Ellis	March 21, 2005	WQ IAG	Distribution of Water Quality Study Draft Study Report (letter)

Table E.2-10: Summary of Consultation Record Related to Water Resources (continued)

Agency/Party	Date	To	Description
NC Division of Water Quality, Darlene Kucken	May 11, 2005	APGI, Gene Ellis, Wendy Bley, and Jody Cason	Comments on Water Quality Study Draft Study Report (email)
U.S. Environmental Protection Agency, Ben West	May 11, 2005	APGI, Jody Cason	Comments on draft reports: Water Quality Study and Sediment Fate and Transport (email)
APGI, Jody Cason	June 20, 2005	WQ IAG	Final summary of April 6, 2005 Water Quality IAG Meeting (email)
APGI, Gene Ellis	August 16, 2005	WQ IAG	Distribution of Water Quality Study Final Study Report (letter)
APGI, Gene Ellis	November 17, 2005	WQ IAG	Distribution of Sediment Fate and Transport Final Study Report (letter)
APGI, Jody Cason	November 18, 2005	WQ IAG	Email informing IAG of the distribution of the Sediment Fate and Transport Final Study Report on CD

Notes: APGI - Alcoa Power Generating Inc.
IAG - Issue Advisory Group
WQ IAG - Water Quality Issue Advisory Group
F&A IAG – Fish and Aquatics Issue Advisory Group

Exhibit E.3

Fish, Wildlife, and Botanical Resources

E.3 Fish, Wildlife, and Botanical Resources

E.3.1 Fish and Aquatic Resources

E.3.1.1 Existing Fish and Aquatic Community

E.3.1.1.1 Resident Fish

The Yadkin Project (Project) reservoirs and tailwaters support a high quality warmwater resident fishery. Prior to initiating the relicensing process, Alcoa Power Generating Inc. (APGI) conducted a baseline fish assessment of the four Project reservoirs to obtain an overview of the composition of the reservoir fish community. This early sampling was supplemented during the relicensing study process by several additional studies designed to examine in more detail the tailwater aquatic communities and the location and extent of high quality aquatic habitats within the reservoirs. The results of these evaluations as they pertain to the resident fish community are summarized in the following section and are reported on in detail in the study reports found in Appendices E-4, E-5 and E-7.

As part of APGI's studies of reservoir aquatic habitat and fish, data drawn from several recent fish surveys including reservoir fisheries studies conducted by APGI in 2000, 2003, and 2004, as well as recent fish sampling done by the North Carolina Wildlife Resources Commission (NCWRC), were compiled and evaluated to provide an overview of the current status of resident fish species at the Project. Table E.3-1 summarizes the species collected through the various survey efforts in each of the four Project reservoirs.

All four of the Project reservoirs are managed by the NCWRC as warmwater sport fisheries. High Rock Reservoir has a renowned sport fishery for largemouth bass, as well as black and white crappie, striped bass, and several species of catfish. Narrows Reservoir also supports a sport fishery for largemouth bass and black and white crappie and is known for its large catfish, especially blue catfish. Narrows and Tuckertown reservoirs have size and creel limits for largemouth bass and black crappie. Falls Reservoir supports a sport fishery for largemouth bass, crappie, striped bass, and several species of catfish. Fishing is very popular on the Yadkin Project reservoirs, and the reservoirs, particularly High Rock, often host bass fishing tournaments.

Table E.3-1: Fish Species Found in the Four Yadkin Project Reservoirs

Scientific Name	Common Name	High Rock	Tuckertown	Narrows	Falls
Alosa aestivalis	Blueback Herring		C	B,C	B,C
Alosa pseudoharengus	Alewife		B		
Ameiurus melas	Black bullhead	A	B		
Ameiurus nebulosus	Brown bullhead	A,B	A,B	A,B	
Amia calva	Bowfin	A,B			C
Aphredoderus sayanus	Pirate perch				
Carassius auratus	Goldfish	A,B	C	B	
Carpiodes cyprinus	Quillback	A,B	A,B,C	A,C	
Catostomus commersoni	White sucker	A		A	
Cyprinus carpio	Common carp	A,B	A,B,C	A,B,C	B,C
Cyprinella analostana	Satinfin shiner		B,C	C	C
Dorosoma cepedianum	Gizzard shad	A,B	A,B,C	A,B,C	B,C
Dorosoma petenense	Threadfin shad	A,B	A,B,C	A,B,C	B,C
Erimyzon oblongus	Creek chubsucker	A,B	A,B,C	A,B,C	
Esox americanus	Redfin pickerel			A	
Esox niger	Chain pickerel			A	
Etheostoma nigrum	Johnny Darter		B		
Etheostoma olmstedi	Tesselated darter		C		
Gambusia holbrooki	Eastern mosquitofish		B	A,B	B
Hybognathus regius	Eastern Silvery Minnow		C		
Ictalurus brunneus	Snail bullhead			B	C
Ictalurus catus	White catfish	A,B	A,B,C	A,B,C	B,C
Ictalurus furcatus	Blue catfish		B,C	B,C	B,C
Ictalurus natalis	Yellow bullhead			A,B	
Ictalurus platycephalus	Flat bullhead	A	B	B	C
Ictalurus punctatus	Channel catfish	A,B	A,B,C	A,B,C	B,C
Ictiobus bubalus	Smallmouth buffalo	A	C	A	B,C
Lepisosteus osseus	Longnose gar	A,B	B,C	A,B,C	C
Lepomis auritus	Redbreast sunfish	A,B	A,B,C	A,B,C	B,C
Lepomis cyanellus	Green sunfish	A,B	A,B,C	A,B,C	B,C
Lepomis gibbosus	Pumpkinseed	A,B	B,C	A,B,C	B
Lepomis gulosus	Warmouth	A,B	A,B,C	A,B,C	B,C
Lepomis macrochirus	Bluegill	A,B	A,B,C	A,B,C	B,C
Lepomis microlophus	Redear sunfish	A,B	A,B,C	A,B,C	B,C
Micropterus salmoides	Largemouth bass	A,B	A,B,C	A,B,C	B,C
Minytrema melanops	Spotted sucker	B			
Morone americana	White perch	A,B	A,B,C	A,B,C	B,C
Morone chrysops	White bass	A,B	A,B,C	A,B,C	C
Morone saxatilis	Striped bass	A,B	A,B,C	A,B,C	B,C
Moxostoma anisurum	Silver redhorse	A	B,C	A,C	C
Moxostoma macrolepidotum	Shorthead redhorse	B	B,C	A,B,C	B,C
Moxostoma pappillosum	V-lip redhorse	A	A	A	
Nocomis leptocephalus	Bluehead chub			B	
Notemigonus crysoleucas	Golden shiner	A,B	B	A,B,C	B,C
Notropis hudsonius	Spottail shiner		C		

Table E.3-1: Fish Species Found in Each of the Four Yadkin Project Reservoirs (continued)

Scientific Name	Common Name	High Rock	Tuckertown	Narrows	Falls
Perca flavescens	Yellow perch	A,B	A,B,C	A,B,C	B,C
Pomoxis annularis	White crappie	A,B	B,C	A,B,C	B,C
Pomoxis nigromaculatus	Black crappie	A,B	A,B,C	A,B,C	B,C
Pylodictis olivaris	Flathead catfish	A,B	A,B,C	B,C	B,C
Scartomyzon spp.	Brassy jumprock	A			
	Striped bass x White bass	B	B,C	B,C	
	Carp x Goldfish	B			
	Sunfish Hybrid			B	B

Notes:
A – Source: NCWRC Surveys (Fisheries and Wildlife Management Plan for the Yadkin-Pee Dee River Basin (NCWRC, 2004))
B – Source: Carolina Power and Light 2000 Survey
C – Source: Normandeau Associates Inc. 2003/2004 Tailwater Surveys (NAI, 2005f Appendix E-5)

In a separate study, Normandeau Associates (NAI) inventoried and assessed the resident fish community in the Project tailwaters on a seasonal basis (spring, summer, and fall). To ensure that the greatest number of species was being collected. Fish sampling was done using a variety of methods and gear types including electrofishing and gill nets. Fish were sampled in many tailwater locations, including both shallow- and deep-water habitats. The complete list of fish species found in each of the development tailwaters is provided in Table E.3-2. In addition, at the request of the agencies, NAI searched for rare, threatened and endangered (RTE) fish species, including the Robust and Carolina Redhorse species, in the Project tailwaters during the spring and during the summer and fall fish surveys (NAI, 2005f Appendix E-5).

Table E.3-2: Summary of Fish Species Collected in the Four Yadkin Project Tailwaters

Common Name	Scientific Name	High Rock Tailwater	Tuckertown Tailwater	Narrows Tailwater	Falls Tailwater
Blueback Herring	*Alosa aestivalis*	X	X	X	X
Gizzard Shad	*Dorosoma cepedianum*	X	X	X	X
Threadfin Shad	*Dorosoma petenense*	X	X	X	X
Goldfish	*Carassius auratus*	X			
Common Carp	*Cyprinus carpio*	X	X	X	
Golden Shiner	*Notemigonus chrysoleucas*	X	X	X	X
Spottail Shiner	*Notropis hudsonius*	X			
Satinfin Shiner	*Cyprinella analostana*	X	X	X	X
Eastern Silvery Minnow	*Hybognathus regius*	X			
Quillback	*Carpiodes cyprinus*	X	X		X
Creek Chubsucker	*Erimyzon oblongus*	X	X		X
Shorthead Redhorse	*Moxostoma macrolepidotum*	X	X	X	X
Silver Redhorse	*Moxostoma anisurum*	X	X	X	X
Flathead Catfish	*Pylodictus olivarus*	X	X	X	X
Blue Catfish	*Ictalurus furcatus*	X	X	X	X
Channel Catfish	*Ictalurus puntatus*	X	X	X	X
White Catfish	*Ameiurus catus*	X	X	X	X
Flat Bullhead	*Ameiurus platycephalus*			X	X
Yellow Bullhead	*Ameiurus natalis*				X
Snail Bullhead	*Ameiurus brunneus*				X
White Perch	*Morone americana*	X	X	X	X
Hybrid Bass (Striped x White)	*Morone saxatilis x chrysops*	X	X		
Striped Bass	*Morone saxatilis*	X	X	X	X
White Bass	*Morone chrysops*	X	X	X	X
Redbreast Sunfish	*Lepomis auritus*	X	X	X	X
Green Sunfish	*Lepomis cyanellus*	X	X	X	X
Pumpkinseed	*Lepomis gibbosus*	X	X	X	X
Bluegill	*Lepomis macrochirus*	X	X	X	X
Redear Sunfish	*Lepomis microlophus*	X	X	X	X
Warmouth	*Lepomis gulosus*	X	X	X	X
Smallmouth Bass	*Micropterus dolomieu*				X
Largemouth Bass	*Micropterus salmoides*	X	X	X	X
White Crappie	*Pomoxis annularis*	X	X	X	X
Black Crappie	*Pomoxis nigromaculatus*	X	X	X	X
Tesselated Darter	*Etheostome olmstedi*	X			X
Yellow Perch	*Perca flavescens*	X	X	X	X
Longnose Gar	*Lepisosteus osseus*	X	X	X	X
Smallmouth Buffalo	*Ictiobus bubalus*	X	X	X	
Bowfin	*Amia calva*			X	
White Sucker	*Catostomus commersoni*				X
Spotted Sucker	*Minytrema melanops*				X

Overall, the fish communities sampled in the tailwaters of High Rock, Tuckertown, Narrows and Falls developments were found to be very similar, but some differences in species captured were noted (NAI, 2005f Appendix E-5). Species diversity recorded in the tailwaters ranged from 34 species in both High Rock and Falls tailwaters to 29 species in Narrows tailwater. Large numbers of bluegill, largemouth bass, gizzard shad and white perch dominated the catches in each tailwater. These four species were among the ten most abundant species captured in each tailwater, comprising 48 percent of the total catch in High Rock tailwater, 57 percent in Tuckertown tailwater, 64 percent in Narrows tailwater and 46 percent in Falls tailwater. These species are generally tolerant of low dissolved oxygen (DO) concentrations, a condition that can occur in the Project tailwaters during summer. Given the numbers of these species captured it also was apparent that these species are well adapted to Project operations, including routine changes in powerhouse discharges. A popular sport fish, black crappies, were more abundant in both Tuckertown and High Rock tailwaters than either Narrows or Falls. Channel catfish were also more abundant in High Rock and Tuckertown tailwaters than either Narrows or Falls, and redbreast sunfish were more abundant in Narrows and Falls tailwaters than either High Rock or Tuckertown. Fish species that cannot tolerate marginal water quality (especially low DO), such as some of the darter and minnow species were generally absent from the catches.

Common carp and quillback were both in the ten most abundant species sampled in the High Rock tailwater and were either not present or captured in low numbers in the other three tailwaters (NAI, 2005f Appendix E-5). The numbers of carp captured in High Rock tailwater were evenly distributed during all three seasons of sampling. Quillback were most abundant in the tailwater during the spring season and may have been using the tailwater area below High Rock Dam for spawning. In the Falls tailwater, silver and shorthead redhorse were in the top ten species collected. The shorthead redhorse was captured at all four tailwaters during the study, but its numbers were higher in the Falls tailwater than in the other three tailwaters. The higher catches of shorthead redhorse in the Falls tailwater may be due to better habitat and water quality conditions, especially dissolved oxygen levels. The shorthead redhorse (and the black redhorse) are considered to be intolerant to poor water quality, as are some darter species (NAI, 2005f Appendix E-5).

Species abundance was highest in the High Rock and Narrows tailwaters during the spring sampling period (NAI, 2005f Appendix E-5). Species richness in the Tuckertown tailwater was highest during the fall sampling period. Although the spring sampling period yielded higher species diversity than either summer or fall, species composition and catch per unit effort (CPUE) rates were similar for all three sampling periods in the Falls tailwater.

In terms of the health of the tailwater fisheries, the relative weight values for bluegill and largemouth bass were either within or near ideal ranges in each of the four tailwaters, indicating fish have adequate food (NAI, 2005f Appendix E-5). Average proportional stock density (PSD) and relative stock density (RSD-P) values for largemouth bass were greater than the ideal range within each of the four tailwaters. Bluegill PSD values were within (High Rock and Narrows) or close to (Tuckertown and Falls) the ideal range for the species in all four tailwaters, suggesting a balanced population. However, RSD-P values for bluegill were well below the ideal range for the species in all four tailwaters and this indicated that few large, fish were available for harvest.

Relative weights for black crappie were within or very close to the ideal range in both Narrows and Tuckertown tailwaters, indicating that the fish are in good condition (NAI, 2005f Appendix E-5). However, black crappie relative weights in High Rock tailwater (Tuckertown Reservoir) were lower than the ideal range, suggesting possible problems finding adequate food. The PSD and RSD-P values for black crappie were either within or greater then the ideal range for the species in High Rock, Tuckertown, and Narrows tailwaters, suggesting a balanced population with most size classes represented.

Striped bass were present in all the reservoirs and tailwaters, but the numbers captured in the High Rock tailwater (n=11) and Falls tailwater (n=18), were low compared to the numbers capture in the Tuckertown (n=65) and Narrows (n=39) tailwaters (NAI, 2005f Appendix E-5). The NCWRC stocks striped bass in all the Project reservoirs except Falls (Narrows tailwater). Striped bass captured in the Narrows tailwater (upper Falls Reservoir) most likely originated in Narrows Reservoir. Those collected in Falls tailwater (upper Tillery Reservoir) may have originated from stockings into Tillery Reservoir or may have passed downstream from Falls Reservoir. Striped bass are known to be relatively sensitive to water temperature and DO conditions, and striped bass in Narrows Reservoir (Tuckertown tailwater) are the target of cooperative bioenergetic studies by NCWRC and North Carolina State University to evaluate growth in relation to available habitat, particularly temperature. Dissolved oxygen levels below 2 mg/l and temperatures greater that 25.0ºC have been recorded at certain times during the summer months in the High Rock, Tuckertown, and Narrows tailwaters (Exhibit E.2.3.1.1). While exposure to dissolved oxygen concentrations less than 2 mg/l can be detrimental to individual striped bass, short-term exposure to these conditions are tolerable and do not necessarily lead to high rates of mortality (NAI, 2005f Appendix E-5).

Blueback herring were captured in all four tailwaters during APGI's study, with the highest numbers captured in the Tuckertown (n=55) and Narrows (n=61) tailwaters, and lower numbers captured in the Falls (n=11) and High Rock (n=2) tailwaters (NAI, 2005f Appendix E-5). The NCWRC stocked blueback herring into Narrows Reservoir during the 1970s and the presence of adult and juvenile fish suggested that this population was maintaining itself. Blueback herring captured in both the Narrows (upper Falls Reservoir) and Falls (upper Tillery Reservoir) tailwaters may have passed downstream through the turbines or were flushed out of Narrows Reservoir during spill. The low numbers of blueback herring captured in High Rock tailwater may be the result of bait-bucket introductions. Although blueback herring occur in the lower Pee Dee River as a diadromous species, as there are currently no operational fishways at any of the Yadkin Project or Yadkin-Pee Dee Project developments, the blueback herring currently found in the Project reservoirs and tailwaters are generally considered a resident species. Blueback herring and striped bass are both listed as species of interest in the Restoration Plan for the Diadromous Fishes of the Yadkin-Pee Dee River Basin: North Carolina and South Carolina (USFWS, et al., 2006).

Two fish species listed as Federal Species of Concern, the Carolina redhorse and robust redhorse, were of particular interest to the fishery agencies during APGI's study of the Project tailwaters (NAI, 2005f Appendix E-5). Both species have been collected previously in the Pee-Dee River below the Blewett Falls Development, and Carolina redhorse individuals have been collected below Tillery Dam and in Tillery Reservoir (FERC No. 2206). For the Yadkin Project study, focused searches for these two species were made in all four tailwaters, with sampling concentrated in Falls tailwater at the upper end of Tillery Reservoir. Despite the intensive surveys, neither the Carolina redhorse nor the robust redhorse was found in any of the Yadkin Project tailwaters.

Although NAI failed to capture any Carolina redhorse in the Falls tailwater area, this species had previously been taken from the upper end of Tillery Reservoir into which the Falls Development releases water. Other than the likely presence of Carolina redhorse in the Falls tailwater area, no other RTE fish species are known to occur in Yadkin Project waters.

E.3.1.1.2 Diadromous Fish

Diadromous fish species known to use the Yadkin-Pee Dee River historically for spawning and/or rearing include American shad, blueback herring, striped bass, Atlantic sturgeon, shortnose sturgeon and American eel. Some of these species are reported to have occurred historically in piedmont locations, upstream of the current location of the Yadkin Project dams (USFWS, et al., 2006). However, natural falls occurring in several locations along the river, including a significant set of falls known to have existed in the Narrows gorge, likely served as a natural migration barrier to many fish.

As part of the relicensing process for the Yadkin-Pee Dee River Project (FERC No. 2206), Progress Energy (PE) did extensive work to understand the historic and present day status of diadromous fish populations in the Yadkin-Pee Dee River basin. The following descriptions are based largely on Progress Energy's studies, as reported in their Draft License Application (DLA) for the Yadkin-Pee Dee River Project, which was distributed for review in November 2005.

Based on the accounts of Stevenson (1897, 1899), the historic upstream extent of spawning migration for American shad in the Yadkin River appeared to be near Wilkesboro, North Carolina (cited in PE, 2005). However, it is unclear to what extent American shad migrated to this upper area of spawning, as migration through the Narrows gorge would have been difficult (PE, 2005). Coffin reported in 1888 that American shad would congregate along a series of rapids in the Narrows gorge area during the spring migration (cited in PE, 2005).

Today, there is a sizeable run of American shad in the Yadkin-Pee Dee River below Blewett Falls Dam. Although fishery agencies have provided no estimate of the size of the run, South Carolina does have estimates of commercial landings of American shad from the river. In 2003, 49,654 pounds of American shad were reported as being harvested by commercial fishermen. Studies conducted by Progress Energy (PE, 2005) in the river below Blewett Falls found American shad to be the most abundant of the migratory anadromous fish species known to inhabit the river (PE, 2005).

The striped bass population in the Pee Dee River is considered a riverine or nearshore coastal population that does not undergo extensive oceanic migrations (PE, 2005). The historic upstream migration limit of striped bass was likely near the fall line zone of the river (PE, 2005). The considerable gradient in the Narrows gorge area would have made striped bass migration past this barrier difficult.

Today, a naturally occurring population of striped bass exists in the Yadkin-Pee Dee River below Blewett Falls. Striped bass are also found in the Project reservoirs and tailwaters of both the Yadkin Project and Yadkin-Pee River Project reservoirs and tailwaters, but these fish are the result of stockings by the NCWRC. The striped bass found in the lower river, below Blewett Falls, are likely a near-shore, coastal and riverine population that doesn't undergo extensive oceanic migrations (PE, 2005). Recreational fishing for striped bass is allowed by both North and South Carolina on the Yadkin-Pee Dee River, but commercial harvest is not currently permitted. Based on sampling done on the lower river, Progress Energy reported that striped bass were not very abundant during the spring spawning periods of 1998-1999 (PE, 2005). Of the few fish collected in the Blewett Falls tailwaters, abundance of spawning adults was greatest in May (PE, 2005).

There is limited information about the historic range of blueback herring in the Yadkin-Pee Dee River (PE, 2005). From an historical account by Mills (1826) blueback herring appeared to have ascended the Pee Dee River perhaps as far upstream as Darlington County, South Carolina (cited in PE, 2005). Today, blueback herring are not very abundant in the river reach below Blewett Falls Dam (PE, 2005). Most migratory adults collected by Progress Energy during their lower river fish surveys were collected in the lower Coastal Plain area of the river (PE, 2005). Only a small number of spawning adults were found in the Blewett Falls tailwater (PE, 2005).

Similarly, there are few historical records for shortnose and Atlantic sturgeon in the Yadkin-Pee Dee River (PE, 2005). The actual upstream migration limit for these two species is unclear, although based on a few anecdotal records, both species migrated to the fall line zone and may have migrated into the lower Piedmont region (PE, 2005)

During fish surveys conducted by Progress Energy between 1998-2005, Atlantic sturgeon were infrequently encountered in the Yadkin-Pee Dee River below Blewett Falls. Most of the sturgeon captured or observed were in the Coastal Plain area of the river. Progress Energy captured no Atlantic sturgeon in the Blewett Falls tailwater area or in the fall line zone. However, there are a few records of sturgeon occurring above the coastal plain (PE, 2005). Based on their own surveys and other records, Progress Energy concluded that Atlantic sturgeon persist in the lower river and are likely utilizing various areas of the river during spawning and non-spawning periods (PE, 2005).

The federally listed shortnose sturgeon has been recently documented by the South Carolina Department of Natural Resources (SCDNR) in the South Carolina portion of the Pee Dee River (Collins, et al., 2003 cited in PE, 2005). Scientists radio tracked several of these fish and found them to be extensively using the Coastal Plain portion of the river. During the spawning period, three areas of the river were used by the radio-tagged fish, and spawning was confirmed in one of these three areas, located at rivermile 116.3 (approximately 0.2 miles upstream of Highway 34 at Cashua Ferry). The spawning habitat at this site was found to consist of emergent gravel bars, pebble to small cobble substrate, fast riffle currents, and a nearby deep channel areas (PE, 2005). During the non-spawning months (May through January) the radio tracked fish generally occupied the lower river near the freshwater-saltwater interface (PE, 2005).

There are few historical accounts of the catadromous American eel in the Yadkin-Pee Dee River (PE, 2005). According to PE (2005), Mills (1826) reported American eel present in Marlborough County. Records suggest that it is likely that eels ascended well into the upper Piedmont region of North Carolina (PE, 2005), though Jenkins and Burkhead (1993) indicated that American eel was unknown to extend into the Virginia portion of the basin (PE, 2005).

Today, American eel are common in the river below Blewett Falls Dam. Fish surveys conducted by Progress Energy in 2004 found American eel, comprised mainly of elvers and juveniles, to be a dominant fish species in the river reach below Blewett Falls. In addition, small numbers of American eel, including elvers, were colleted from all transects in the river reach below the Tillery development (PE, 2005). According to Progress Energy, the presence of American eel in this river reach indicates that some individuals are able to migrate past Blewett Falls Dam. To date, no American eel have been documented in the river or tributaries upstream of Tillery Dam (PE, 2005).

According to the U.S. Fish and Wildlife Service (USFWS), the river basin's diadromous fish stocks are diminished relative to historic levels (USFWS, et al., 2006). Continued harvest of some species of diadromous fishes may still act as a limiting factor to their restoration. Other factors that have contributed to the decline of diadromous fish species in the Yadkin-Pee Dee River likely include poor water quality in critical habitats, alterations to river flow, and lack of access to suitable spawning and nursery areas (USFWS, et al., 2006).

There are no fishways operating at any of the Yadkin Project developments. There are no fishways at Tillery Dam, the hydropower development located downstream of the Yadkin Project. An old fishway exists at Blewett Falls Dam, but it was determined to be ineffective and has not been operated for many years. As a result, there are currently no diadromous fish species that are known to occur in Yadkin Project waters. American eel have been documented upstream of Blewett Falls Dam, but have not been documented above Tillery Dam. Blueback herring and striped bass both occur in the Yadkin Project waters, but these are resident individuals that were introduced to the reservoirs via planned stockings or inadvertently via bait bucket.

The USFWS, along with SCDNR, National Marine Fisheries Service (NMFS) and NCWRC have prepared a Restoration Plan for the Diadromous Fishes of the Yadkin-Pee Dee River Basin: North Carolina and South Carolina (USFWS, et al., 2006). This Plan includes objectives for the restoration of diadromous fish in the river basin in several key areas including: 1) instream flows; 2) increased fish populations; 3) water quality, 4) habitat protection and enhancement; and 5) downstream passage. Target restoration species identified by the Plan include American shad, blueback herring, striped bass, Atlantic sturgeon, and shortnose sturgeon, and American eel. Other migratory species such as white bass, white perch and native suckers may benefit from restoration efforts, but are not specifically targeted in the Plan.

E.3.1.1.3 Other Aquatic Organisms (Mussels and Macroinvertebrates)

In response to agency comments, during the study phase of the relicensing process, APGI inventoried macroinvertebrates and mussels in the Yadkin Project waters. The focus of the inventories was on the four development tailwaters, where it was felt that freshwater mussels were most likely to exist.

Mussels and benthic macroinvertebrates were sampled seasonally by APGI along transects established in each of the tailwaters (NAI, 2005f Appendix E-5). Two transects were set up in each tailwater, one transect located near each powerhouse and the other located downstream in the lower tailwater. Mussel searches were conducted in each season by divers swimming along the length of each transect line. Divers searched at least one meter upstream and downstream of each transect line. Additional searches were conducted along the shoreline of each tailrace looking for mussel shells and by having divers search in areas identified by agencies as good mussel habitat that were not located along a transect line. Benthic macroinvertebrates were collected during summer (September 2003), fall (November 2003), and spring (June 2004) along each transect using an airlift in deep water and a kick net in shoal water. Benthic organisms were preserved in the field and returned to the laboratory for identification and counting. Additionally, the initial study effort included a detailed survey and description of the aquatic habitat found in each of the tailwaters. This work was accomplished by doing a detailed survey of substrate and other habitat characteristics along the transect lines.

A total of seven species of freshwater mussels were found in the four Project tailwaters (NAI, 2005f Appendix E-5). A summary of the mussel species found in each of the tailwaters is provided in Table E.3-3.

Table E.3-3: Mollusk Species Found in the Yadkin Project Tailwaters

Species	Falls Tailwater	Narrows Tailwater	Tuckertown Tailwater	High Rock Tailwater
Anodonta implicata (Alewife floater)	R	1		
Elliptio complanta (Eastern Elliptio)	328	16		
Elliptio cf. lanceolata (Pee Dee Lance)	113	1		
Lampsilis radiata (Eastern lamp mussel)	117	R		
Pyganodon cataracte (Eastern floater)	1	2		
Utterbackia imbecillis (Paper pond shell)	8	2	4	1
Villosa delumbis (Eastern creekshell)	8			
Total No. of Unionidae Species	7	6	1	1
Total No. of Individuals	575	22	4	1
Corbicula fluminea	A	A	A	A
Cipangopalucdinea chinensis (Chinese mystery snail)				231

Notes: R = represented by relics only
A = abundant

Falls tailwater had the greatest mussel diversity with seven species and 575 total individuals (NAI, 2005f Appendix E-5). In Falls tailwater, *Elliptio complanta* (Eastern Elliptio) was the most abundant (57 percent) mussel species, while *Elliptio cf. lanceolata* (Pee Dee Lance) (20 percent) and *Lampsilis radiata* (Eastern lamp mussel) (20 percent) were common. Narrows tailwater had six species with 22 total individuals. *Elliptio complanta* (73 percent) was the most abundant species within the Narrows tailwater. One specimen of *Anodonta implicata* (Alewife floater) was found within the Narrows tailwater. The only mussel species found in the Tuckertown and High Rock tailwaters was the *Utterbackia imbecillis* (Paper pond shell) with four individuals found in the Tuckertown tailwater and one in the High Rock tailwater. *Corbicula fluminea*, the Asiatic clam, is an invasive species that was abundant throughout all four tailwaters.

There were no federally endangered mussel species found within any of the four Project tailwaters (NAI, 2005f Appendix E-5). *Elliptio cf. lancolata* (Pee Dee Lance) is listed as endangered by the state of North Carolina and was found in the tailwaters of both Falls and Narrows. Two species, *Anodonta implicata* (alewife floater) and *Lampsilis radiata* (Eastern lamp mussel), are both listed as threatened by the state of North Carolina. *Anodonta implicata* was found in both Falls (relic shells only) and Narrows tailwaters. *Lampsilis radiata* was found in Falls and Narrows (relics only) tailwaters. *Villosa delumbis* (Eastern creekshell) is considered significantly rare by the North Carolina Natural Heritage Program and eight individuals were found within the Falls tailwater.

APGI's study also examined benthic macroinvertebrate communities in each of the tailwaters (NAI, 2005f Appendix E-5). Because of their limited mobility, benthic macroinvertebrates are often used as indicators of water quality and aquatic habitat quality. Generally speaking, a more diverse benthic community is indicative of better water quality. At the Yadkin Project, 6 phyla, 24 orders, and 41 families represented by 99 benthic macroinvertebrate species were found in the four Project tailwaters. Spring sampling in Falls tailwater yielded the highest number of species, with 53 found, and the summer sampling in High Rock yielded the lowest number of species, i.e., 29. The spring sampling in Narrows (12,008/12m^2) and Falls (10,172/12m^2) yielded the highest densities of individuals. The lowest numbers of individuals per sample were recorded in Falls (1,420/12m^2) and Narrows (1,333/12m^2) during the fall sampling. Table E.3-4 summarizes the percent composition of the most abundant benthic macroinvertebrate species in each of the four tailwaters during the three seasons of sampling.

Dominant species in Falls tailwater during the three sampling periods included *Corbicula fluminea* (Asiatic clam; summer and fall) and *Caecidota* sp. (isopod sp.; spring) (NAI, 2005f Appendix E-5). The three sampling periods in Narrows were dominated by *Rheotanytarsus* sp. (midge sp.; summer), *Corbicula fluminea* (fall), and *Caecidotea* sp. (spring). Tuckertown samplings were dominated by *Musculium transversum* (Fingernail clam; summer and fall) and *Caecidotea* sp. (spring). *Musculium transversum* was the dominant species in High Rock during the summer and spring, and *Caecidotea* sp. was dominant in the fall.

Table E.3-4: Percent Composition of the Dominant Benthic Macroinvertebrate Species by Sampling Season in the Yadkin Project Tailwaters

	September 2003				***November 2003***				***June 2004***			
SPECIES	**Falls Dam**	**Narrows Dam**	**Tucker-town**	**High Rock**	**Falls Dam**	**Narrows Dam**	**Tucker-Town**	**High Rock**	**Falls Dam**	**Narrows Dam**	**Tucker-town**	**High Rock**
Dugesia tigrina		9.3		7.6			6.2	12.5				
Corbicula fluminea	26.7				48.0	43.5			11.0	9.3		
Musculium transversum	15.1	9.6	38.2	43.7	6.2		53.2	28.3			18.6	35.2
Physella sp.									8.2			
Menetus dilatatus			6.3									
Dero sp.											14.1	
Slavina appendiculata										14.6		9.1
Lumbriculidae										10.0		
Caecidotea sp.	11.1	17.0	10.0	12.6	6.8	17.9	13.8	28.8	17.3	16.3	29.7	6.8
Hyalella azteca					11.1				8.2	6.8		
Cyrnellus fraternus		7.3										
Cricotopus sp.										15.0		
Dicrotendipes simpsoni			24.5	22.3				11.7				
Glyptotendipes sp.							9.2					9.2
Rheotanytarsus sp.		22.5										

E.3.1.1.4 Reservoir Aquatic Habitat

In response to agency comments, APGI conducted a comprehensive survey of aquatic habitat in the four Yadkin Project reservoirs. The survey entailed mapping aquatic habitats in the existing and potential drawdown zones of High Rock and Narrows reservoirs and the littoral zones of Tuckertown and Falls reservoirs. The study also examined the impacts to aquatic habitat under existing and alternative water level scenarios at High Rock and Narrows reservoirs.

Habitat surveys were conducted on the four Project reservoirs between December 2003 and August 2004 (NAI, 2005d Appendix E-4). Aquatic habitats were mapped within the existing drawdown zone of High Rock Reservoir, the littoral zone and a potential drawdown zone in Narrows Reservoir, and within the littoral zones of both Tuckertown and Falls Reservoirs. The habitat surveys at High Rock and Narrows occurred during the winter months when the reservoirs were drawn down below 15 ft to assist in the habitat mapping. The habitat surveys on Tuckertown and Falls took place during the summer of 2004 while the two reservoirs were drawn down between one and 2 ft below full pool. During each survey, a digital video camera was used to film the entire shoreline of each reservoir, further documenting the habitat and cover present. Habitat types in the reservoir drawdown and littoral zones that were mapped during this study included: 1) aquatic vegetation (wetlands); 2) trees and woody debris (brush, fallen trees, standing trees, stumps); 3) Christmas trees added for habitat enhancement; 4) docks; 5) riprap; 6) ledge; 7) boulder; 8) cobble; 9) gravel; and 10) mud/sand/clay. The results of the habitat mapping were entered into a Geographic Information System (GIS) database. This information, combined with bathymetry at High Rock and Narrows in 2-foot increments, allows for the determination of the amount of each type of habitat that may be impacted as water levels in these reservoirs change.

Results of the habitat mapping study, in terms of the amount of each habitat type available in the drawdown or littoral zone of each of the reservoirs, are summarized in Table E.3-5 (NAI, 2005d Appendix E-4). As shown, at High Rock, mud/sand/clay substrates accounted for approximately 79 percent of the drawdown zone between elevation 624 ft and 612 ft (12-foot drawdown). This substrate type provides poor quality habitat for most fish and other aquatic biota. High quality habitat types accounted for the remainder of the drawdown zone. Among the high quality habitats present, four wetland cover types (palustrine emergent, floodplain forest, shrub-swamp, and sparse shrub-swamp) comprised about 19 percent of the habitat. Other high quality habitats including rock substrates (0.56 percent), woody cover (0.63 percent) and docks (0.50 percent) comprised the remaining 2 percent of habitat within the drawdown zone. Similarly, at Narrows Reservoir, habitat within the upper 14 ft of the reservoir (elevation 508 ft. to 494 ft.) was dominated by poor quality mud/sand/clay substrates accounting for approximately 83 percent of the mapped habitat. Four wetland types comprised 8.4 percent of the habitat. Rock substrates (4.88 percent), woody cover (1.87 percent), and docks (1.01 percent) accounted for the remaining mapped habitats.

At the other two reservoirs, Tuckertown and Falls, only the high quality habitats found in the 2-foot littoral zone were mapped (NAI, 2005d Appendix E-4). At Tuckertown, wetland habitat types accounted for the majority (approximately 85 percent) of the quality habitat types within the littoral zone (palustrine emergent, floodplain forest, lacustrine aquatic plant beds, shrub-swamp, sparse shrub-swamp, and aquatic vegetation), while boulders were the dominant form of rock substrate accounting for 2.52 percent of the total habitat mapped, with lesser amounts of cobble (0.6 percent), riprap (0.17 percent) and ledge (0.11 percent). At Falls, wetland habitat types (palustrine emergent, floodplain forest, and shrub-swamp, and aquatic vegetation) accounted for the highest percentage of quality habitat mapped in the littoral zone (approximately 64 percent). Rock substrate, consisting of boulders (18.21 percent) and cobble (3.6 percent), and woody cover, including medium branched trees (13.76 percent), stumps (0.09 percent) and no branched trees (0.05 percent) were also found in Falls Reservoir.

Table E.3-5: Habitat Types Mapped in the Drawdown and Littoral Zones of the Yadkin Project Reservoirs

Habitat Type	High Rock Habitat Mapped between Elevation 624 ft and 612 ft (12-foot drawdown)		Tuckertown Habitat Mapped in Littoral Zone[1]		Narrows Habitat Mapped between Elevation 508 ft and 494 ft		Falls Habitat Mapped in Littoral Zone[2]	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Mud/sand/clay	4743.62	79.09%			1098.75	83.28%		
Boulder	10.87	0.18%	4.43	2.52%	25.41	1.93%	1.05	18.21%
Brush	2.37	0.04%	0.12	0.07%	0.25	0.02%		
Christmas Trees	0.67	0.01%			0.15	0.01%		
Cobble	3.48	0.06%	1.05	0.60%	22.92	1.74%	0.21	3.60%
Docks	29.88	0.50%	0.16	0.09%	13.34	1.01%		
Gravel	0.00	0.00%			4.26	0.32%		
Heavily Branched Trees	1.44	0.02%	0.08	0.04%	8.67	0.66%		
Ledge	4.59	0.08%	0.20	0.11%	6.57	0.50%		
Medium Branched Trees	29.95	0.50%	16.39	9.32%	10.42	0.79%	0.79	13.76%
No Branched Trees	0.49	0.01%	0.23	0.13%	0.18	0.01%	0.00	0.05%
Riprap	14.49	0.24%	0.30	0.17%	5.17	0.39%		
Stumps	2.98	0.05%	2.66	1.51%	4.97	0.38%	0.01	0.09%
Tires	0.01	0.00%						
Palustrine emergent	15.09	0.25%	27.27	15.5%	54.89	4.16%	1.99	34.66%
Floodplain forest	533.10	8.89%	24.42	13.88%	3.94	0.30%	0.05	0.83%
Shrub-swamp	193.16	3.22%	12.74	7.24%	1.10	0.08%	0.17	2.87%
Sparse shrub-swamp	411.49	6.86%	3.67	2.09%				
Lacustrine aquatic bed			10.72	6.09%	50.95	3.86%		
Aquatic vegetation			71.46	40.63%			1.49	25.97%
Misc. Man-made					0.06	0.00%		

[1] The full pool elevation of Tuckertown Reservoir is 564.7 ft (U.S. Geological Survey [USGS]). Percentages are the quality habitat types mapped within the 2-foot littoral zone. Areas classified as low quality habitat (mud/sand/clay) are not included.
[2] The full pool elevation of Falls Reservoir is 332.84 ft (USGS). Percentages are the quality habitat types mapped within the 2-foot littoral zone. Areas classified as low quality habitat (mud/sand/clay) are not included.

E.3.1.1.5 Habitat Fragmentation Study

In response to agency comments, during the study phase of the relicensing process, APGI conducted a Habitat Fragmentation Study of the Yadkin Project portion of the Yadkin River watershed (NAI, 2006 Appendix E-6). The focus of the study was on compiling existing information on the presence and status of populations of fish, mussels, and aquatic macroinvertebrates (snails, crayfish, etc.) within the portion of the Yadkin Project watershed that drains directly to the Yadkin Project reservoirs, including some of the Yadkin River mainstem, and to examine the distribution of these populations for evidence of fragmentation. More specifically, the stated objectives of the study were:

- Map in GIS layers the existing databases for fish, mussel, crayfish and snail species found in the Yadkin Project watershed that may be fragmented – including recent data collected by APGI at the Project
- Enlist the assistance of local experts with experience in fish, mussel, crayfish and snail populations in the region to get information on historic ranges if not found in existing databases, and to review/edit the GIS maps once compiled.
- Review the potential causes of any observed habitat fragmentation and the species or type of species that are usually affected by each cause.
- Map in GIS format the causes of habitat fragmentation, such as locations of dams, reservoirs, water quality, National Pollutant Discharge Elimination System (NPDES) discharges, natural barriers, Level IV ecoregion breaks, etc.

The study area consisted of the drainage area (4,189 square miles[1]) of the Yadkin River upstream of Falls Dam, and included the four Yadkin Project dams and reservoirs (High Rock, Tuckertown, Narrows or Badin, and Falls), and the Yadkin River and tributaries in central North Carolina.

Species occurrence and distribution for mussels, snails, crayfishes, and fishes were compiled from various data sources including NCWRC, North Carolina State Museum (NCSM), and Robert Dillon (College of Charleston) into four separate databases for mussels, snails, crayfishes, and fishes. Species identification and distribution from compiled databases and maps were reviewed by experts (mussels: Bogan, A., Ph.D., NCSM, Raleigh, NC; snails: Dillon, R., Ph.D., College of Charleston, Charleston, SC; crayfishes: Cooper, J.E., Ph.D., NCSM, Raleigh, NC; fishes: Starnes, W.C., NCSM, Raleigh, NC).

Layers of potential sources of habitat fragmentation included dams, NPDES discharge sites, watersheds, and ecoregion level IV breaks. A GIS layer was created from the database of the inventory of dams provided by the State of North Carolina. The symbology for this layer was categorized by each dam's primary purpose (hydroelectric, flood control, fish/wildlife pond, irrigation, fire protection/stock pond, water supply, tailings, debris/sediment, recreation, and other). A GIS layer for NPDES discharge sites was provided by North Carolina Center for Geographic Information and Analysis. A GIS layer was obtained from the U.S. Environmental

[1] This drainage area is taken from the Yadkin Habitat Fragmentation Study Maps Draft (NAI, 2006 Appendix E-6).

Protection Agency (USEPA) for ecoregion level IV areas, classified by similar ecosystems and habitat type.

Sixteen taxa and 13 species of mussels were identified from a total of 185 records within the study area (NAI, 2006 Appendix E-6). Seven of these were state RTE species. The Brook floater *Alasmidonta varicosa* and yellow lampmussel *Lampsilis cariosa* were state-listed endangered species and federally listed species of special concern that were observed in the South Yadkin and Yadkin River, respectively, upstream from the High Rock Dam. State-listed threatened species observed within the study area were the alewife floater *Anondonta implicata,* eastern lampmussel *L. radiata,* and creeper *Strophitus undulatus.* Alewife floater *A. implicata* was only identified from transects in the tailwaters of the Narrows and Falls Dams. Eastern lampmussel was observed upstream and downstream of the Yadkin Project dams; in the northern part of High Rock Reservoir and also in the tailwaters of Narrows and Falls Dams. The eastern creekshell *Villosa delumbis,* considered significantly rare by the National Heritage Program, was observed in Fourmile Branch upstream of High Rock Dam, Lick Creek downstream of High Rock Dam, and tailwaters of Falls Dam. The notched rainbow *V. constricta* (state-listed species of special concern) was observed in tributaries upstream and downstream of High Rock Dam. The Carolina slabshell *E. congaraea* (watch list species) was observed in Tuckertown Reservoir's Lick Creek.

Fifteen snail species were identified from a total of 255 records within the study area. At sites recorded with either presence or absence of snails, snails were absent from five sites. The pebblesnail *Somatogyrus virginicus* was a significantly rare species according to the North Carolina Heritage Program that requires continued monitoring. The pebblesnail was found upstream of High Rock Reservoir in South Yadkin River. The physa snail *Physa acuta* was distributed throughout the Yadkin drainage area, including tributaries that flow into High Rock and Tuckertown reservoirs.

Twenty-eight taxa and ten species of crayfishes were identified in the study area. State-listed RTE species observed in the study area included Greensboro burrowing crayfish *Cambarus (Depressicambarus) catagius* (special concern) and Chattahoochee crayfish *C. (Cambarus) howardi* (watch list). Distribution of crayfishes was limited to the tributaries of the reservoirs, but the extent of their distribution within the Yadkin Project reservoirs was limited due to the lack of sampling effort. The Greensboro burrowing crayfish was observed in Abbotts Creek and Pounders Fork which flow into High Rock Reservoir. The Chattahoochee crayfish was observed in tributaries north of High Rock in the South and Upper Yadkin watersheds. An introduced species, *Procambarus (Scapulicambarus) clarkii*, was observed in upper High Rock Reservoir near the mouth of South Potts Creek and north in the Yadkin River.

Specimens identified as *C. (D.) reduncus, P. (Ortmannicus) acutus, C. (Puncticambarus)* sp. C (*acuminatus* complex), *C. (P.) hobbsorum* were observed in tributaries north and south of the reservoirs, and throughout the surrounding watersheds suggesting little habitat fragmentation. *Cambarus (Hiaticambarus) longulus* and *C. (Cambarus) bartonii, Orconectes (Procericambarus) cristavarius* and possible members of these species were confined to the upper Yadkin watershed (NAI, 2006 Appendix E-6).

Eighty taxa of fishes were identified from 7,382 records within the study area. Thirteen species found in the study area were nonnative to the region and two additional species were possibly nonnative. The fish records represent a wide distribution throughout the study area. The Carolina Redhorse *Moxostoma* sp. was a state-listed threatened species and federal-listed species of concern found in the study area. The Carolina Redhorse was only identified in the tailwaters of Falls Dam. Some diadromous fishes, such as striped bass *Morone saxatilis* and blueback herring *Alosa aestivalis* have been found throughout the Yadkin Project waters.

The fantail darter complex *Etheostoma* sp. (cf *E. flabellare*) include several similar forms such that *E. brevispinum* occupy the upper portion of the Yadkin River down to but not including the Uwharrie River and Rocky River subbasins, downstream of Falls Dam. Another taxon that is similar to, or conspecific with, *E. flabellare* occurs in other areas, but has been mapped as a complex because of uncertainty of the taxonomy of the data (NAI, 2006 Appendix E-6).

As part of the study, NAI also mapped the location of other factors that may contribute to habitat fragmentation including dams and NPDES discharges that were found to be widely distributed throughout the Yadkin drainage area. A total of 787 dams were identified in the study and included in a GIS layer. Most of the dams were built primarily for recreation (473), fire protection/stock pond (110), irrigation (77), flood control (55), water supply (22), fish or wildlife pond (21), debris/sediment control (4), hydroelectric (4), and other purposes (21). The Colleemee Dam was the only non-APGI hydroelectric dam found in the study area. Many (225) NPDES discharge sites were also found to occur within the study area and included in a GIS layer. Finally, NAI mapped Level IV ecoregions categorized by the USEPA, with similar habitat types and ecosystems that were mapped within the study area included Carolina Slate Belt, Eastern Blue Ridge Foothills, New River Plateau, Northern Inner Piedmont, Sauratown Mountains, Southern Crystaline Ridges and Mountains, Southern Outer Piedmont, and Triassic Basins.

The location of the aquatic species mapped by NAI did not reveal any obvious patterns of distribution or fragmentation in the study area. Aquatic species distribution may be limited due to a variety of natural and anthropogenic barriers. Species distribution might be limited because they are reproductively isolated from a lack of mixing among populations. Populations or groups of a species might be isolated by watersheds, river systems, ecoregions, habitat type, and water quality or flow. Habitat might also change as the result of dams, pollution, agriculture effects, and invasion of nonnative species. Distribution of species might depend on abundance or presence of another species either for prey or reproduction, such as mussels that require a fish host (NAI, 2006 Appendix E-6).

In addition, NAI noted that conclusions about species distribution and degree of fragmentation must be considered with caution because of certain limitations in the data used to create the GIS layers (NAI, 2006 Appendix E-6). For example, many of the species locations mapped in the study were drawn largely from museum collections and do not adequately reflect sampling effort. The number of sites and effort to obtain all of these records were not random, standardized or necessarily known. Other records, particularly those received from NCWRC, were from surveys conducted at bridge crossings and readily accessible points that may not be representative of all habitat types.

Although the distribution of the data has to be viewed cautiously, NAI concluded that there were some observations worth noting. The numerous dams widely distributed throughout the study area are potential contributors to the fragmentation of aquatic species, particularly anadromous fishes. Habitat type on a large scale as Level IV ecoregions did not appear as a major cause of habitat fragmentation for aquatic biota mapped, but impacts on habitat at a fine scale for a limited area within the Yadkin Project was reported in detail in the Yadkin Reservoir Fish and Aquatic Habitat Assessment (Appendix E-4). In some areas, concentration of NPDES discharge sites may indicate suboptimal conditions for species in question. Dissolved oxygen levels in some reservoirs and tailwater areas during warm months have been shown to be suboptimal for many aquatic species from previous studies. Water masses of suboptimal quality (temperature or dissolved oxygen) can form barriers for aquatic species and delimit their distribution or change their movements, but are often difficult to interpret as two-dimensional GIS layers because of their shifting patterns in depth and time. All of these factors individually or in combination could have fragmentation effects on certain populations of aquatic species. However, NAI was unable to discern any specific patterns of fragmentation among species, or attribute fragmentation to any particular cause (NAI, 2006 Appendix E-6).

E.3.1.2 Effects of Current Project Operation on Fish and Aquatics

E.3.1.2.1 Effects on Reservoir Habitat and Fish

APGI examined the potential impacts to aquatic habitats and fish associated with current reservoir operating regimes and the resulting water level fluctuations (NAI, 2005d Appendix E-4). Results of the study demonstrated that there is very little impact to aquatic habitat or fish populations associated with the current operation of Tuckertown and Falls reservoirs. Both reservoirs are operated as essentially run-of-river developments and therefore neither reservoir experiences any seasonal drawdowns. Short term fluctuations do occur at both reservoirs (on a daily or weekly basis), typically 0-3 ft at Tuckertown and 0-4 ft at Falls. In neither case do short term fluctuations appear to be significantly impacting aquatic habitats or their use by fish (NAI, 2005d Appendix E-4). Reservoir fluctuations, even short term fluctuations, may have some impact on fish during the spring spawning season, when many species need access to high quality shallow water habitats. But, study results demonstrate that in most years, reservoir water levels in both reservoirs appear to remain relatively constant during the spring spawning season. In addition, voluntary efforts by APGI to stabilize reservoir water levels during the spring spawning season has led to more stable water levels during the most critical time.

Like Tuckertown and Falls, Narrows Reservoir is generally operated as a run-of-river facility, resulting in short-term reservoir fluctuations of about 0-3 ft. However, there is some storage available in Narrows Reservoir and historically APGI has utilized this storage to help meet downstream flow requirements during periods of low river flow. This has resulted in a fairly typical pattern of a modest lowering of the reservoir elevation during the late summer and early fall of, on average, 2-3 ft. This modest change in reservoir water level over the course of the summer does result in some impacts to aquatic habitats and their uses (NAI, 2005d Appendix E-4). Some areas of aquatic vegetation (water willow beds) become dewatered later in the summer forcing fish and other organisms (if they are mobile) to seek cover elsewhere. However, the overall good health of the reservoir fishery suggests that these impacts are small. Moreover, voluntary efforts by APGI in recent years to maintain relatively stable water levels during the spring spawning period (mid-April to mid-May) ensure that critical shallow water habitats are available during this most important season.

As part of its study of aquatic habitat, NAI estimated the number of acres of critical habitat types located within 2-foot contours of the upper 16 ft of Narrows Reservoir. These estimates provide a means of considering how much critical habitat would be dewatered under various operating scenarios for Narrows Reservoir. Under existing operations, Narrows is typically operated within 3 ft of full, year round. As shown in Table E.3-6, a total of approximately 74 acres and 135 acres of high quality aquatic habitat are exposed when water levels are drawn down 2 ft and 4 ft from full, respectively. Assuming that habitat is generally linearly distributed throughout the reservoir between elevations 510 and 506, the average of these numbers (105 acres) can be used to estimate the amount of high quality habitat that is typically exposed within the upper 3 ft of Narrows Reservoir under existing operations. The remaining 203 acres of high quality habitat found within the upper 16 ft of Narrows Reservoir is generally protected and would only be exposed during infrequent periods when APGI utilizes available storage in Narrows Reservoir down to 6.6 ft (elevation 503.4).

Table E.3-6: High Quality Habitat in the Upper 16 ft of Narrows Reservoir in 2-foot Contour Intervals

Habitat Type	**Elevation**							
	510-508	**508-506**	**506-504**	**504-502**	**502-500**	**500-498**	**498-496**	**496-494**
	Acres	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
Lacustrine Aquatic Beds	6.82	10.72	12.38	10.71	8.04	5.45	2.60	1.04
Palustrine Emergent	25.46	29.72	17.98	5.41	1.28	0.33	0.12	0.05
Floodplain Forest	28.63	2.63	0.70	0.19	0.09	0.09	0.23	0.01
Shrub-swamp	1.29	0.51	0.29	0.14	0.06	0.05	0.03	0.03
Docks	2.18	3.40	4.04	3.89	1.54	0.63	0.22	0.09
Misc. Man-made	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03
Boulder	2.10	2.42	4.51	4.41	4.73	3.96	3.18	2.20
Brush	0.00	0.04	0.04	0.03	0.04	0.03	0.04	0.02
Christmas Tree	0.01	0.01	0.01	0.00	0.01	0.04	0.04	0.04
Cobble	1.93	3.26	3.88	3.88	3.59	3.43	2.91	1.97
Gravel	0.18	0.49	0.73	0.70	0.70	0.69	0.62	0.33
Heavy Branched Tree	1.58	2.76	2.35	1.43	0.94	0.61	0.36	0.21
Ledge	0.83	0.94	1.28	1.23	0.86	0.91	0.78	0.56
Medium Branched Tree	1.65	3.07	2.78	1.84	1.07	0.63	0.50	0.54
No Branched Tree	0.03	0.02	0.02	0.03	0.03	0.04	0.03	0.02
Rip rap	0.88	1.07	1.16	1.12	0.69	0.39	0.38	0.37
Stumps	0.00	0.01	0.06	0.47	0.49	0.53	1.60	1.82
TOTAL	**73.57**	**61.07**	**52.20**	**35.49**	**24.14**	**17.82**	**13.65**	**9.33**

High Rock Reservoir, which is operated as a store-and-release facility, produces a very different pattern of water levels, which NAI's study found has more significant impacts on aquatic habitat and fish (NAI, 2005d Appendix E-4). Under current operations, High Rock Reservoir is operated with a seasonal winter drawdown of 12 ft, on average. In addition, available storage in High Rock is utilized by APGI over the course of the summer to help meet downstream flow requirements, resulting in a typical pattern of a decrease in reservoir elevation of up to 5 ft over the course of the summer. Short-term fluctuations (daily and weekly) at High Rock Reservoir, however, are small, generally on the order of one foot or less.

As part of the study of aquatic habitat in High Rock Reservoir, NAI quantified the amount of high quality habitat (acres) located in the upper 12 ft of the reservoir, in 2-foot increments (Table E.3-7). The distribution of these high quality habitats within the upper 12 ft of the reservoir drawdown zone suggests some impacts to aquatic habitat, fish, and other aquatic biota associated with the current operation of High Rock. There is a loss of about 1,386 acres of quality habitat in the 12-foot drawdown zone over the course of the fall and winter for use by fish and other biota. Fish are mobile and may find cover and habitat elsewhere in the reservoir as water levels recede. However, fish, especially young fish, become vulnerable to predation when they are forced to move into open water or seek cover elsewhere. The habitat mapping done as part of this study demonstrates that about 63 percent of the high quality habitat found in High Rock Reservoir is located in the upper 6 ft of the 12-foot reservoir drawdown zone. Thus, a slow drawdown of the reservoir by as much as 5 ft over the course of the summer results in the loss of a portion of the high quality habitat available to fish. Again, the fish that are likely most affected by this reduction in summer water levels are young fish that require the cover and protection of the high quality habitats to escape predation and mature.

Table E.3-7: High Quality Habitat in the Upper 12 ft of High Rock Reservoir in 2-foot Contour Intervals

Habitat Type	Elevation						
	624-622	**622-620**	**620-618**	**618-616**	**616-614**	**614-612**	**<612**
	Acres	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**	**Acres**
Boulder	1.23	0.92	1.42	2.19	2.67	2.52	11.46
Brush	0.33	0.36	0.51	0.27	0.37	0.60	1.39
Christmas Tree	0.01	0.05	0.16	0.11	0.16	0.19	0.50
Cobble	0.28	0.33	0.58	0.60	1.02	0.69	2.54
Heavy Branched Tree	0.25	0.29	0.93	0.21	0.34	0.03	0.02
Medium Branched Tree	6.92	8.25	9.49	4.19	2.16	0.95	1.88
No Branch Tree	0.06	0.04	0.06	0.01	0.02	0.01	0.01
Stumps	0.14	0.04	0.12	0.18	0.51	1.98	39.92
Gravel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ledge	1.02	0.84	1.35	0.48	0.73	0.47	0.47
Misc.	0.00	0.16	0.66	0.02	0.00	0.00	0.00
Rip rap	2.54	2.29	2.64	2.49	2.09	2.50	9.06
Tires	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Palustrine Emergent	2.38	7.55	3.22	0.70	0.71	0.00	0.00
Floodplain Forest	353.64	141.07	53.11	31.23	9.74	2.43	0.03
Shrub-swamp	23.64	49.75	70.20	27.45	16.65	0.87	0.45
Sparse Shrub-swamp	15.99	15.25	77.59	170.64	106.78	28.50	3.16
Docks	5.13	5.64	7.60	6.01	3.95	1.58	1.19
TOTAL	**413.54**	**232.83**	**229.64**	**246.76**	**147.88**	**43.32**	**72.07**

The study also found that at High Rock most of the important shallow water habitats used by fish for spawning (cobble, gravel, and vegetation) are located in the upper most portion of the reservoir drawdown zone. In order to maximize the availability of these habitats to spawning fish, the study suggests that High Rock Reservoir water levels should be near full during the April - May period, when most reservoir fish species spawn. Currently, APGI operates High Rock voluntarily to try to maintain relatively stable water levels during the mid-April to mid-May period to help enhance fish spawning in the reservoir. As shown in Table E.3-8, this voluntary operation helps to ensure that water levels remain relatively stable through a significant portion of the spawning season for most species, including species of management priority such as largemouth bass, crappie, and sunfish.

Changing water levels also play a role in the success of fish spawning, especially crappie spawning. Black and white crappie use brushy cover in the littoral zone for spawning. According to researchers, successful crappie recruitment appears to be related to high inflows entering a reservoir just prior to the spring spawning season (NAI, 2005d Appendix E-4). Research suggests that crappie respond to these inflows and rising reservoir levels with increased spawning activity as it may mimic the natural flooding that would ordinarily trigger these fish to spawn (NAI, 2005d Appendix E-4). Thus, rising water levels before and during the crappie spawning season can increase crappie production along with that of other fish species spawning in the littoral zone.

Table E.3-8: Spawning Times for Fish Species Found in Falls, Narrows, Tuckertown and High Rock Reservoirs

Common Name	J	F	M	A	M	JN	JL	A	S	O	N	D	Range	Temperature	Substrate
Longnose gar													3Apr-4May		shallow, heavy vegetation
Bowfin													2Mar-4May	16-19ºC	
Gizzard shad													1May-2Jun		shallow water
Threadfin shad													Apr-Sep	21ºC	shallow shorelines, boulders, logs debris
Blueback herring													Mar		
Alewife *													Mar		
Common carp													Mar-Jun		shallow, submerged vegetation
Goldfish													Mar-May		submerged vegetation
Golden shiner													4Apr-1Aug	68-80 ºF	submerged vegetation
Bluehead chub *													Apr-Jun		
Eastern silvery minnow													Mar-May		
Satinfin shiner													3Apr-1Jul		
Spottail shiner													4Apr-4May		
Spotted sucker													2Apr-3May	12.2-19.4ºC	shallow gravel shoals
White sucker													2Mar-4Apr	10ºC	gravel areas
Quillback													4Apr-3May		
Creek chubsucker													Mar-1May	17-18ºC	gravel substrate, slow water
Smallmouth buffalo													1Mar-2Jun	15-16ºC	1-6m submerged vegetation
Silver redhorse													Mar-1Apr	14-15ºC	gravel shoal areas
Shorthead redhorse													2Apr-2May	14ºC	gravel shoals (15-21cm)
Flathead catfish													Jun-2Jul		spawning shelters
Blue catfish													Apr-May		
Channel catfish													4May-1Jul	22-30ºC	spawning shelters
Yellow bullhead													Apr-2May		
Flat bullhead													Jun-Jul	21-24ºC	
Snail bullhead													4Mar-1Jun		
White catfish													3May-3Jun		
Black bullhead *													2Apr-2Jun		gravel substrate
Brown bullhead *													Apr-1May	21ºC	
Eastern mosquitofish *													Apr-Aug		
White perch													1Mar-2Apr		
Striped bass													3Mar-4Apr	15ºC	mid-water, eggs must stay suspended
White bass													Mar-4Apr		mid-water- demersal eggs
Redbreast sunfish													4Apr-Jun		nests in sandy substrate

Table E.3-8: Spawning Times for Fish Species Found in Falls, Narrows, Tuckertown and High Rock Reservoirs (continued)

Common Name	J	F	M	A	M	JN	JL	A	S	O	N	D	Range	Temperature	Substrate
Warmouth													2May-Aug		shallow, silty debris near cover
Green sunfish													1May-Aug		sunny areas near cover
Bluegill													1May-Oct		shallow gravel substrate
Pumpkinseed													1May-Oct		shallow water, less the 1m
Redear sunfish													May-Aug		shallow water
Largemouth bass													1May-Jun		firm substrate along shallow edges
Smallmouth bass													Apr-1Jun	15-18ºC	coarse gravel, less then 1m
White crappie													1Apr-1Jun		shallow protected areas near brush
Black crappie													1Apr-1Jun		shallow protected areas near brush
Yellow perch													2Feb-Mar		vegetation, brush, sand and gravel
Tesselated darter													Mar-May		
Johnny darter *													1Apr-2May		clear areas under submerged objects

Source: NAI Reservoir Fish and Aquatic Habitat Assessment, 2005 (NAI, 2005d Appendix E-4)
* Species captured by Carolina Power & Light sampling in 2000.

E.3.1.2.2 Effects on Tailwater Fish and Aquatic Biota

One of the objectives of the tailwater study was to consider impacts from Project operations on aquatic biota in the Project tailwaters (NAI, 2005f Appendix E-5). Two types of impacts were considered potentially significant at the Yadkin Project: 1) the effects of low tailwater dissolved oxygen; and 2) the effects of Project peaking operations on fish stranding.

Water Quality Effects

During the tailwater fish collections made in 2003 and 2004, NAI analyzed the differences in fish catches during periods of higher DO levels (5 mg/l or greater) and of low DO levels (at least a 2 mg/l drop) over two 24-hour periods (NAI, 2005f Appendix E-5). In both instances, the change in tailwater DO resulted from going from full generation down to no generation. The first test occurred during the summer collections at Narrows. During this collection period, of the 18 fish species collected, 15 had fewer individuals captured during the low DO period. In the second test that occurred during the fall sampling at Narrows, significantly fewer species were captured during the low DO period, and of the 21 fish species, 17 had fewer individuals collected during the low DO period. It is not known if the fish ceased or slowed their movements during the low DO tests making them less available for capture or moved out of the tailwater area.

Overall, the fish populations currently found in the four Yadkin Project tailwaters have been shaped by stocking and current Project operations, including the routine peaking flows and low DO concentrations that occur in three of the four tailwaters (all but Falls) between 20 and 29 percent of the year during an average year. Many of the fish species present in the tailwaters are tolerant of marginal water quality, such as gizzard shad, white perch and largemouth bass, and this is why these species dominate the catches in the Yadkin Project tailwaters. Fish species that cannot tolerate marginal water quality (especially low DO), such as some of the darter and minnow species were generally absent from the tailwaters.

Study results suggest that tailwater macroinvertebrates are also affected by water quality, particularly low dissolved oxygen levels (NAI, 2005f Appendix E-5). As discussed in detail in Exhibit E.2.3.1.1, at each dam, both surface and bottom water from the upstream reservoir is entrained and mixed during passage through the turbines, which can cause low dissolved oxygen concentrations in the tailwaters. The species composition and diversity of macroinvertebrates sampled in the High Rock and Tuckertown tailwaters were generally indicative of poor water quality. In the Narrows and Falls tailwaters, the macroinvertebrate communities were generally indicative of fair water quality.

Similar water quality effects were also evident for the mussel species (NAI, 2005f Appendix E-5). Although freshwater mussels were found in all four Project tailwaters, the number of species found in each tailwater increased moving downstream. Research shows that there is a strong link between reduced DO and losses in mussel diversity, and it is believed that the observed pattern of increasing mussel diversity in the tailwaters from upstream to downstream likely reflects improving tailwater water quality conditions from upstream to downstream. In the High Rock and Tuckertown tailwaters, only one mussel species was collected during all three sampling periods. In the Narrows tailwater area, six mussel species were collected (22 individuals). In the

Falls tailwater, which had the best water quality conditions and the highest DO levels, seven mussel species (575 individuals) were found. However, in addition to having the best water quality, the Falls tailwater also had the most habitat suitable for mussels of the four tailrace areas.

Fish Stranding

The potential for fish stranding was also examined as part of the tailwater study. As the Yadkin Project developments are operated primarily as peaking facilities, there are rapid changes in tailwater flows as turbines are turned on and off with generation demands. Depending on the configuration of the tailwaters, these rapid flow changes can result in significant changes in water levels and wetted perimeter and can lead to the stranding of fish that are unable or reluctant to move from habitats that become dewatered. To determine if stranding is a problem in the four Yadkin Project tailwaters, as part of the overall Tailwater Study, NAI evaluated the stranding potential in each of the tailwaters by observing the entire tailwater area during both full and non-generation conditions. Throughout the multiple sampling events conducted by APGI, there was no stranding of fish observed at any time, in any locations, in any of four Project tailwaters (NAI, 2005f Appendix E-5). Moreover, observed drops in tailwater water levels were minor (one foot or less) at each site after generation went from full or near full down to no generation. The lack of conditions that might produce stranding in the four tailwaters is primarily a result of the fact that all four Project developments discharge into a downstream reservoir, rather than a free-flowing river reach. Thus, even after discharge from a development is reduced to zero, the downstream tailwater areas generally remain well inundated.

E.3.1.2.3 Fish Entrainment

In response to comments on the Yadkin Project Relicensing Initial Consultation Document filed with the Federal Energy Regulatory Commission (FERC) in 2002, APGI conducted a study to examine the potential for impacts to fish due to entrainment at the Yadkin Project developments. The resulting Fish Entrainment study conducted by NAI evaluated the potential for entrainment of resident fishes at the four Yadkin Project powerhouses; evaluated the potential for entrainment of four diadromous fish species, alewife, Blueback herring, American shad and American eel, which are candidates for possible reintroduction to Yadkin Project waters; and evaluated fish survival rates at each development taking into account site specific data such as turbine type, turbine rotational speed (rpm), and size of entrained fish (NAI, 2005a Appendix E-7).

The fish entrainment evaluation was conducted as a desk-top evaluation using existing literature and data from the Electric Power Research Institute (EPRI) on fish entrainment at other hydroelectric projects for species relevant to the Yadkin Project (NAI, 2005a Appendix E-7). The fish species considered in the evaluation were those identified by the fishery agencies and the Fish and Aquatics Issue Advisory Group (F&A IAG) as important management species and included both resident fish such as largemouth bass, black crappie, and stocked striped bass and four diadromous fish species (alewife, Blueback herring, American shad, and American eel). For species of management interest that were not represented in the EPRI database, evaluations were made using representative surrogate species included in the EPRI database.

The study considered the potential for entrainment based on a number of physical characteristics of the Project reservoirs, dams, and powerhouses. Some key characteristics considered were the location and depth of the powerhouse intakes, the potential abundance of fish in the littoral zone, the propensity of fish to migrate, reservoir water levels, the approach velocities at the intakes, and the hydraulic capacity and configuration of the turbines (NAI, 2005a Appendix E-7). The study also considered the potential for fish survival in the event of entrainment into and through the Project turbines. The mortality/survival assessment was also based on an extensive review of literature and existing data and considered the important physical characteristics of the units, as well as the biological characteristics of the various fish species. Some of the important factors considered in this portion of the assessment included turbine type, turbine speed, and intake and tunnel characteristics.

Overall, the results of the Entrainment Study indicate that the potential for impact to fishes due to entrainment and turbine passage is low at the four Yadkin Project developments (High Rock, Tuckertown, Narrows and Falls) (NAI, 2005a Appendix E-7). Although the entrainment potential for certain fish species was found to be high to moderate-high at all four developments, the overall potential mortality rates for fish entrained at the four developments was estimated to be low.

Generally, the entrainment potential for small fish was higher than for medium and large fish, with alewife and gizzard shad (and by surrogate Blueback herring, American shad, and threadfin shad) having the highest potential for entrainment in reservoirs where they are abundant (NAI, 2005a Appendix E-7). Small yellow perch had a high entrainment potential while the potential for entrainment of small bluegill and other sunfish, black crappie, white perch, channel catfish, blue and white catfish (as suggested by surrogates), and largemouth bass was moderate-high. The entrainment potential of small striped bass (based on the surrogate white bass) and juvenile American eel was judged to be low.

At High Rock, APGI’s study concluded that the overall impact to fishes due to entrainment and turbine passage is low (NAI, 2005a Appendix E-7). High Rock Development does possess certain risk factors that suggest entrainment rates are likely to be high or moderate-high. In addition, High Rock is unique among the Yadkin developments because of the annual winter drawdown (12-foot average). The reduced reservoir volume in late fall and winter along with clupeid (primarily threadfin and gizzard shad) movements to lower reservoir areas, places these forage species and potentially their predators at somewhat higher risk of entrainment than at the other reservoirs. However, because the High Rock turbines are large and rotate slowly, survival rates of the small fish that are most likely to be entrained are expected to be high. Thus, while entrainment rates at High Rock are likely to be high due to the prevalence of shad, the overall impact to fishes due to entrainment and turbine passage at the High Rock Development is expected to be low for all species considered due to the relatively benign turbine characteristics. The fact that High Rock supports a successful and popular sport fishery supports this conclusion.

At Tuckertown, APGI concluded that the overall potential impact to fishes due to entrainment and turbine passage is low (NAI, 2005a Appendix E-7). Like High Rock, the Tuckertown Development also has abundant clupeids and other risk factors that can cause high or moderate-high entrainment rates, except there is no winter drawdown. However, the Tuckertown

Development houses large slow Kaplan turbines, generally the most benign turbine type for the fishes of concern in APGI's Fish Entrainment Study. Thus, in spite of the high to moderate-high entrainment potential, expected high survival rates during turbine passage suggest that the overall potential impact due to entrainment at Tuckertown is low.

The entrainment and survival risk factors for fishes in Narrows Reservoir are similar to those for the Tuckertown Development, with a few exceptions. Penstock pressure at Narrows is slightly more than two atmospheres (approximately 70 psi) at the turbine entrance which could affect entrained fish depending upon the depth of the fish when it enters the intake (NAI, 2005a Appendix E-7). The fish most likely to be entrained at Narrows would be pelagic clupeids that may experience brief disorientation but no additional mortality prior to reacclimation upon reaching the tailrace. In addition, the Narrows Development utilizes Francis turbines rather than Kaplans, but the Francis units at Narrows rotate at a slow speed, which minimizes their potential impacts on fish. A final difference between Narrows and the other three developments is the design head of 175 ft compared to 52-55 ft of head at the other three sites. However, high head alone does not necessarily exacerbate turbine passage mortality. The potential entrainment of fishes at Narrows Development is probably high for clupeids (shad) and moderate-high for other fishes. However, given the specific turbine configurations, fish survival during turbine passage is at least moderate to high. Thus, given the overall abundance of Narrows Reservoir fishes and the overall health of the sport fisheries for striped bass, largemouth bass, and catfishes, any impact due to entrainment mortality is probably low.

At the Falls Development, APGI's study concluded that the overall impact to fishes due to entrainment and turbine passage is low (NAI, 2005a Appendix E-7). The potential for fish entrainment at the Falls Development was judged high due to the abundance of clupeids, and moderate-high for other types of abundant species, including yellow perch. In addition, the location of the Falls intakes is closer to reservoir shorelines (approximately 50 ft), than at the other Yadkin developments, a factor that could increase entrainment potential. However, due to the steep character of littoral zone habitat near the dam and powerhouse, it is likely to be inhabited by few fish. Moreover, the powerhouse contains one large, slow Francis unit, and two large, slow propeller runners with few blades that operate at low design head. These features enhance the likelihood of fish survival during turbine passage. Thus, the overall potential for impacts to fishes due to turbine entrainment at Falls Development is low.

E.3.1.2.4 Effects of Instream Flows on Downstream Habitat

The effects of Yadkin Project flow releases on aquatic habitat located downstream of the Blewett Falls Dam was raised as an issue by several resource agencies during initial consultation on the Yadkin Project. For Progress Energy's (PE) Yadkin-Pee Dee Project (FERC No. 2206), the agencies' interest was in establishing instream flow regimes, including minimum flow requirements, for the Tillery and Blewett Falls developments that would support desired aquatic habitat conditions in the free-flowing river reach below Tillery and in the lower river below Blewett Falls. Relative to the Yadkin Project, the agencies' primary interest was determining the volume and timing of minimum flow releases from the Yadkin Project necessary to maintain habitat conditions for fish and mussels in the river below Blewett Falls.

The investigation of this issue proved to be very complex due to the interaction of the two different Projects. As there is essentially no storage in Falls Reservoir, and only limited storage in Narrows Reservoir, flows released from Falls Dam are essentially those that are released out of storage from High Rock Reservoir. Moreover, flows released from Falls Dam are reregulated by Progress Energy through the operation of the Tillery and Blewett Falls developments.

The direct effects of flows on downstream aquatic habitat were evaluated through an Instream Flow Study conducted by Progress Energy (PE, 2005). The Instream Flow Study Plan was developed by PE, in consultation with resource agencies, non-governmental organizations (NGOs) and APGI, through the establishment of an Instream Flow Subgroup. The Instream Flow Subgroup met approximately monthly beginning in June 2003 to develop a study plan, review study results, and most recently to discuss possible instream flow regimes for the two Projects.

The goal of the Instream Flow Study was to determine how flow variation in the river may affect the aquatic habitat for fish, mussels, and other aquatic organisms. The study also examined the flow effects on boating navigability in certain river reaches (PE, 2005). The Instream Flow Study used the Instream Flow Incremental Method (IFIM). A major component of the IFIM is the Physical Habitat Simulation Model (PHABSIM), a model which simulates the relationship between river flow and identified habitat types. The results of the Instream Flow Study conducted for the Yadkin-Pee Dee River are provided in a study report found in an appendix to Progress Energy's Application for New License for the Yadkin-Pee Dee River Hydroelectric Project (FERC No. 2206). A Technical Memorandum appended to this License Application describes the use and interpretation of the Instream Flow Study to evaluate APGI's flow proposal (Dilts and Leonard, 2006 Appendix E-8).

The Yadkin-Pee Dee Instream Flow Study examined flow/habitat relationships in three river reaches:

- Reach 3 (R3) – A 20.5 mile free-flowing river reach extending from the Tillery Dam to the headwaters of Blewett Falls Reservoir. Reach 3 was further subdivided into 3 subreaches (Figure E-7).

- Reach 2 (R2) – A 23.4 mile reach extending from Blewett Falls Dam to just above U.S. Highway 1/S.C. Highway 9. This reach was further subdivided into three subreaches. This reach is located in the Fall Line zone of the river (Figure E-8).

- Reach 1 (R1) – a 64.6 mile reach in South Carolina extending from U.S. Highway 1/S.C. Highway 9 down to S.C. Highway 301 near Florence, South Carolina. This reach was further subdivided in to 3 subreaches. This reach is located in the Coastal Plain area of the river (Figure E-8).

**Figure E-7: Yadkin-Pee Dee River Instream Flow Study Reach 3 (R3)
Tillery Dam to Blewett Falls Dam**

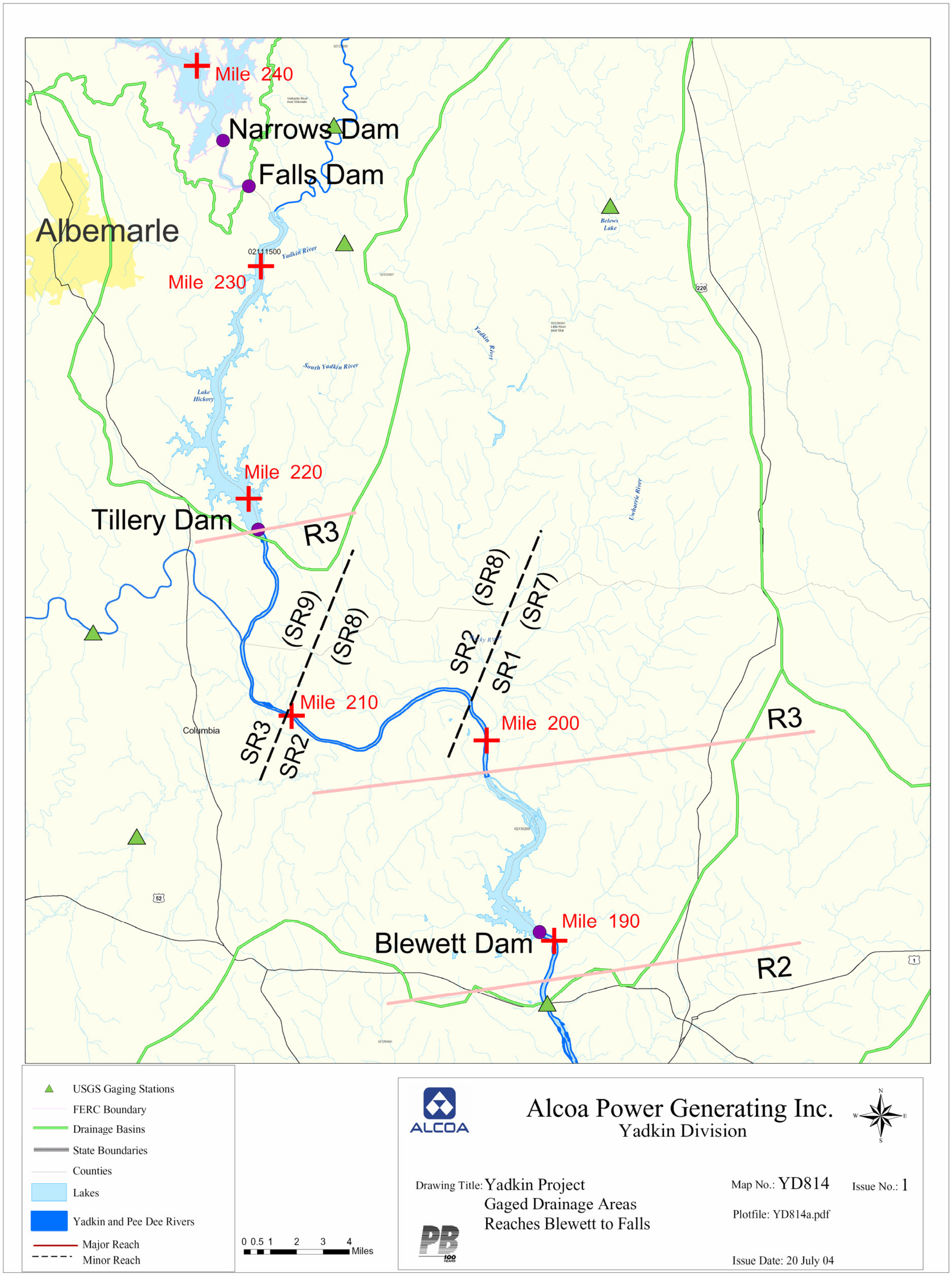
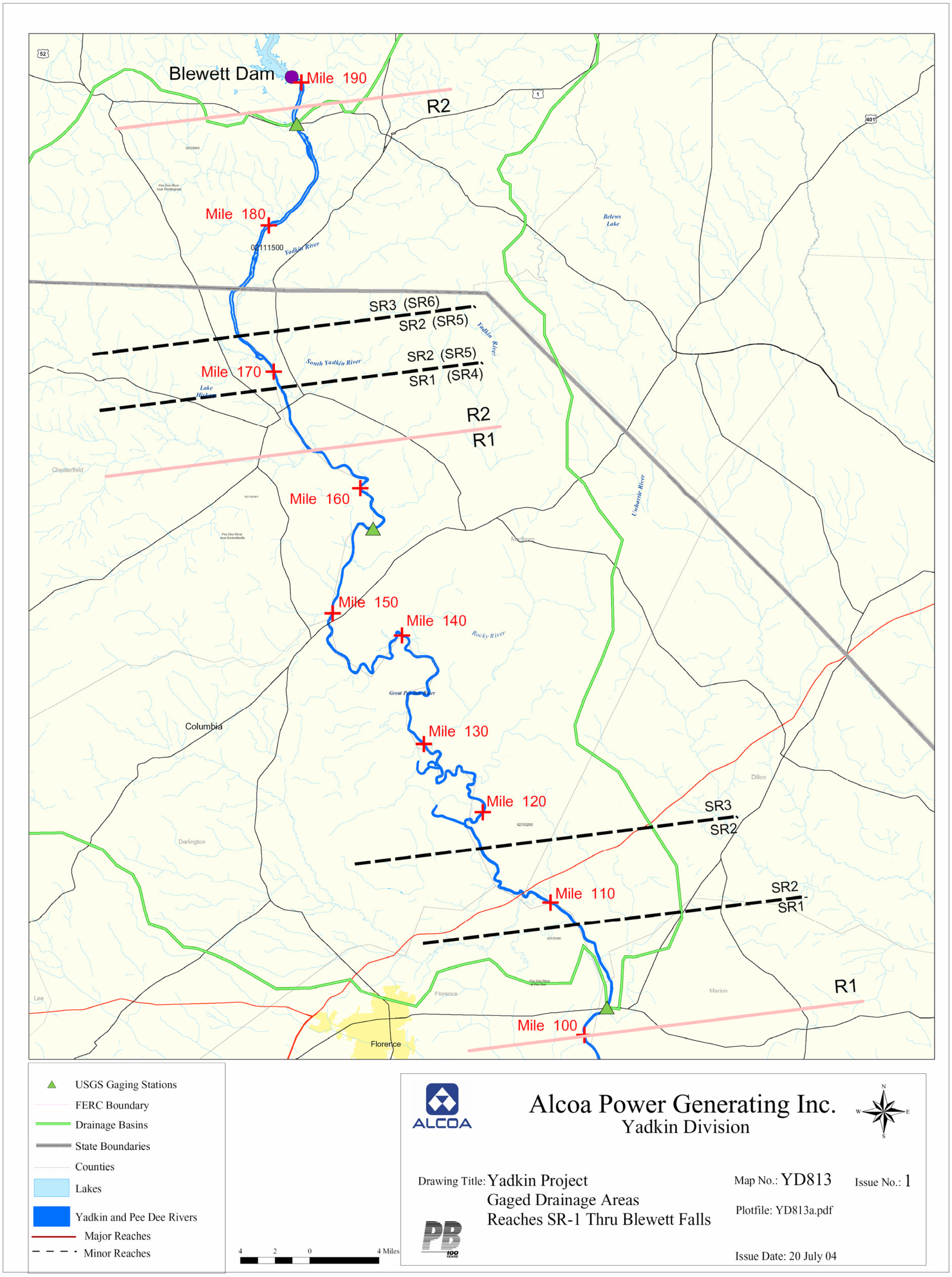


Figure E-8: Yadkin-Pee Dee River Instream Flow Study Reaches 2 (R2) and 1 (R1) Downstream of Blewett Falls Dam



The Yadkin-Pee Dee Instream Flow Study looked at flow/habitat relationships for many fish species/lifestages. In some cases certain fish species were selected to represent the habitat requirements for a “guild” of fish species. Macroinvertebrate habitat requirements were also examined. A list of the different species/lifestage habitat types examined in the study is provided below:

- American Shad Spawning
- Shallow Slow Early Lifestage (Bluehead Chub young-of-the-year [YOY])
- Deep Slow Generic – Cover
- Deep Slow Generic – Proximal
- Deep Slow Generic – No cover
- Shallow Fast Adult High Velocity (Fantail Darter Adult)
- Golden Redhorse Adult (Carolina Redhorse surrogate)
- Golden Redhorse Juvenile
- Shallow Fast Adult Lower Velocity (Margined Madtom Adult)
- Deep Slow Adult Cover (Redbreast Sunfish Adult)
- Shallow Slow Spawn Fine Substrate No Cover (Redbreast Sunfish Spawn)
- Robust Redhorse Spawning
- Shallow Fast Generic Mid Velocity
- Shallow Slow Generic Coarse Substrate
- Deep Fast Adult Coarse Mix Substrate (Shorthead Redhorse Adult)
- Deep Fast Adult Fine Substrate (Silver Redhorse Adult)
- Shallow Slow YOY Veg Cover (Silver Redhorse YOY Veg Cover)
- Shallow Slow YOY Wood Cover (Silver Redhorse YOY Wood Cover)
- Striped Bass Incubation and Larval
- Striped Bass Spawning
- Sturgeon Spawning and Incubation
- Deep Fast Spawn Gravel, Small Cobble (White Bass Spawning)
- Ephemeroptera
- Macroinvertebrate Community Large Rivers
- Plecoptera
- Trichoptera (1 and 2&3)

The central component of the Instream Flow Study analysis was the development of flow/habitat relationships for each of species/lifestages/habitat types of interest and the estimation of weighted useable area (WUA). WUAs were in turn used in a habitat duration analysis that examined the frequency of time that a certain habitat condition was present in the river under a particular flow regime. The Instream Flow Subgroup utilized habitat duration analysis as its primary means of assessing the suitability of flows for the protection of aquatic habitat. The habitat duration analysis is done by converting a record of stream flows to a record of habitat values. This is done by converting cfs to WUA using the WUA curves produced for each species/lifestage of interest in each of the river reaches. Index C is the average of all daily habitat values for a month that are less than or equal to the median (50 percent exceedence level) habitat value for that month. Index C values under different flow scenarios can be compared to determine the effect of different flow regimes on habitat. The concept underlying the Index C is that all low habitat events are assumed to be important. Values above the median are considered to represent habitat that cannot be used effectively due to previous limitations created by low habitat values.

For the Yadkin-Pee Dee Instream Flow Study, the Instream Flow Subgroup utilized Index C under a simulated “unregulated” flow regime as the standard for comparing habitat conditions under various river flows, and established 80 percent of unregulated Index C as one of the habitat goals it was seeking to achieve for the critical species and lifestages in the river reaches below Tillery and Blewett Falls. To aid in this analysis, the Instream Flow Subgroup developed an interactive spreadsheet that allowed a quick means of estimating the percent of unregulated Index C that any static flow release from the Tillery or Blewett Falls developments (plus accretion flows) would produce in each of the river reaches and subreaches. The Instream Flow Subgroup used the static flow interactive spreadsheet to identify a shorter list of “driver species” for which 80 percent of Unregulated Index C values were difficult to achieve in the range of flows being considered as possible minimum flows from the two developments.

The fundamental problem with the static flow interactive spreadsheet was that it only examined habitat duration under static flow conditions, and ignored the variability in flow conditions that would actually be released downstream from the developments. In short, when used to examine possible minimum flows in the range of 0-4,000 cfs, the method entirely ignored the habitat created by the remaining volume of water that would flow down the river. This resulted in a skewing of the results in terms of determining what flows were needed in the river reaches to achieve 80 percent of unregulated Index C values for the species/lifestages of interest.

There was another complicating factor in the analysis of the Instream Flow Study results related to the delivery of flow from Falls Dam. The Instream Flow Subgroup was concerned that the assessment of habitat conditions below Tillery and Blewett Falls had to be looked at on an instantaneous flow basis. They determined that examining flow/habitat conditions on a daily average basis would be of little value, because a daily average flow could contain a period of high peaking flows followed by an extended period of little or no flow. In short, they believed that daily average flow conditions would not accurately predict habitat conditions that could result from a daily average flow minimum flow requirement.

However, flows released from the Yadkin Project (at Falls Dam) on a daily average basis can be reregulated by PE’s operation of the Tillery and Blewett Falls developments. Thus, the volume of water represented by an average daily minimum flow release at Falls has the potential to create certain habitat conditions if that volume of flow were reregulated by PE and released on an instantaneous basis from Blewett Falls Dam. Therefore, APGI believes that examining the habitat conditions that could be produced by the reregulation of flow delivered under a weekly average minimum flow requirement at Falls into flow delivered under an instantaneous minimum flow requirement at Blewett Falls is an appropriate way to consider the effects of APGI’s operation of the Yadkin Project on habitat conditions downstream of Blewett Falls.

To do this APGI examined habitat conditions in the river reaches below Blewett Falls under three flow alternatives (Table E.3-9).

Table E.3-9: Description of Three Operational Alternatives/Baseline Conditions

Operational Alternative	General Description [1]
Existing Condition (or Baseline)[2]	Simulated estimate of the flows that have occurred/would occur if the Yadkin Project and Yadkin-Pee Dee River Project were operated according to existing reservoir rule curves, minimum flow requirements, and current standards and practices
APGI Flow Proposal	Simulated estimate of the flows that would occur if the Yadkin Project were to be operated as proposed, with a revised High Rock guide curve and a 900-cfs weekly average minimum flow released from Falls and with Tillery and Blewett Falls being generally operated essentially as run-of-river, with flow accrual from the intervening drainage
Unregulated Condition	Simulated estimate of flows that would have occurred/would occur if the flow in the river was controlled by past rainfall and runoff, as estimated from historical USGS gauging records and modeling; similar to "pre-impoundment" conditions and similar to the flows that would occur if the Yadkin Project and Yadkin-Pee Dee Project were operated according to strict run-of-river conditions

[1] A description of the complete details of each simulated flow alternatives is provided in Appendix E-8.
[2] The baseline condition OASIS model run used for this analysis does not include the flows provided under the existing headwater benefits agreement between APGI and Progress Energy.

Analysis of historical flows and hydropower operations records and hydrologic simulation modeling was performed using the OASIS project simulation model to estimate the flow conditions that would occur in the river for each alternative. This modeling was performed by first estimating the historical daily unregulated flow for a 74-year period 1930 – 2003 (Nebicker, 2005 referenced in Dilts and Leonard, 2006 Appendix E-8). Using this historical flow time series, the Baseline and APGI Flow Proposals were simulated using the OASIS model by applying rules that closely simulated the operations of the hydropower plants under those alternatives. When modeling the operations and resulting flows downstream of Blewett Falls Dam, the Tillery and Blewett Falls developments were simulated as being operated generally according to run-of-river conditions with flow accrual from the intervening drainage[2]. The result was a 74-year record of daily flows for all three flow alternatives.

These 74-year flow time series were combined with the habitat versus flow relationships for the resident and anadromous fish of the Pee Dee River, to produce a 74-year record of habitat values for each alternative (habitat time series). These records were then further summarized into monthly habitat duration for each month of the year and species (called habitat duration tables, or if depicted in graphical format, habitat duration curves).

The habitat duration tables (and graphical curves) provide estimates of the percent of the time in any given month that a given level of habitat is equaled or exceeded. In addition to monthly habitat exceedence values, Index C habitat values were calculated. The habitat duration and

[2] By necessity, certain assumptions had to be made about the manner in which the Tillery and Blewett Falls developments of the Yadkin-Pee Dee Project would be operated by Progress Energy to re-regulate the flows provided by APGI from Falls Dam. For purposes of this simulation, Tillery and Blewett Falls were assumed to operate essentially as run-of-river conditions with flow accrual from the intervening drainage. This approach allows the habitat potential of the APGI Flow Proposal to be most objectively evaluated.

Index C results produced by the alternatives were then compared using a pair-wise comparison method.

Two different pair-wise comparisons were made: 1) APGI Flow Proposal versus Existing condition (or Baseline) comparison and 2) APGI Flow Proposal versus the Unregulated condition. The APGI Flow Proposal – Existing condition (or Baseline) comparison provides an estimate of the incremental difference in habitat provided as compared to what is now being provided and has been provided with the existing license conditions for the AGPI and PE projects[3]. This comparison is most consistent with FERC guidance, as it uses the existing environmental condition as a basis for comparison and the benchmark for comparison in developing protection, mitigation, and enhancement (PME) measures.

Comparison of the APGI Flow Proposal with the Unregulated condition estimates how closely the APGI proposal comes to providing the habitat values that would occur if the AGPI and PE projects were operated with minimal control of the river. This is the comparison that NCWRC typically uses in assessing river flow needs and recommending flow regimes. The focus of the analysis was on the "driver" species in Reach 1 and 2. These species were identified by the Instream Flow Subgroup as the species whose flow versus habitat relationships were most sensitive to change in flow and for which changes in Index C were greatest. Results of Index C comparisons of the APGI Flow Proposal with the Baseline existing condition (Base Case) are shown in Tables E.3-10 and E.3-11. Results of the Index C comparisons of the APGI Flow Proposal with the Unregulated condition are shown in Tables E.3-12 and E.3-13.

[3] The baseline (existing) condition OASIS model run used for this analysis does not include the flows provided under the existing headwater benefits agreement between APGI and Progress Energy.

Table E.3-10: APGI Proposal Index C Values Compared to Base Case Condition (Reach 1)

Table E.3-10
Yadkin-Pee Dee River
APGI Proposal Index C Values Compared to the Base Case Condition*
Reach 1

Subreach 2			DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
	Flow (cfs)	Month	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
		Annual	34,161	33,461	98%	45,481	46,008	101%	10,351	10,657	103%												
	900	Jan	35,295	35,712	101%	53,630	54,406	101%	9,155	9,328	102%												
	900	Feb	37,956	38,527	102%	57,644	58,067	101%	8,755	8,841	101%										186,472	190,003	102%
	900	Mar	38,668	39,215	101%	59,375	58,750	99%	8,449	8,619	102%										185,423	188,202	101%
	900	Apr	35,524	35,905	101%	52,174	54,073	104%	9,446	9,512	101%	1,261	1,147	91%	599,530	630,597	105%	422,155	442,259	105%	187,762	190,775	102%
	900	May	34,134	33,251	97%	46,191	46,110	100%	10,799	11,143	103%	4,013	3,513	88%	476,136	483,383	102%	341,728	351,831	103%	179,355	180,282	101%
	900	Jun	33,952	32,604	96%	43,077	43,802	102%	11,472	12,243	107%	5,644	7,735	137%	405,586	418,163	103%	296,082	309,651	105%			
	900	Jul	33,742	32,312	96%	41,869	42,887	102%	11,820	13,153	111%												
	900	Aug	33,452	32,552	97%	42,067	43,233	103%	11,460	12,847	112%												
	900	Sep	33,517	32,180	96%	40,163	41,919	104%	12,175	14,574	120%										140,566	149,918	107%
	900	Oct	33,462	32,164	96%	39,087	40,731	104%	11,649	14,347	123%										128,031	135,655	106%
	900	Nov	33,749	32,858	97%	42,788	43,552	102%	11,496	12,999	113%												
	900	Dec	34,194	33,919	99%	47,368	48,478	102%	10,720	10,934	102%												

Subreach 1b			DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
	Flow (cfs)	Month	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
		Annual	10,946	10,257	94%	18,461	18,403	100%	3,433	3,410	99%												
	900	Jan	12,703	12,387	98%	20,576	20,626	100%	3,205	3,190	100%												
	900	Feb	13,958	13,749	99%	21,429	21,425	100%	3,041	3,053	100%										16,983	17,097	101%
	900	Mar	14,433	13,991	97%	21,812	21,578	99%	3,008	3,023	100%										16,708	16,791	100%
	900	Apr	12,004	12,262	102%	20,113	20,512	102%	3,189	3,156	99%	0	0	0%	80,344	84,453	105%	49,151	51,585	105%	17,523	17,692	101%
	900	May	10,775	10,027	93%	18,599	18,370	99%	3,503	3,448	98%	41	32	78%	61,709	60,992	99%	38,290	38,293	100%	18,115	18,483	102%
	900	Jun	9,921	9,767	98%	17,746	17,776	100%	3,573	3,597	101%	179	461	258%	50,705	50,627	100%	31,817	32,313	102%			
	900	Jul	9,839	9,718	99%	17,503	17,581	100%	3,626	3,651	101%												
	900	Aug	10,267	9,785	95%	17,623	17,667	100%	3,670	3,620	99%												
	900	Sep	9,941	9,564	96%	17,190	17,399	101%	3,701	3,646	99%										15,678	17,574	112%
	900	Oct	10,077	9,745	97%	16,986	17,219	101%	3,645	3,648	100%										14,665	16,811	115%
	900	Nov	10,746	9,645	90%	17,907	17,719	99%	3,774	3,612	96%												
	900	Dec	11,366	10,404	92%	19,001	19,018	100%	3,472	3,412	98%												

Subreach 1a			DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
	Flow (cfs)	Month	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
		Annual	10,898	10,288	94%	17,108	17,003	99%	2,362	2,378	101%												
	900	Jan	12,752	12,330	97%	18,981	18,909	100%	1,952	1,952	100%												
	900	Feb	13,789	13,585	99%	19,717	19,738	100%	1,753	1,773	101%										4,892	4,993	102%
	900	Mar	14,306	13,733	96%	20,032	19,715	98%	1,698	1,707	101%										4,716	4,765	101%
	900	Apr	12,029	12,212	102%	18,505	18,763	101%	1,978	1,940	98%	0	0	0%	87,824	93,833	107%	45,531	48,732	107%	5,530	5,449	99%
	900	May	10,714	9,564	89%	17,185	17,085	99%	2,578	2,491	97%	25	18	74%	69,804	79,931	115%	36,510	41,630	114%	6,651	6,911	104%
	900	Jun	9,738	9,526	98%	16,453	16,402	100%	2,660	2,728	103%	124	192	155%	59,459	48,907	82%	30,840	25,472	83%			
	900	Jul	9,516	9,518	100%	16,308	16,350	100%	2,679	2,780	104%												
	900	Aug	10,023	9,611	96%	16,461	16,314	99%	2,746	2,775	101%												
	900	Sep	9,532	9,352	98%	16,126	16,156	100%	2,738	2,810	103%										6,235	6,498	104%
	900	Oct	9,732	9,416	97%	16,030	16,126	101%	2,653	2,749	104%										5,857	6,256	107%
	900	Nov	10,541	9,412	89%	16,707	16,274	97%	2,857	2,787	98%												
	900	Dec	11,312	10,673	94%	17,582	17,605	100%	2,555	2,502	98%												

* Index C is the average of the lowest half of the daily habitat values over the period of record for the given year or month. Units for Index C habitat values are weighted usable area (square feet per 1,000 linear feet of stream).

All reported Index C habitat values are divided by 100 for display purposes.

All data based on average daily flows over the period of record, 1930 to 2003

Table E.3-11: APGI Proposal Index C Values Compared to Base Case Condition (Reach 2)

Table E.3-11
Yadkin-Pee Dee River
APGI Proposal Index C Values Compared to the Base Case Condition*
Reach 2

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
Subreach 3		Annual							25,806	27,378	106%	14,000	16,017	114%							2,978	4,053	136%
	900	Jan							24,643	25,988	105%	12,893	14,062	109%							1,768	2,589	146%
	900	Feb							23,899	24,526	103%	12,129	12,614	104%				19,388	19,723	102%	1,117	1,418	127%
	900	Mar	35,058	35,944	103%				23,727	24,145	102%	12,015	12,278	102%				21,185	20,114	95%	1,027	1,132	110%
	900	Apr	36,427	38,003	104%	14	16	117%	25,740	26,137	102%	13,560	14,035	104%	22,493	27,392	122%	12,813	15,138	118%	1,897	2,259	119%
	900	May	36,279	38,950	107%	71	149	212%	28,110	28,997	103%	16,064	17,157	107%	12,158	8,755	72%	7,931	6,768	85%	4,348	4,656	107%
	900	Jun				119	352	297%	28,039	29,023	104%	16,365	17,707	108%	6,160	5,100	83%				5,222	5,311	102%
	900	Jul							26,940	28,488	106%	15,688	17,647	112%							5,119	5,486	107%
	900	Aug							26,181	28,603	109%	14,897	17,666	119%							4,665	5,456	117%
	900	Sep							25,330	27,915	110%	14,161	17,560	124%				4,055	3,372	83%	4,699	5,626	120%
	900	Oct							23,867	26,595	111%	12,830	16,613	129%				3,798	2,969	78%	3,581	4,929	138%
	900	Nov							26,452	29,006	110%	14,698	17,638	120%							4,394	5,284	120%
	900	Dec							27,545	29,914	109%	15,253	17,322	114%							3,608	4,580	127%

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
Subreach 2		Annual							84,450	86,910	103%	34,014	38,592	113%							14,522	16,217	112%
	900	Jan							83,736	88,345	106%	30,266	33,027	109%							10,808	13,754	127%
	900	Feb							82,053	84,113	103%	27,565	28,625	104%				89,633	89,931	100%	8,363	9,532	114%
	900	Mar	120,027	123,227	103%				81,581	82,718	101%	27,051	27,571	102%				95,322	91,702	96%	8,084	8,722	108%
	900	Apr	131,931	135,846	103%	660	613	93%	87,715	88,939	101%	31,852	32,799	103%	66,706	81,343	122%	65,417	73,016	112%	11,742	12,481	106%
	900	May	141,120	150,979	107%	1,920	1,918	100%	92,833	93,551	101%	39,648	42,052	106%	35,099	26,583	76%	43,875	35,422	81%	19,860	19,455	98%
	900	Jun				2,705	4,971	184%	89,617	89,970	100%	40,467	43,631	108%	19,038	16,551	87%				20,949	20,056	96%
	900	Jul							84,252	86,129	102%	38,639	43,267	112%							18,991	19,132	101%
	900	Aug							83,067	87,214	105%	36,937	43,457	118%							17,711	19,535	110%
	900	Sep							78,833	82,467	105%	35,212	43,143	123%				21,647	11,351	52%	17,014	18,147	107%
	900	Oct							73,264	76,642	105%	31,681	40,360	127%				19,917	8,898	45%	13,590	15,443	114%
	900	Nov							86,390	89,589	104%	36,556	43,460	119%							19,030	20,143	106%
	900	Dec							93,194	99,950	107%	37,609	42,648	113%							17,792	21,456	121%

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case	Base Case Index C	Alternative Index C	% of Base Case
Subreach 1		Annual							36,481	40,630	111%	11,449	11,373	99%							4,379	5,616	128%
	900	Jan							31,223	33,604	108%	7,529	7,620	101%							2,182	2,195	101%
	900	Feb							28,014	28,811	103%	6,226	6,306	101%				17,341	17,032	98%	1,502	1,559	104%
	900	Mar	33,629	33,676	100%				27,337	27,619	101%	5,962	6,007	101%				18,360	17,015	93%	1,403	1,430	102%
	900	Apr	41,408	41,674	101%	468	450	96%	32,551	33,514	103%	7,660	7,493	98%	47,114	52,403	111%	13,456	15,221	113%	2,211	2,085	94%
	900	May	55,176	61,697	112%	640	646	101%	41,989	44,413	106%	13,281	12,552	95%	35,937	32,267	90%	11,248	10,334	92%	6,332	6,546	103%
	900	Jun				1,124	1,515	135%	44,225	46,646	105%	15,784	16,846	107%	26,224	24,581	94%				8,245	11,171	135%
	900	Jul							43,186	46,606	108%	17,424	19,505	112%							9,884	14,131	143%
	900	Aug							41,787	46,587	111%	16,560	18,786	113%							8,626	13,338	155%
	900	Sep							40,984	46,830	114%	18,477	21,903	119%				6,530	6,601	101%	10,154	16,536	163%
	900	Oct							37,027	43,536	118%	16,312	20,333	125%				5,731	5,592	98%	7,480	14,822	198%
	900	Nov							40,725	46,340	114%	16,064	18,738	117%							7,555	13,287	176%
	900	Dec							39,864	44,180	111%	12,104	11,680	96%							5,056	5,452	108%

* Index C is the average of the lowest half of the daily habitat values over the period of record for the given year or month. Units for Index C habitat values are weighted usable area (square feet per 1,000 linear feet of stream).

All reported Index C habitat values are divided by 100 for display purposes.

All data based on average daily flows over the period of record, 1930 to 2003

Table E.3-12: APGI Proposal Index C Values Compared to Unregulated Condition (Reach 1)

Table E.3-12
Yadkin-Pee Dee River
APGI Proposal Index C Values Compared to the Unregulated Condition*
Reach 1

Subreach	Flow (cfs)	Month	DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 2		Annual	33,921	33,461	99%	47,456	46,008	97%	10,489	10,657	102%												
Subreach 2	900	Jan	34,500	35,712	104%	53,473	54,406	102%	8,721	9,328	107%												
Subreach 2	900	Feb	35,238	38,527	109%	56,334	58,067	103%	8,129	8,841	109%										193,562	190,003	98%
Subreach 2	900	Mar	35,718	39,215	110%	57,940	58,750	101%	7,973	8,619	108%										192,367	188,202	98%
Subreach 2	900	Apr	34,692	35,905	103%	54,431	54,073	99%	9,017	9,512	105%	21,015	21,466	102%	672,178	630,597	94%	469,047	442,259	94%	205,140	190,775	93%
Subreach 2	900	May	34,223	33,251	97%	49,807	46,110	93%	10,900	11,143	102%	21,080	21,957	104%	588,906	483,383	82%	419,506	351,831	84%	212,859	180,282	85%
Subreach 2	900	Jun	33,796	32,604	96%	46,972	43,802	93%	12,390	12,243	99%	21,262	22,343	105%	515,555	418,163	81%	372,728	309,651	83%			
Subreach 2	900	Jul	33,636	32,312	96%	45,007	42,887	95%	13,390	13,153	98%												
Subreach 2	900	Aug	33,501	32,552	97%	44,356	43,233	97%	13,696	12,847	94%												
Subreach 2	900	Sep	33,142	32,180	97%	42,762	41,919	98%	15,492	14,574	94%										159,047	149,918	94%
Subreach 2	900	Oct	32,876	32,164	98%	41,990	40,731	97%	15,056	14,347	95%										149,027	135,655	91%
Subreach 2	900	Nov	33,529	32,858	98%	45,073	43,552	97%	13,954	12,999	93%												
Subreach 2	900	Dec	34,115	33,919	99%	49,293	48,478	98%	10,471	10,934	104%												
	Flow (cfs)	Month	DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 1b		Annual	10,146	10,257	101%	18,688	18,403	98%	3,580	3,410	95%												
Subreach 1b	900	Jan	11,801	12,387	105%	20,485	20,626	101%	3,451	3,190	92%												
Subreach 1b	900	Feb	12,917	13,749	106%	21,260	21,425	101%	3,313	3,053	92%										16,998	17,097	101%
Subreach 1b	900	Mar	13,573	13,991	103%	21,693	21,578	99%	3,270	3,023	92%										16,858	16,791	100%
Subreach 1b	900	Apr	12,055	12,262	102%	20,747	20,512	99%	3,489	3,156	90%	0	0	0%	90,680	84,453	93%	55,219	51,585	93%	18,219	17,692	97%
Subreach 1b	900	May	10,384	10,027	97%	19,244	18,370	95%	3,740	3,448	92%	118	32	27%	76,592	60,992	80%	47,165	38,293	81%	19,448	18,483	95%
Subreach 1b	900	Jun	9,868	9,767	99%	18,476	17,776	96%	3,752	3,597	96%	557	461	83%	64,946	50,627	78%	40,437	32,313	80%			
Subreach 1b	900	Jul	9,537	9,718	102%	18,003	17,581	98%	3,710	3,651	98%												
Subreach 1b	900	Aug	9,484	9,785	103%	17,867	17,667	99%	3,674	3,620	99%												
Subreach 1b	900	Sep	9,242	9,564	103%	17,544	17,399	99%	3,687	3,646	99%										17,540	17,574	100%
Subreach 1b	900	Oct	9,163	9,745	106%	17,399	17,219	99%	3,626	3,648	101%										16,985	16,811	99%
Subreach 1b	900	Nov	9,302	9,645	104%	17,965	17,719	99%	3,684	3,612	98%												
Subreach 1b	900	Dec	10,265	10,404	101%	19,143	19,018	99%	3,628	3,412	94%												
	Flow (cfs)	Month	DS Gen Cov			Gldn Redhorse Adlt			Gldn Redhorse Juv			Robst Redhors Spn			Striped Bass I&L			Striped Bass Spn			Sturgeon Spn&Inc		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 1a		Annual	9,966	10,288	103%	17,151	17,003	99%	2,381	2,378	100%												
Subreach 1a	900	Jan	12,389	12,330	100%	18,813	18,909	101%	2,007	1,952	97%												
Subreach 1a	900	Feb	13,390	13,585	101%	19,508	19,738	101%	1,768	1,773	100%										4,922	4,993	101%
Subreach 1a	900	Mar	14,009	13,733	98%	19,892	19,715	99%	1,707	1,707	100%										4,767	4,765	100%
Subreach 1a	900	Apr	12,725	12,212	96%	19,019	18,763	99%	2,106	1,940	92%	0	0	0%	96,102	93,833	98%	50,131	48,732	97%	5,743	5,449	95%
Subreach 1a	900	May	10,369	9,564	92%	17,549	17,085	97%	2,689	2,491	93%	55	18	33%	84,111	79,931	95%	44,011	41,630	95%	7,003	6,911	99%
Subreach 1a	900	Jun	9,457	9,526	101%	16,907	16,402	97%	2,760	2,728	99%	231	192	83%	73,176	48,907	67%	38,073	25,472	67%			
Subreach 1a	900	Jul	9,019	9,518	106%	16,558	16,350	99%	2,693	2,780	103%												
Subreach 1a	900	Aug	8,997	9,611	107%	16,481	16,314	99%	2,658	2,775	104%												
Subreach 1a	900	Sep	8,734	9,352	107%	16,287	16,156	99%	2,647	2,810	106%										6,690	6,498	97%
Subreach 1a	900	Oct	8,597	9,416	110%	16,233	16,126	99%	2,558	2,749	107%										6,478	6,256	97%
Subreach 1a	900	Nov	8,844	9,412	106%	16,507	16,274	99%	2,613	2,787	107%												
Subreach 1a	900	Dec	10,324	10,673	103%	17,518	17,605	100%	2,505	2,502	100%												

* Index C is the average of the lowest half of the daily habitat values over the period of record for the given year or month. Units for Index C habitat values are weighted usable area (square feet per 1,000 linear feet of stream).

All reported Index C habitat values are divided by 100 for display purposes.

All data based on average daily flows over the period of record, 1930 to 2003

Table E.3-13: APGI Proposal Index C Values Compared to Unregulated Condition (Reach 2)

Table E.3-13
Yadkin-Pee Dee River
APGI Proposal Index C Values Compared to the Unregulated Condition*
Reach 2

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 3		Annual							28,685	27,378	95%	17,113	16,017	94%							6,112	4,053	66%
	900	Jan							26,433	25,988	98%	14,638	14,062	96%							4,086	2,589	63%
	900	Feb							24,942	24,526	98%	13,109	12,614	96%				16,776	19,723	118%	2,546	1,418	56%
	900	Mar	37,753	35,944	95%				24,611	24,145	98%	12,710	12,278	97%				18,474	20,114	109%	2,151	1,132	53%
	900	Apr	42,294	38,003	90%	58	16	28%	27,968	26,137	93%	15,494	14,035	91%	26,774	27,392	102%	14,827	15,138	102%	4,489	2,259	50%
	900	May	46,630	38,950	84%	431	149	35%	32,252	28,997	90%	19,690	17,157	87%	15,330	8,755	57%	10,335	6,768	65%	8,798	4,656	53%
	900	Jun				643	352	55%	31,941	29,023	91%	19,867	17,707	89%	10,250	5,100	50%				8,770	5,311	61%
	900	Jul							30,666	28,488	93%	19,222	17,647	92%							8,059	5,486	68%
	900	Aug							29,817	28,603	96%	18,636	17,666	95%							7,462	5,456	73%
	900	Sep							28,632	27,915	97%	18,065	17,560	97%				4,331	3,372	78%	6,938	5,626	81%
	900	Oct							27,608	26,595	96%	17,237	16,613	96%				4,098	2,969	72%	6,215	4,929	79%
	900	Nov							30,363	29,006	96%	19,168	17,638	92%							8,227	5,284	64%
	900	Dec							30,595	29,914	98%	18,521	17,322	94%							7,659	4,580	60%

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 2		Annual							94,212	86,910	92%	41,354	38,592	93%							23,027	16,217	70%
	900	Jan							91,670	88,345	96%	34,736	33,027	95%							19,190	13,754	72%
	900	Feb							87,711	84,113	96%	30,404	28,625	94%				87,871	89,931	102%	14,417	9,532	66%
	900	Mar	129,368	123,227	95%				87,556	82,718	94%	29,287	27,571	94%				94,498	91,702	97%	13,175	8,722	66%
	900	Apr	151,521	135,846	90%	1,059	613	58%	99,729	88,939	89%	37,033	32,799	89%	76,670	81,343	106%	82,264	73,016	89%	22,495	12,481	55%
	900	May	176,300	150,979	86%	4,127	1,918	46%	111,543	93,551	84%	47,734	42,052	88%	44,465	26,583	60%	60,899	35,422	58%	35,013	19,455	56%
	900	Jun				7,305	4,971	68%	106,266	89,970	85%	48,409	43,631	90%	30,745	16,551	54%				32,106	20,056	62%
	900	Jul							98,038	86,129	88%	46,929	43,267	92%							27,432	19,132	70%
	900	Aug							94,055	87,214	93%	45,492	43,457	96%							24,747	19,535	79%
	900	Sep							87,249	82,467	95%	44,093	43,143	98%				18,674	11,351	61%	21,684	18,147	84%
	900	Oct							82,785	76,642	93%	41,788	40,360	97%				16,581	8,898	54%	19,217	15,443	80%
	900	Nov							96,376	89,589	93%	46,669	43,460	93%							26,945	20,143	75%
	900	Dec							103,521	99,950	97%	44,919	42,648	95%							29,399	21,456	73%

Subreach	Flow (cfs)	Month	Am Shad Spawn2			Robst Redhors Spn			DF A Coarse Mix			DF A Fine			Striped Bass Spn			Sturgeon Spn&Inc			DF S Grav Cob		
			Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated	Unregulated Index C	Alternative Index C	% of Unregulated
Subreach 1		Annual							44,142	40,631	92%	15,043	11,372	76%							10,411	5,616	54%
	900	Jan							35,476	33,604	95%	8,890	7,620	86%							3,886	2,195	56%
	900	Feb							30,188	28,811	95%	6,955	6,306	91%				16,878	17,032	101%	2,087	1,559	75%
	900	Mar	35,610	33,676	95%				28,987	27,619	95%	6,600	6,007	91%				18,126	17,015	94%	1,834	1,430	78%
	900	Apr	46,657	41,674	89%	526	450	85%	37,317	33,514	90%	9,153	7,493	82%	58,876	52,403	89%	17,488	15,221	87%	3,901	2,085	53%
	900	May	69,598	61,697	89%	978	646	66%	51,483	44,413	86%	16,377	12,552	77%	47,256	32,267	68%	14,670	10,334	70%	11,975	6,546	55%
	900	Jun				1,990	1,515	76%	53,156	46,646	88%	20,730	16,846	81%	37,579	24,581	65%				16,269	11,171	69%
	900	Jul							51,609	46,606	90%	22,776	19,505	86%							18,084	14,131	78%
	900	Aug							50,239	46,587	93%	23,241	18,786	81%							18,370	13,338	73%
	900	Sep							49,030	46,830	96%	25,841	21,903	85%				7,482	6,601	88%	20,613	16,536	80%
	900	Oct							46,049	43,536	95%	24,271	20,333	84%				6,781	5,592	82%	18,995	14,822	78%
	900	Nov							51,748	46,340	90%	23,715	18,738	79%							19,253	13,287	69%
	900	Dec							48,354	44,180	91%	15,279	11,680	76%							10,843	5,452	50%

* Index C is the average of the lowest half of the daily habitat values over the period of record for the given year or month. Units for Index C habitat values are weighted usable area (square feet per 1,000 linear feet of stream).

All reported Index C habitat values are divided by 100 for display purposes.

All data based on average daily flows over the period of record, 1930 to 2003

<u>Reach 2</u>: Blewett Falls Dam to Cheraw, SC.

Compared to the Existing condition, the APGI Flow Proposal would generally provide similar to substantially improved habitat conditions for most resident and anadromous fish in Reach 2 of the Pee Dee River during most months. The magnitude of the increase in Index C habitat varies considerably with species; most of the increases are small to moderate (one percent to 20 percent increase in Index C habitat); however, in the case of certain guilds and months the increases are considerable (i.e., >20 percent increase to over 90 percent increase). In a limited few cases, the APGI Flow Proposal produces levels of Index C habitat that are 10-20 percent less than Existing conditions, and in the case of fall sturgeon spawning (Sep-Oct), levels drop to 45-52 percent of Existing conditions.

The APGI Flow Proposal would achieve levels of habitat substantially similar to Unregulated conditions (75 to 100 percent of Unregulated Index C habitat values) for some of the driver species year-round. These include American shad and the Deep Fast Adult Coarse and Deep Fast Adult Fine guilds. For other driver species, the APGI Flow Proposal would produce levels of habitat that vary between approximately 50 percent and 80 percent of Unregulated Index C habitat. Levels of Index C habitat for robust redhorse spawning in some months fall as low as 28 percent of Unregulated Index C.

In general, the APGI Flow Proposal would provide a considerable improvement in fish and aquatic habitat, and would obtain habitat conditions close to Unregulated conditions for some guilds. In contrast, while other species would experience minor to moderate increase in habitat, for some species these increases would not obtain levels necessary to meet the North Carolina Division of Water Resources (NCDWR) 80 percent of Index C habitat standard.

Some of the specific results are presented in detail below.

- The Index C levels of American shad and sturgeon spawning habitat provided by the APGI Flow Proposal would achieve levels similar to or slightly higher than that provided under Existing conditions in all spring spawning months and at all subreaches (Table E.3-11). Levels of Index C habitat for American shad spawning would range from 100 percent to 112 percent of Existing Index C habitat levels, and Index C habitat levels for sturgeon spawning would range from 81 percent to 118 percent of Existing Index C habitat levels.
- In addition to providing an incremental increase in American shad and sturgeon spawning habitat compared to Existing conditions, the APGI Flow Proposal largely achieves NCDWR's 80 percent of Unregulated Index C criterion (Table E.3-13). American shad spawning Index C ranges from 84 percent to 95 percent of Unregulated Index C in all months and subreaches. For sturgeon spawning habitat during the months March through May, Index C habitat levels attain 87 percent to 118 percent of Unregulated (Table E.3-13), though these levels tail off to 58 percent to 70 percent during May, near the end of the spawning period.
- During fall spawning period (Sep – Oct), the APGI Flow Proposal would achieve sturgeon spawning habitat levels similar to the Existing condition in Subreach 1 (98

percent to 101 percent), somewhat lower than Existing conditions in Subreach 3 (78 percent to 83 percent), and about half of Existing conditions in Subreach 2 (Table E.3-11). A similar level of attainment of sturgeon spawning habitat would occur as compared to Unregulated conditions.

- The Index C levels of American shad and sturgeon spawning habitat provided by the APGI Flow Proposal would achieve levels similar to or slightly higher that that provided under Existing conditions in all spring spawning months and at all subreaches (Table E.3-11).
- The results of Index C habitat levels for striped bass spawning are mixed and depend on which subreach and months are being considered. In Subreach 1 during all months and in Subreach 2 and 3 during April, Index C habitat levels would generally be high and similar to Existing conditions (90 percent to 122 percent; Table E.3-11). Index C habitat levels decrease in June (72 percent to 87 percent of Existing condition Index C values) in reaches 2 and 3. However, the APGI Flow Proposal would provide relatively comparable levels of habitat during most of the prime spawning period[4] in most years.
- The APGI Flow Proposal provides striped bass spawning habitat levels very similar to Unregulated conditions during May (89 percent to 106 percent of Unregulated), but lower levels during May and June (50 percent to 68 percent of Unregulated). These levels of habitat partially attain the NCDWR's 80 percent of Unregulated Index C criterion.
- The APGI Flow Proposal results in increased level of Index C habitat for the Deep-Fast-Small Gravel/Cobble habitat use guild. The increase in the Index C values for this guild varies from small to large, depending on the month (Table E.3-11). The habitat increases are largest during the periods (Jan – Feb and Jun – Dec) (increases typically about 10 percent to 40 percent with some as high as 50 percent to 98 percent), and smaller during Mar – May.
- The level of Index C habitat for the Deep-Fast-Small Gravel/Cobble habitat use guild, however, attains about 50 percent to 80 percent of Unregulated conditions (Table E.3-13). Values of Index C habitat are generally lower (50 percent to 70 percent of Unregulated conditions) during the winter and spring, and higher (>70 percent of Unregulated) during the summer and fall.
- Index C habitat values for the other guilds representing deep-fast habitats, but with more general substrate criteria requirements – Deep-Fast-Adult-Coarse Mix Substrate and Deep-Fast-Adult-Fine Substrate – would improve relative to Existing conditions. The increases in most months and subreaches range from 5 percent to 30 percent, and the changes in the other months and reaches range from 95 percent to 105 percent.
- The APGI Flow Proposal also achieves levels of Index C habitat for the Deep-Fast-Adult-Coarse Mix Substrate and Deep-Fast-Adult-Fine Substrate similar to that provided under Unregulated conditions (76 percent to 98 percent of Unregulated Index C values) in all months and at all subreaches. Thus, for these species, the APGI Flow Proposal meets or exceeds the NCDWR's 80 percent of Unregulated Index C criterion. It is

[4] As depicted by the spawning periodicity charts included in the Pee Dee River Instream Flow Study Plan (DTA, 2004 cited in Dilts and Leonard, 2006 Appendix E-8).

noteworthy that the habitat suitability criteria representing these guilds, are shorthead redhorse adult and silver redhorse adult, respectively. These representative species have more general substrate requirements than the Deep-Fast-Small Gravel/Cobble guild criteria and are likely better indicators of the year-round availability of deep-fast habitats in this reach of the Pee Dee River.

- The APGI Flow Proposal results in little change in levels of Index C habitat for robust redhorse spawning habitat compared to the Existing condition during April and May (Table E.3-11). During June the increases are considerable on a percentage basis. However, levels of available robust redhorse spawning habitat are relatively low in all subreaches, even under Existing conditions, as shown by the WUA versus flow relationships (Attachment E to Appendix E-8). Index C habitat levels are greater in Subreaches 2 and 1 which includes areas, such as the Jones Creek Shoal and Big Island areas, that are thought to represent important spawning habitats (DTA, 2004 cited in Dilts and Leonard, 2006 Appendix E-8).
- In contrast, the APGI Flow Proposal provides low to moderate percentage of robust redhorse spawning habitat as compared to Unregulated conditions. Levels of Index C habitat for of robust redhorse spawning habitat are mostly between 28 percent and 68 percent of Unregulated, with values of 76 percent and 85 percent in Subreach 1. Though these habitat values for the most part do not reach the 80 percent of Unregulated conditions preferred by the NCDWR, thus there are special considerations for this species that must be considered.
- Habitat levels for robust redhorse spawning were further evaluated by considering its WUA versus flow relationship, as well as the flow exceedence statistics and habitat duration curves (Attachment F to Appendix E-8) for the APGI Flow Proposal Unregulated flow scenarios. The interpretation provided below focuses on consideration of data from Subreach 3, but the trends described also occur to a lesser extent in Subreaches 2 and 1.
    - The WUA curve for robust redhorse spawning at Subreach 3 generally peaks (attains approximately 80 percent of maximum) between 2,000 and 5,000 cfs, and approaches near zero levels at flows greater than 8,000 cfs (Attachment E to Appendix E-8). (This bell-shaped relationship results in a similar, but even narrower band of peak habitat levels at Subreaches 2 and 1.) Consequently, flow events less than about 1,000 cfs or greater than about 7,000 cfs result in low habitat events for this species.
    - Stream flows less than 1,000 cfs would not occur during the months of April and May under the APGI Flow Proposal (Attachment B to Appendix E-8). Additionally, stream flows exceeding 7,000 cfs would occur about 56 and 43 percent of the time in April and May, respectively, at Subreach 3. Therefore, the low habitat events under the APGI Flow Proposal (i.e., those habitat events considered in the calculation of Index C habitat) are associated with higher flow events rather than minimum flow events. Consequently, increasing the minimum flow in these months would have no direct benefit on Index C habitat levels.
    - Relative to the Unregulated condition, the APGI Flow Proposal reduces the frequency of intermediate flows in April and May (i.e., flows greater than 2,000 cfs, but less than 10,000 cfs) (Attachment B to Appendix E-8). This trend manifests itself in the

habitat duration curves for spawning robust redhorse, which depict a plateau of high habitat events (associated with the minimum flow releases) that decreases steeply to low habitat events associated with higher flows (Attachment F to Appendix E-8). Due to the more normal distribution of intermediate flows under the Unregulated condition (Attachment C to Appendix E-8), the slope of the habitat duration curve for that scenario is less steep. This difference, and not the minimum flow, is primarily responsible for the separation between the two habitat duration curves at values less than the median habitat value, and the associated differences in the Index C values (Attachment F to Appendix E-8).

- The habitat duration curve trends noted above also largely hold true in June, but intermediate to lower flows are more common and the frequency of high flows is reduced. Because habitat events associated with the minimum flow are more frequent in June (i.e., the minimum flow habitat plateau is extended), the separation between the Unregulated and APGI Flow Proposal habitat duration curves may be reduced by increasing the minimum flow in that month (Attachment F to Appendix E-8). However, it should be noted that total robust redhorse Index C habitat levels in May, when robust redhorse spawning is declining, are much greater than provided by the April and May flows.

<u>Reach 1</u>*: Florence, SC at Highway 76 to Cheraw, SC.*

In Reach 1 of the Pee Dee River, the APGI Flow Proposal would generally provide habitat conditions very similar to the Existing conditions (Table E.3-10). Most of the driver species attain levels of habitat ranging between 90 percent and 110 percent of Existing conditions. In a limited few cases, the APGI Flow Proposal produces levels of Index C habitat values that are in some months and for some species slightly lower or higher.

The APGI Flow Proposal would also achieve levels of habitat very similar to Unregulated conditions, with most of the species and guilds attaining between 90 percent and 110 percent of Unregulated Index C habitat values in year-round. The lowest levels of Index C habitat are achieved for robust redhorse spawning, but these are described as occurring as a result of the patchy distribution and low abundance of those habitats in the lower Pee Dee River. In general, the APGI Flow Proposal would provide comparable levels of habitat to existing conditions and as compared to Unregulated conditions.

Some of the specific results are presented in detail below.

- Levels of Index C sturgeon spawning habitat provided by the APGI Flow Proposal would achieve levels similar to and slightly higher than under Existing conditions (99 to more than 115 percent of Existing Index C values) in all spring spawning months and at all subreaches (Table E.3-12). Additionally, the APGI Flow Proposal would provide Index C spawning habitat levels somewhat higher than that provided under Existing conditions in October and November (104 percent to 115 percent of Unregulated Index C values). This may be important given that there is some anecdotal evidence of fall spawning by Atlantic sturgeon in this reach of the Pee Dee River (i.e., one ripe male sturgeon collected in the fall of 2003; DTA 2004 cited in Dilts and Leonard, 2006 Appendix E-8).

- Levels of Index C sturgeon spawning habitat provided by the APGI Flow Proposal would also be very close to the levels of habitat provided by the Unregulated condition (91 percent to 101 percent of Unregulated) in all reaches and spawning months. These habitat levels would meet and exceed the NCDWR 80 percent of Unregulated criterion.
- Index C habitat levels for striped bass spawning and incubation/larvae would generally be high (100 percent to 114 percent of Existing conditions at all subreaches in April, May, and June except for June in Subreach 1a (83 percent) (Table E.3-12). However, the APGI Flow Proposal would provide relatively high levels of habitat during most of the prime spawning period in most years. Additionally, given the magnitude of the total available spawning habitat available in this reach of the Pee Dee River (Table E.3-12), it is unlikely that spawning and incubation habitat availability would be a limiting factor for the striped bass population.
- The APGI Flow Proposal would provide Index C habitat levels that largely match or exceed habitat levels provided by Existing conditions and Unregulated conditions for the Deep-Slow-Generic Cover habitat use guild in all months and at all subreaches.
- Likewise, Index C habitat levels for those habitat suitability criteria representing Carolina redhorse habitats (Golden Redhorse Adult and Juvenile) would generally be high (97 percent to 120 percent of Existing conditions; 92 percent to 108 percent of Unregulated Index C values) at all subreaches in all months of the year (Table E.3-12).

Though Index C levels of robust redhorse spawning habitat would be low relative to Existing conditions and Unregulated conditions and at Subreaches 1b and 1a. However, the amount of available robust redhorse spawning habitat is very low, even under Unregulated conditions (Attachment E to Appendix E-8). In contrast, the levels of Index C robust redhorse spawning habitat provided by the APGI Flow Proposal in Subreach 2 would approximate that provided under Existing conditions and Unregulated conditions in the spawning months of April-June. Subreach 2 includes areas, such as the Blues Landing area, that are thought to represent important robust redhorse spawning habitats (DTA, 2004 cited in Dilts and Leonard, 2006 Appendix E-8).

Mussel Habitat Analysis

As a part of the Pee Dee River Instream Flow Study, habitat transects were established at locations in the river thought to best represent important habitats for freshwater mussels in the habitat simulation modeling process. These locations were selected based on the best available information and on the judgement and input of participants in the Instream Flow Subgroup and they reflected the findings of field mussel surveys and the judgement of biologists from the North Carolina Department of Environment and Natural Resources (NCDENR), The Nature Conservancy (TNC), Progress Energy, and others.

The habitat and hydraulic modeling results for each of the Mussel Transects were summarized and displayed on interactive spreadsheets that showed, for any selected flow, the resulting water surface elevation, wetted perimeter, and average depth. The graphical depiction allowed the user to see the water depth superimposed on the areas of various substrate types along the length of the transect (see Attachment G to Appendix E-8).

The Instream Flow Subgroup jointly interpreted the mussel transect habitat results and arrived at flows that would provide suitable levels of habitat for mussels in each of three Pee Dee River Study reaches. In a communication dated November 11, 2005, Jim Mead (NCDWR) (Mead, 2005 cited in Dilts and Leonard, 2006 Appendix E-8) shared with the Instream Flow Subgroup a summary of the findings (Table E.3-14).

Table E.3-14: Estimated Flow Requirements to Satisfy Mussel Habitat Needs at Certain Transects in the Lower Pee Dee River (NCDWR, 2005) [1]

Reach	Transect (s) with Highest Flow Needs	Flow Needed for Mussel Habitat
Reach 2	Mussel Transect 3 (Rivermile 185.15) and Mussel Transect 2 (Rivermile 185.05)	1,300 cfs
Reach 1	Mussel Transect 3 (Rivermile 132.0)	2,300 cfs

[1] The flow values needed to satisfy mussel habitat needs at certain transects in the lower Pee Dee River were developed solely by the agencies and are used here for comparative purposes only. The mussel survey results and transect habitat-modeling results to derive alternative estimates of appropriate or needed flows have not been reinterpreted.

The flow value requirements needed to satisfy mussel habitat needs at certain transects in the lower Pee Dee River were developed solely by the agencies and are used here for comparative purposes only.

How often these mussel flows would be achieved was evaluated by comparing the proportion of time that these flows would be met annually and by month under the Existing condition (or Baseline), APGI Flow Proposal, and the Unregulated condition. The percent of time that each of the flows needed for mussels in each reach was determined by using the flow exceedence tables in Attachment B to Appendix E-8. The results are summarized in Table E.3-15.

Table E.3-15: Percent of Time that Average Daily Flows Meet Agency-derived Flow Thresholds at Mussel Transects in Reaches 1 and 2 of the Pee Dee River

Alternative	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Existing (Baseline)	93	96	97	95	88	86	83	82	79	77	80	87
APGI Proposal	100	100	100	100	100	99	98	98	97	93	98	99
Unregulated	100	100	100	100	99	98	94	94	92	91	97	99

With few and infrequent exceptions, the APGI Flow Proposal would provide sufficient flow to meet the agency mussel flows. This is a considerable improvement over that of the Existing conditions in which low water conditions during the late spring through fall result in flows failing to meet the agency mussel flows between 12 to 23 percent of the time. The Unregulated condition meets the agency mussel flows most of the time, but the APGI Flow Proposal represents and improvement over that of Unregulated flows.

E.3.2 Wildlife Resources

There is an abundance of wildlife that uses the Yadkin Project reservoirs and shorelines as habitat. Table E.3-16 lists species of mammals and birds that are generally known to inhabit the Project area. Bird species listed in the table are those that were recently identified during an Avian Inventory conducted by APGI during the relicensing study phase (Smith, Paxton, and Bradshaw, 2006 Appendix E-9).

During the consultation phase of the Project relicensing, agencies and stakeholders identified several issues with respect to wildlife and wildlife habitats that they requested be addressed by conducting certain studies or inventories of wildlife or habitats including an inventory of birds utilizing various habitats in and around the Project (Smith et al., 2006 Appendix E-9), and an assessment of wildlife habitats on Project lands, which occur primarily along two short sections of transmission line and in the immediate vicinity of the Project dams and powerhouses (NAI, 2005g Appendix E-10). The findings of both of these studies are summarized later in this section.

In addition to these two studies, the use of the Project by bald eagles and great blue herons for nesting has been the subject of ongoing monitoring for several years. Specifically, for the past five years, APGI has conducted a bald eagle and great blue heron nesting survey on all four Project reservoirs. The results of the most recent surveys are provided in Appendix E-11 and are summarized herein.

Table E.3-16: Species of Wildlife Commonly Observed or Known to Occur at the Project

Species	Habitat	Resident/ Breeding	Part-year Resident	Transitory
Mammals				
Red fox	Forest, field, shoreline	X		
Gray fox	Forest, field, shoreline	X		
White-tailed deer	Forest, field, shoreline, lands	X		
Longtail Weasel	Shoreline, wetlands, woods	X		
Mink	Shoreline, wetlands, tributaries	X		
Muskrat	Reservoir, wetlands	X		
Beaver	Reservoir, wetlands, shoreline	X		
River Otter	Reservoir, rivers, streams	X		
Gray Squirrel	Forest, shoreline	X		
Flying Squirrel	Forest	X		
Opossum	Forest, shoreline	X		
Chipmunk	Forest, field, shoreline	X		
Striped Skunk	Forest, shoreline	X		
Eastern Cottontail	Forest, field, marshes	X		
Harvest Mouse	Fields, shoreline	X		
Cotton Rat	Fields, forest, shoreline	X		
Shorttail Shrew	Forest, field, wetland, shoreline	X		
Least Shrew	Forest, wetland	X		
Southeastern Shrew	Forest, wetland, shoreline	X		
Eastern Mole	Fields, shoreline	X		
Raptors				
Bald Eagle	Open water, shoreline	X		
Osprey	Open water, shoreline			X
Red-tailed Hawk	Forest, fields, shoreline	X		
Cooper's Hawk	Forest, forested wetlands			X
Red-shouldered Hawk	Forest, forested wetlands	X		
Mississippi Kite	Forest, streams			X
Peregrine Falcon	Open areas, cliffs near rivers, cities			X
American Kestrel	Fields			X
Eastern Screech Owl	Forest, fields, farmland	X		
Great Horned Owl	Forest, forested wetlands	X		
Barred Owl	Forest, forested wetlands	X		
Turkey Vulture	Forest, field, shoreline			X
Black Vulture	Forest, field, shoreline			X
Wading/Shorebirds				
Great Blue Heron	Wetlands, shoreline	X		
Great Egret	Wetlands, shoreline			X
Snowy Egret	Wetlands, shoreline			X
Little Blue Heron	Wetlands, shoreline			X
Cattle Egret	Wetlands, farmland			X
Green Heron	Wetlands			X
Killdeer	Fields, shoreline			X
Spotted Sandpiper	Shoreline, wetlands			X
Greater Yellowlegs	Open wetlands, shoreline			X

Table E.3-16: Species of Wildlife Commonly Observed or Known to Occur at the Project (continued)

Species	Habitat	Resident/ Breeding	Part-year Resident	Transitory
American Woodcock	Wetlands, forest, field, thickets			X
Laughing Gull	Wetlands, open water			X
Common Tern	Open water, shoreline, lakes			X
Black Tern	Wetlands, lakes			X
Waterfowl				
Wood Duck	Wetlands			X
Gadwall	Wetlands, lakes			X
Mallard Duck	Wetlands, open water			X
American Black Duck	Wetlands, open water			X
Green-winged Teal	Wetlands, open water			X
Ring-necked Duck	Wetlands, open water			X
Canada Goose	Wetlands, open water	X		
Common Loon	Open water			X
Pied-billed Grebe	Wetlands, lakes			X
American Coot	Wetlands, open water			X
Double-crested cormorant	Open water			X
Song Birds				
Rock Pigeon	Cities, residential areas, farmland	X		
Mourning Dove	Forest, field, shoreline	X		
Yellow-billed Cuckoo	Forest, field			X
Black-billed Cuckoo	Forest, forest edges, thickets			X
Red-headed Woodpecker	Forest	X		
Pileated Woodpecker	Forest	X		
Northern Flicker	Forest			X
Downy Woodpecker	Forest	X		
Hairy Woodpecker	Forest	X		
Red-bellied Woodpecker	Forest	X		
Yellow-bellied Sapsucker	Forest			X
Eastern Kingbird	Shoreline, field, wetlands			X
Great Crested Flycatcher	Forest, shoreline			X
Eastern Wood-Pewee	Forest, shoreline			X
Eastern Phoebe	Forest, shoreline			X
Acadian Flycatcher	Forested wetlands, wetlands			X
Barn Swallow	Fields, farmland, shoreline			X
Willow Flycatcher	Thickets			X
Northern Rough-winged Swallow	Shoreline, tributaries			X
Chimney Swift	Towns, residential areas			X
American Crow	Shoreline, wetlands, fields	X		
Fish Crow	Forest, rivers, shoreline, fields	X		
Purple Martin	Towns, farmland, fields			X
Tree Swallow	Wetlands, meadows, lakes			X
Cliff Swallow	Farmland, cliffs near rivers, lakes			X
Blue Jay	Forest			X
Carolina Chickadee	Forest	X		

Table E.3-16: Species of Wildlife Commonly Observed or Known to Occur at the Project (continued)

Species	Habitat	Resident/ Breeding	Part-year Resident	Transitory
Eastern Tufted Titmouse	Forest	X		
White-breasted Nuthatch	Forest	X		
Brown-headed Nuthatch	Forest	X		
Ruby-crowned Kinglet	Forest			X
Carolina Wren	Forest, residential, shoreline	X		
Golden-crowned Kinglet	Forest			X
Blue-gray Gnatcatcher	Forest			X
Brown Thrasher	Fields, wetlands			X
Gray Catbird	Fields, residential, shoreline			X
Northern Mockingbird	Residential	X		
Eastern Bluebird	Fields, farmland			X
American Robin	Residential, fields			X
Hermit Thrush	Forest			X
Wood Thrush	Forest			X
Red-Eyed Vireo	Forest			X
Yellow-throated Vireo	Forest			X
White-eyed Vireo	Forest			X
Warbling Vireo	Forest			X
Prothonotary Warbler	Forested wetlands, shoreline			X
Northern Parula	Forested wetlands			X
Yellow-throated Warbler	Forest			X
Black-and-white Warbler	Forest			X
Yellow Warbler	Forest			X
Pine Warbler	Forest			X
Hooded Warbler	Forest, forested wetlands			X
Kentucky Warbler	Forest			X
Cape May Warbler	Forest			X
Palm Warbler	Forest, wetlands			X
Prairie Warbler	Forest edge, shrubby forest, thickets			X
Blackburnian Warbler	Forest			X
Worm-eating Warbler	Forest, forested wetlands			X
Northern Waterthrush	Wetlands, lakes			X
Common Yellowthroat	Wetlands, forested wetlands			X
Yellow-breasted Chat	Forest, shoreline			X
Ovenbird	Forest			X
Louisiana Waterthrush	Forested wetlands, tributaries			X
Red-winged Blackbird	Wetlands	X		
Common Grackel	Shoreline, fields, wetlands	X		
Eastern Meadowlark	Fields, farmland			X
Orchard Oriole	Forest			X
Scarlet Tanager	Forest			X
Summer Tanager	Forest			X
Northern Cardinal	Forest, residential	X		
Blue Grosbeak	Forested wetlands			X

Table E.3-16: Species of Wildlife Commonly Observed or Known to Occur at the Project (continued)

Species	Habitat	Resident/ Breeding	Part-year Resident	Transitory
Indigo Bunting	Fields, farmland			X
Eastern Towhee	Forest			X
Chipping Sparrow	Fields, farmland, residential			X
Song Sparrow	Fields, farmland, residential			X
White-throated Sparrow	Forest			X
American Goldfinch	Fields, residential, farmland			X
House Sparrow	Residential, farmland	X		
House Finch	Cities, residential areas, farmland	X		
Brown-headed Cowbird	Field, shoreline, forest	X		
Ruby-throated Hummingbird	Fields, farmland, residential			X
Belted Kingfisher	Shoreline, open water	X		
Gamebirds				
Wild Turkey	Forest	X		
Northern Bobwhite	Fields, farmland	X		

Source: Yadkin Shoreline Management Plan (1999) and Avian Inventory (Smith et al., 2006 Appendix E-9).
Note: Many other songbirds, waterfowl, and shorebirds may use the reservoirs and surrounding buffer in migration.

E.3.2.1 Bald Eagle and Great Blue Heron Nesting Surveys

The Yadkin Project reservoirs have been utilized for many years by bald eagles. Bald eagles initially appeared at the Project in the mid-1990s during the winter and used the reservoirs for fishing and areas surrounding the reservoirs for roosting. As early as 1996, the USFWS indicated its concern with the protection of bald eagle roosting and nesting habitat and the protection of those habitats in the face of increasing shoreline development around the Yadkin Project reservoirs. In response to those concerns, APGI developed a Bald Eagle Management Plan (BEMP) for the Yadkin Project which was submitted to and approved by FERC. Later, bald eagle habitats were inventoried and identified as critical habitat that was subsequently classified as “Conservation Zone” under the FERC-approved Yadkin Project Shoreline Management Plan (SMP).

Beginning in 2001, APGI initiated annual bald eagle nesting surveys to document nesting attempts and successes by eagles at the Project. The specific objectives of the surveys were to: document the status, distribution and productivity of nesting pairs of bald eagles in association with the Yadkin reservoirs and associated river corridors; increase the understanding of bald eagle natural history in interior regions of North Carolina; and determine the status and distribution of breeding great blue herons along the Project reservoirs.

Each spring, all four Project reservoirs and their major tributaries were surveyed for breeding bald eagles (Watts, 2006, Watts and Bradshaw, 2002, 2004 and 2004a; Appendix E-11). Surveys were conducted from the air, and usually nesting activity was surveyed twice each spring; once early in the spring to inventory nesting attempts and again in late spring to determine fledgling success. During the early spring aerial surveys, eagle nests and bald eagles were surveyed including examination of nests to determine structural condition, the type and condition of nest trees, and the condition of the surrounding landscape. During the late spring surveys, bald eagle observations were recorded and the nests were rechecked to determine the structural condition of the nests and nest contents.

Table E.3-17 summarizes the results of the most recent surveys. Although two bald eagle territories were located in 2002 along High Rock Reservoir, only one bald eagle territory was observed to be active on there from 2003 through 2005, because one nest (RO-02-01) was blown out of the tree in 2002 and has not been replaced. One nest has been active on Tuckertown Reservoir since 2002. Although two nests have been documented in the surveys at Narrows Reservoir, only the newer nest was active 2003 through 2005. The nest located at Falls Reservoir has not been active since 2002 and appears to have been abandoned.

Table E.3-17: Summary of Activity of Bald Eagle Surveys (2002-2005)

Nest	2002	2003	2004	2005	Comments
High Rock Reservoir					
DA-01-01	Active	Active			First located in 2001; good visual buffer on all sides once trees leaf out; limited disturbance potential.
RO-04-01			Active	Active	Replacement nest for DA-01-01; active late in the breeding season; located directly across the reservoir from DA-01-01; limited disturbance potential.
RO-02-01					Nest was blown out of the tree in spring of 2002 and has not been rebuilt; located along the shoreline.
Tuckertown Reservoir					
RO-02-02	Active	Active	Active	Active	Located within the upper section; fairly remote with a considerable buffer on upland side and a tree buffer on water side; limited disturbance potential.
Narrows Reservoir					
ST-01-01					An older nest; disturbance appears to be limited.
MO-03-01		Active	Active	Active	A new nest located on Uwharrie National Forest land; protected by a visual buffer of scattered trees; may be seen and accessed from a nearby logging road.
Falls Reservoir					
ST-01-02					Located along the shoreline of Falls Reservoir; appeared to be in good condition; appeared to be abandoned; limited disturbance potential.

The Yadkin Project also provides breeding habitat for a significant number of great blue heron. For this reason, all breeding colonies of great blue herons are also inventoried during the annual bald eagle nesting surveys. Since 2002, breeding colonies of great blue heron were found on High Rock, Tuckertown and Narrows Reservoirs (Table E.3-18). No breeding colonies were detected on Falls Reservoir, but this is not surprising as appropriate nesting habitat is limited along this reservoir.

Table E.3-18: Results of Great Blue Heron Breeding Colony Surveys (2002-2005)

Reservoir	**2002 Number of Breeding Colonies**	**2002 Estimated Breeding Pairs**	**2003 Number of Breeding Colonies**	**2003 Estimated Breeding Pairs**	**2004 Number of Breeding Colonies**	**2004 Estimated Breeding Pairs**	**2005 Number of Breeding Colonies**	**2005 Estimated Breeding Pairs**
High Rock	5	528	5	437	5	563	7	546
Tucker-town	1	19	1	60	1	75	1	90
Narrows	1	140	1	185	2	118	2	218
Falls	0	0	0	0	0	0	0	0
Total	**7**	**687**	**7**	**682**	**8**	**756**	**10**	**854**

E.3.2.2 Transmission Line and Project Facility Habitat

In response to comments on the Yadkin Project Relicensing Initial Consultation Document (ICD), APGI surveyed wildlife habitats on Project lands, including two short sections of transmission line that are within the Yadkin Project boundary. The specific objectives of the study were to: identify vegetation cover types and wildlife habitat quality in the vicinity of Project transmission lines, dams, and powerhouses; evaluate effects of transmission line and facility operation and maintenance on vegetation cover and wildlife habitat; and identify opportunities for wildlife habitat enhancements on Yadkin Project lands (NAI, 2005g Appendix E-10). A more detailed discussion relative to botanical species can be found in Exhibit E.3.3.3.

The study area for this wildlife habitat assessment included the Falls and Narrows transmission corridors (approximately 4.3 miles) and Project lands in the vicinity of the four dams and powerhouses including parking lots and access roads (NAI, 2005g Appendix E-10). A preliminary delineation of vegetation cover types was made using aerial photographs taken during the summer 2003 and was verified in the field during three reconnaissance-level surveys conducted between April and October 2004. During the field surveys, vegetation cover types and wildlife habitat quality were reviewed and representative areas were also inventoried for species, structure and composition. All of the dam-related facilities and both transmission line corridors were visited one or more times during the field surveys. An evaluation was completed of wildlife habitat quality and use by birds, mammals, reptiles and amphibians within representative areas.

Results of the surveys showed that the vegetation found on Project lands around the dams and powerhouses and in the transmission line corridors is managed by APGI to maintain visibility, appearance and facility access, resulting in a mixture of grasses and shrubs as the predominant vegetative cover type in these areas (NAI, 2005g Appendix E-10). Around the dams and powerhouses, most lands are open areas used for parking and vehicle access which offer relatively low quality habitat for wildlife. Common vertebrate wildlife using these areas include small mammals and small birds, including migratory songbirds. Species likely to be encountered include gray squirrel, moles, shrews, lizards, snakes, Carolina chickadee, blue jay, and cardinal.

The Falls (approximately 2.8 miles in length) and Narrows (approximately 1.5 miles in length) transmission line corridors add to the diversity of habitat within the area that otherwise is characterized by large blocks of woodland, sections of which are under silvicultural management (NAI, 2005g Appendix E-10). Both of the transmission line corridors are characterized by a mix of herbaceous and shrub habitat abutting timber stands which provides structure (vertical and horizontal complexity), an important habitat element for wildlife usage. Because of this habitat diversity, many vertebrate species were found to use the transmission line corridor including neotropical migratory birds, resident songbirds and game birds, birds of prey, large and small mammals, reptiles and amphibians. Reptiles find particular value in the “solar window” provided by forest openings of the kind maintained in transmission line corridors. In addition, the Falls transmission line crosses an emergent marsh, in which the water ponds for a sufficient time to support aquatic species. The “ephemeral pool” is important habitat to many amphibian species, such as spotted and marbled salamanders (*Ambystoma* spp.) and upland chorus frog (*Pseudacris triseriata*), which may use them for breeding (NAI, 2005g Appendix E-10).

Table E.3-19 lists the wildlife species observed along the Falls and Narrows transmission lines during this study.

Table E.3-19: Wildlife Species or Signs of Wildlife Observed in the 2004 Narrows and Falls Transmission Line Surveys

Common Name	Scientific Name	Narrows	Falls
Birds			
Blue jay	*Cyanocitta cristata*		X
Bluebird, eastern	*Sialia sialis*		X
Chickadee, Carolina	*Poecile carolinensis*		X
Crow, American	*Corax brachyrhynchos*		X
Cuckoo, yellow-billed	*Coccyzus americanus*		X
Eagle, bald	*Haliaeetus leucocephalus*	X	
Flycatcher, Acadian	*Empidonax virescens*		X
Flycatcher, great crested	*Myiarchus crinitus*		X
Goldfinch, American	*Carduelis tristis*		X
Hawk, red-tailed	*Buteo jamaicensis*	X	
Hummingbird, ruby-throated	*Archilochus colubris*		X
Indigo bunting	*Passerina cyanea*	X	X
Kingfisher, belted	*Ceryle torquata*	X	
Tanager, summer	*Piranga rubra*	X	X
Thrush, wood	*Hylocichla mustelina*	X	
Towhee	*Pipilo erythrophthalmus*	X	X
Tufted titmouse	*Baeolophus bicolor*		X
Turkey	*Meleagris gallopavo*		X
Vireo, red-eyed	*Vireo olivaceus*	X	X
Vulture, black	*Coragyps atratus*	X	X
Vulture, turkey	*Cathartes aura*	X	X
Warbler, black and white	*Mniotilta varia*		X
Warbler, magnolia	*Dendroica magnolia*		X
Warbler, parula	*Parula Americana*		X
Warbler, pine	*Dendroica pinus*		X
Warbler, prairie	*Dendroica discolor*		X
Warbler, prothonotary	*Protonotaria citrea*		X
Woodpecker, red-bellied	*Melanerpes carolinus*		X
Wren, Carolina	*Thyothorus ludovicianus*	X	X
Reptiles			
Fence lizard	*Sceloporus undulatus*		X
Racerunner, six-lined	*Cnemidophorus sexlineatus*		X
Skink, ground	*Scincella lateralis*		X
Snake, black racer	*Coluber constrictor*		X
Snake, eastern hognosed	*Heterodon platyrhinos*		X
Snake, rat	*Elaphe obsolete*		X
Snake, ringneck	*Diadophis punctatus*		X
Snake, timber rattler	*Crotalus horridus*		X
Snake, worm	*Carphophis amoenus*	X	
Turtle nest	Emydidae	X	X
Turtle, box	*Terrepene Carolina*	X	X
Amphibians			
Egg masses	*Rana clamitans*		X

Table E.3-19: Wildlife Species or Signs of Wildlife Observed in the 2004 Narrows and Falls Transmission Line Surveys (continued)

Common Name	Scientific Name	Narrows	Falls
Green frog	*Acris crepitans*		X
Northern cricket frog	*Hyla crucifer*		X
Spring peeper	*Hyla versicolor*		X
S. gray treefrog	*Acris* spp.		X
Cricket frog chorusing			X
Salamander tadpoles			X
Toad tadpoles			X
Toad, American	*Bufo americanus*		X
Mammals			
Red Squirrel	*Tamiasciurus hudsonicus*		X
Rodent	Cricetidae		X
White-tailed deer	*Odocoileus virginicus*		X

Source: Transmission Line and Project Facility Habitat Assessment Final Study Report (NAI 2005g, Appendix E-10).

E.3.2.3 Avian Inventory

In response to comments on the Yadkin Project Relicensing ICD, migratory and breeding birds in the Project area were surveyed. The main objective of the study was to evaluate the current status of migratory and breeding bird use of the Yadkin Project. The focus of the survey was to survey priority habitats for birds. Priority was given to documenting species of management interest or species already listed by state or federal authorities (Smith et al., 2006 Appendix E-9).

Habitats within the Project area were surveyed and habitat types were grouped into the following habitat categories:

- Mainland habitats located along two transmission line corridors (an approximately 1.5-mile long corridor from Narrows Dam, and an approximately 2.8-mile long corridor from Falls Dam), and small areas of land around the Project dams and powerhouses. In addition, mainland habitats located within close proximity to the Project reservoirs were also included in the survey.
- Wetlands and riparian floodplain islands located in upper High Rock Reservoir and upper parts of Tuckertown and Narrows reservoirs. Wetlands associated with Crane Creek cove were also surveyed.
- Early successional shrub-scrub habitat associated with clearcuts.
- Open water surveys were conducted on all four Project reservoirs.

Each of these habitats were surveyed for birds using a variety of methods including point counts, line transects, aerial surveys, and area searches between October 2003 and July 2004 with an additional aerial survey in January 2005 to aid in analysis of waterfowl habitat use on the Project reservoirs (Smith et al., 2006 Appendix E-9). The survey results found that habitats within the Project area supported an array of species. During the survey, 124 species (over 7,000 individuals) were recorded in the Yadkin Project area (Smith et al., 2006 Appendix E-9). Nine of the species detected are designated by Partners in Flight (PIF) as "watch" species or species of concern in the Southern Piedmont Region, including brown-headed nuthatch, prairie warbler, worm-eating warbler, chimney swift, field sparrow, wood thrush, Kentucky warbler, prothonotary warbler, and American black duck. All bird species listed in Table E.3-16 in Exhibit E.3.2 were identified during the recent surveys.

Of the Project habitats surveyed, the riparian floodplain habitats located along undeveloped portions of the reservoir shorelines, particularly in the upper end of High Rock Reservoir, were found to support the most diverse assemblages of neotropical migratory birds, including high concentrations of the prothonotary warbler, a PIF "watch list" species. The pine islands in the Project reservoirs were found to support most of the great blue heron rookeries in the Project area. Great egrets were also found to be nesting in these rookeries (Smith et al., 2006 Appendix E-9). Keeping the islands containing rookeries free of disturbance during the May through June breeding season would benefit these species.

A high species richness and density of neotropical migrants were observed in the early successional shrub-scrub habitat. At the Project, this habitat type is often bordered by a thin section of pine or hardwood, creating an edge effect between two separate habitats. The edge effect can concentrate species between two habitat types, thereby increasing species richness within the shrub-scrub habitat. The prairie warbler and field sparrow, PIF "watch" species, used shrub-scrub type habitat for breeding.

Hardwood habitats located within the Project area were found to support at least three PIF "watch" species (wood thrush, worm-eating warbler, and Kentucky warbler). This habitat was also important for neotropical migratory birds passing through and late successional stage hardwood habitats provide the largest species richness and abundance of hardwood habitat types.

The habitat with the lowest observed bird densities was the monoculture pine plantations located near the Project reservoirs. While both young (1-5 years) and old (>100 years) pine forests support large communities of birds, intermediate aged pine forests support very few bird species. However, at least one important PIF "watch" species, the brown-headed nuthatch, is a southeastern pine ecosystem obligate and would be expected to utilize this habitat.

The fall and winter Narrows and Falls transmission line corridor surveys detected low diversity and numbers of migrant and wintering birds. The patchy, grassy habitat along these corridors provided poor habitat for migrant or wintering birds and much of the corridor habitat was exposed rock. Since the transmission line was too narrow to provide any substantial habitat for wintering birds, it was not an important migratory bird use area.

The Project area generally provided little suitable habitat for waterfowl. The aerial waterfowl survey found waterfowl congregating mainly on Duke Power's Buck Steam Station settling ponds. The Center for Conservation Biology (CCB) suggested that the lack of shallow water and emergent vegetation in the Project area deters waterfowl use.

Overall, the CCB study found that the Yadkin Project area provided nesting and migratory habitat for a large number of bird species. Many of the habitats used by the birds are outside the Project boundary and not within the influence of Project operations (hardwood and softwood forests). Other habitat types, including primarily the riparian shrub-scrub habitats located in places around the periphery of the Project reservoirs, could be influenced by Project operations, and in particular reservoir water levels. However, the study identified no specific adverse impacts to the bird community or habitats associated with the current operation of the Yadkin Project.

E.3.3 Botanical Resources

E.3.3.1 Wetlands

Wetlands are one of the most important habitats found at the Yadkin Project. In response to comments on the Yadkin Project Relicensing ICD during the study phase of the relicensing process, APGI conducted a comprehensive survey of wetlands at the Yadkin Project. The primary objectives of the study were to: 1) identify and map vegetated wetlands and riparian habitats within the influence of reservoir water levels; 2) evaluate the effects of current Project operations on these wetlands and riparian habitats; 3) assess the effects of reservoir facilities (such as piers, boat ramps, beaches, bulkheads, and other forms of shoreline hardening) on wetlands and riparian habitats, with a particular emphasis on the potential impact of piers on water willow at Narrows Reservoir; and 4) evaluate how significant changes in Project operations, including both increasing and decreasing short-term and long-term reservoir drawdowns would impact existing wetlands, or would allow for additional wetland development (NAI, 2005i Appendix E-12). Assessing the effects of reservoir facilities on wetlands and riparian habitats was added as a study objective to address the concern of the NCWRC regarding the impact of piers on emergent and wetlands and aquatic beds, particularly on Narrows Reservoir.

As part of the study, all of the wetlands located within the study area which included all the Project reservoirs and the shoreline within 200 ft of the reservoirs were mapped (NAI, 2005i Appendix E-12). Table E.3-20 below summarizes the wetland acreage at the Project reservoirs. Wetland delineation and mapping was done using aerial photography conducted in July 2003 and field surveys in late 2003 and 2004. Wetlands were categorized into six categories: forested wetland, forested floodplain wetland, scrub-shrub wetland, sparse scrub-shrub wetland, emergent marsh, and aquatic bed. The remainder of the study area was categorized into eight upland cover types: forest, shrub (including areas, typically under powerlines, permanently maintained in the shrub/sapling stage), urban/recreational grasslands, agriculture-pasture, agriculture-crops, residential, commercial/industrial, and bare soil or rock.

Table E.3-20: Existing Wetland Acres at the Yadkin Project Reservoirs

Wetland Type	High Rock	Tuckertown	Narrows	Falls	Falls Tailrace	Project Total
Forested Wetland	234	64	51	<1	6	355
Forested Floodplain Wetland	2,194	86	40	0	<1	2,320
Scrub-Shrub Wetland	325	40	4	<1	<1	369
Sparse Scrub-Shrub Wetland	484	4	0	0	0	488
Emergent Marsh	28	45	179	3	2	257
Aquatic Bed	3	14	60	0	0	77
Reservoir Total	**3,268**	**253**	**334**	**3**	**8**	**3,866**

High Rock Wetlands

As shown in Table E.3-20, High Rock Reservoir supported the greatest total acreage of wetland habitat with a total of 3,268 acres. The vast majority of the wetland acres found at High Rock were concentrated in the upper end of the reservoir, where extensive areas of forested floodplain wetlands existed (2,194 acres of the total) and where there were sizeable scrub-shrub wetlands, mainly composed of black willow, which have developed on deltas and islands formed by sediment deposits. Elsewhere in High Rock Reservoir, wetlands were noticeably absent, and there were almost no stands of emergent marsh or aquatic bed wetlands.

The concentration of scrub-shrub wetlands in the upper end of High Rock Reservoir was primarily the result of colonization by wetland plant species of large areas of sediment deposition which created a complex of islands, deltas, and sand bars (NAI, 2005i Appendix E-12). These wetlands provide the premier riparian habitat on High Rock Reservoir and are critical to the reservoir as fish spawning and rearing habitat. The wetlands located in the upper end of High Rock Reservoir appeared to be unaffected by the current operation of the reservoir and the resulting fluctuating reservoir water levels, but were clearly affected by high river flows that caused flooding in the floodplain and can generate flow velocities that can dislodge vegetation and remobilize the deposited sediments.

The lack of wetlands elsewhere in the reservoir appeared to be due to the current operation of the reservoir which is characterized by a period of reservoir drawdown of between 10-15 ft during the fall and winter (NAI, 2005i Appendix E-12). In addition, drawdowns of 5 ft or more late in the summer growing season impact wetland formation. Few native emergent or aquatic species can tolerate the combined effects of the conditions created in the reservoir drawdown zone: flooding for periods in the spring, followed by “drought” as the water levels drop in the late summer and fall. Exposure to freezing and desiccation in the winter further stresses any overwintering plant material. Annuals are the best strategists for taking advantage of regeneration opportunities, as was observed during the drought of 2002 when entire sections of the reservoir that were exposed by the prolonged drawdown were colonized in the late summer by grasses and sedges.

Tuckertown Wetlands

Tuckertown Reservoir supported 253 acres of wetlands (NAI, 2005i Appendix E-12). The wetlands at Tuckertown were a mix of all six wetland types. Forested floodplain wetlands and forested wetlands were the dominant wetland types at Tuckertown occurring in scattered stands at the mouths of most tributaries. Within each of the wetland types found at Tuckertown, the species composition was very diverse. In particular, the emergent marsh and aquatic bed wetlands found in the reservoir contained a healthy mix of species and exhibited a classic pattern of zonation that is a characteristic of a healthy wetland system. The extensive development of emergent marsh and aquatic bed wetlands at Tuckertown was attributed to its relatively stable water levels, quiet water, and fine, gently sloping substrates.

Narrows Wetlands

Narrows Reservoir supported 334 acres of wetlands (NAI, 2005i Appendix E-12). The most prevalent wetland type at Narrows was emergent marsh which accounted for 179 acres of the total, followed by aquatic beds (60 acres of the total). There were no sparse scrub shrub wetlands at Narrows. In contrast to Tuckertown, emergent marsh wetlands on Narrows were not species diverse but were instead dominated by water willow *(Justicia americana*). In some cases beds of emergent vegetation were found to be made up entirely of water willow. The existence of large stands of water willow on Narrows suggested that growing conditions were very suitable for this species, which is particularly tolerant of alternating periods of inundation and exposure. Aquatic beds at Narrows Reservoir were confined to four backwater ponds created by the railroad bed on the west side of the reservoir.

Falls Wetlands

Falls Reservoir had the fewest wetlands both in acres (three acres) and percent (NAI, 2005i Appendix E-12). This reservoir is characterized by steep, rocky slopes and substrates and a riverine nature. These natural features along with very frequent fluctuations in reservoir water levels serve to limit additional wetland development on Falls Reservoir. The dominant wetland type at Falls was emergent marsh which accounted for about three acres. Like Narrows, emergent wetlands at Falls were dominated by water willow. Forested floodplain wetlands, aquatic beds, and sparse scrub shrub wetlands were not present in Fall Reservoir. The Falls tailrace, which extends into Tillery Reservoir, was estimated to have eight acres of wetlands. The most prevalent type of wetland in the Falls tailrace was forested wetlands.

Effects of Structures on Water Willow

During the study phase of the relicensing process, NCWRC indicated a particular concern with the effects of man-made facilities (such as piers, boat ramps, beaches, bulkheads, and other forms of shoreline hardening) on wetlands and wetland vegetation. The focus of this concern is Narrows Reservoir, where there are approximately 1,084 (as of September 6, 2005) private piers which have the potential to impact water willow. To address this issue, as part of the Wetlands Study, NAI conducted a special investigation of the effects of piers on water willow at Narrows. Specifically, NAI sampled 16 “old” piers constructed prior to 1997 and 18 “new” piers constructed after 1997 and located in beds of water willow or in potential water willow habitat (NAI, 2005i Appendix E-12). At each new pier, key parameters collected included length, width, and water depth of the water willow bed on either side of the pier, the height and width of the pier within the water willow bed, land use features, and management of the aquatic bed (if apparent). For the old piers, the data were more qualitative and included estimates of the percent cover of water willow adjacent to and under the pier and a description of impacts to the water willow bed.

Approximately 178 acres of water willow were recorded on Narrows, with almost half (86 acres) occurring in beds large enough to be delineated from the aerial photographs. The remainder (92 acres) resulted from estimates of small and/or narrow beds fringing the edge of the reservoir. In total, 30 percent of the shoreline of Narrows was estimated to support water willow. In general, NAI found that water willow is capable of growing close to and around piers, even piers that are situated low to the water. However, associated uses of piers for boating, jet skis, swimming and other activities clearly can disturb and destroy these beds. Other human disturbance activities along the shoreline such as the addition of sand and the intentional removal of aquatic plants were also observed to have a detrimental effect on water willow located along developed portions of Narrows Reservoir.

E.3.3.2 Invasive Exotic Plant Pests

The presence of invasive exotic plant pests (IEPPs) at the Yadkin Project was another issue of concern to resource agencies. In response to comments on the Yadkin Project Relicensing ICD, APGI conducted a survey of the IEPPs found within the Yadkin Project area. The specific objectives of the study were to: identify potential impact areas within the Project area and inventory for the presence of IEPP species, evaluate the current status of known aquatic IEPPs, and evaluate potential impacts of IEPPs on natural communities in areas of concern (NAI, 2005b Appendix E-13).

IEPPs are non-native plants that were introduced to this country over the years, which possess characteristics or growth habits that allow them to out-compete native vegetation or occupy new habitats. IEPPs are ubiquitous in developed areas of the United States, and the Yadkin Project area is no exception (NAI, 2005b Appendix E-13). Common examples of IEPPs include Japanese honeysuckle and kudzu. IEPPs are of concern in areas where they have the potential to threaten rare plant species or native vegetation that provide important habitat for wildlife.

The focus of APGI’s study was to survey the Project area for IEPPs that pose a threat to rare plant species or important wildlife habitats at the Yadkin Project (NAI, 2005b Appendix E-13). At the outset of the study, a list of IEPPs that were considered likely to occur in the Project area and would be the focus of the inventory was developed and approved by the Wetlands, Wildlife and Botanical IAG (WWB IAG). In total, 32 IEPPs, including both aquatic and terrestrial plants, were included on the initial IEPP search list. Field searches for IEPPs were conducted during the fall of 2003 and the spring, summer and fall of 2004.

Results of the field surveys found 20 species of IEPPs in the Yadkin Project area, including 3 aquatic species and 17 terrestrial species (NAI, 2005b Appendix E-13). Table E.3-21 lists the IEPP species found in the Project area during APGI's study.

Table E.3-21: IEPP Species Observed within Yadkin Project Area

Scientific Name	Common Name	Life Form	Habitat
Aquatic			
Hydrilla verticillata	Hydrilla	SAV	Aquatic bed
Ludwigia hexapetala/uruguayensis	Uruguay waterprimrose	SAV	Aquatic bed
Pistia stratiotes	Water lettuce	SAV	Aquatic bed
Terrestrial			
Ailanthus altissima	Tree of Heaven	Tree	Upland, dams
Albizia julibrissin	Mimosa	Tree	Upland, dams
Arthraxon hispidus	Small carpgrass/hairy jointgrass	Grass	Powerline
Lespedeza cuneata	Chinese lespedeza	Grass	Powerline, dams
Ligustrum japonicum	Japanese privet	Shrub	Upland
Ligustrum sinense	Chinese privet	Shrub	Upland, forested wetlands
Lonicera japonica	Japanese honeysuckle	Vine	Upland, forested wetlands
Lonicera spp (morrowii, bella, tartarica)	Bush honeysuckle	Shrub	Upland, forested wetlands
Melia azedarach	Chinaberry	Tree	Powerline
Microstegium vimineum	Nepalese browntop	Grass	Powerline, upland, forested wetlands
Miscanthus sinensis	Chinese silvergrass	Grass	Powerline
Pueraria montana	Kudzu	Vine	Dams
Rosa multiflora	Multiflora rose	Shrub	Upland, dams
Wisteria sinensis	Chinese wisteria	Vine	Dams
Glechoma hederacea	Gill-over-the-ground	Herb	Forested wetlands
Lysimachia nummularia	Moneywort	Herb	Forested wetlands
Rosa wichuraiana	Memorial rose	Vine	Dams

Of the aquatic IEPP species located by NAI at the Yadkin Project, only one, a small population of Hydrilla found in the Flat Creek Arm of Tuckertown Reservoir, is of any concern (NAI, 2005b Appendix E-13). NAI concluded that this Hydrilla population "bears watching" to see if the population is expanding or stable. Another aquatic IEPP species, Uruguay Water-primrose (*Ludwigia uruguayensis* (*L. hexapetala*)), was found in a large monotypic stand only in Abbotts Creek at High Rock Reservoir, but was not considered a concern. The third aquatic IEPP found included three small specimens of floating Water Lettuce (*Pistia stratiotes*), found in Narrows Reservoir, apparently far from their point of origin. Two aquatic IEPP species that were previously reported to occur in one or more of the Project reservoirs, Variable-leaf Milfoil (*Myriophyllum heterophyllum*) and Brazilian elodea (*Egeria densa*) were not found during the study period. Overall, the NAI study concluded that aquatic IEPP species constitute no apparent threat to native species in aquatic plant communities under existing conditions. However, because aquatic IEPPs do have the potential to become more widely established, particularly in response to any change in reservoir operation, NAI recommended periodic monitoring of aquatic IEPPs.

About a dozen terrestrial IEPP species were found in the primarily upland vegetation of both the Falls Dam and Narrows Dam transmission lines as described in further detail in Exhibit E.3.3.3. However, many of the IEPP species appear to be irreversibly incorporated in their respective plant communities, and in most cases, attempts to eliminate or control them would be infeasible. Moreover, only one of the terrestrial IEPP species, *Lonicera X bella* (bush honeysuckle), was determined to be of immediate management concern (NAI, 2005b Appendix E-13). On the Falls Reservoir shoreline, just downstream of Narrows Dam, this species was found growing in the upland forest in close association with two RTE species, piedmont indigo-bush (*Amorpha schwerinii*) and thick-pod white wild indigo (*Baptisia alba*). At this site, an area commonly referred to as the "Yadkin River Scour Banks", the bush honeysuckle occupied most of the available space that appeared to provide suitable habitat for the two RTE species.

E.3.3.3 Transmission Line and Project Facility Habitat

In response to comments on the Yadkin Project Relicensing Initial Consultation Document filed with FERC in 2002, APGI conducted a survey of the vegetation cover types and wildlife habitat on Project lands, including two Project transmission line sections. The specific objectives of the study were to identify vegetation cover types and wildlife habitat quality in the vicinity of Project transmission lines, dams, and powerhouses; to evaluate effects of transmission line and facility operation and maintenance on vegetation cover and wildlife habitat; and to identify opportunities for wildlife habitat enhancements on Yadkin Project lands (NAI, 2005g Appendix E-10). A more detailed discussion of the survey results relative to wildlife species was provided earlier in Exhibit E.3.2.2.

The study area for APGI's assessment included the Falls and Narrows transmission corridors (approximately 4.3 miles) and Project lands in the vicinity of the four dams and powerhouses including parking lots and access roads (NAI, 2005g Appendix E-10). A preliminary delineation of vegetation cover types was made using aerial photographs taken during the summer of 2003 and was verified in the field during three reconnaissance-level surveys conducted between April and October 2004. During the field surveys, vegetation cover types and wildlife habitat quality were reviewed and representative areas were also inventoried as to species, structure and composition. All of the dam-related facilities and both transmission line corridors were visited one or more times during the field surveys.

The vegetation found on Project lands around the dams and powerhouses and in the transmission line corridors is managed by APGI through a combination of logging to remove tree fall risk, and mowing and herbicides to maintain visibility, appearance and facility access. As a result, the predominant vegetative cover type found in these areas was a mixture of grasses and shrubs. Around the dams and powerhouses, most lands are open areas used for parking and vehicle access that offer relatively low quality habitat for wildlife.

The Falls and Narrows transmission line corridors are predominantly rolling upland with scattered rock outcrops and boulders. The vegetation found within the cleared portion of the corridors was generally a mix of herbaceous and shrub species. Grasses, sedges, and regenerating tree species were all common including bush clovers (*Lespedeza* spp.), beard grasses (*Andropogon* spp.), sedges (*Carex* spp.), foxtail grasses (*Setaria* spp.), meadow fescue (*Festuca elatior*), small white aster (*Aster vimineus*), ragweed (*Ambrosia artemisiifolia*), St. johnsworts (*Hypericum* spp.), *Lobelia* spp., black-eyed susans (*Rudbeckia* spp.), goldenrods (*Solidago* spp.) panic grasses (*Panicum* spp.), loblolly pine (*Pinus taeda*), water oak (*Quercus falcata*), shortleaf pine (*Pinus echinata*), black locust (*Robinia pseudoacacia*), and vines such as greenbrier (*Smilax* spp.) and rose (*Rosa* spp.). Generally species that are adapted to direct sunlight and generally drought-like conditions were dominant over most of the managed corridors, while on either side of the transmission line corridors, where trees provide some shading, there was a narrow band supporting species that prefer partial shade and more moisture. Several small, mostly intermittent streams drain from the transmission line corridors to the Narrows, Falls or Tillery reservoirs, and both the Falls and Narrows transmission line corridors cross narrow coves of their respective reservoirs. A segment of the Narrows transmission line bordered a narrow fringe of scrub-shrub habitat. In addition, the Falls transmission line crossed two narrow wetland areas, a wet meadow, in which water is at or near the surface but rarely ponded, and an emergent marsh, in which the water ponded for a sufficient time to support aquatic species (see Exhibit E.3.2.2).

The Falls and Narrows transmission line corridors added to the diversity of habitat within the area that otherwise was characterized by large blocks of woodland, sections of which were under silvicultural management (NAI, 2005g Appendix E-10). The mix of herbaceous and shrub habitat abutting timber stands provided structure (vertical and horizontal complexity), an important habitat element for wildlife use.

Vegetation within the transmission line corridors and Project lands associated with the dam facilities are maintained by APGI at specific height limits, depending on location, to ensure the safe and reliable operation of the Project (NAI, 2005g Appendix E-10). APGI's maintenance program involves the use of herbicide treatments as the major method of control, with mowing or brush cutting used where appropriate. Herbicide applications are not made within 100 ft of the reservoirs. Along the transmission lines, the treatment objectives are to maintain vegetation height while minimizing adverse impacts on sensitive habitats and desirable species such as cedar and dogwood, which will not interfere with the line. By means of spot applications, spray drift to non-target species and soil is kept to a minimum. In sensitive areas such as wetlands, the herbicide Habitat® is used, which is approved for use in wetlands when there is no ponded water. Herbicides are generally applied with either backpack sprayers or from a truck by means of a 600-foot hose. A drift control agent is added to the mix when there is wind and applications are discontinued when wind speed exceeds approximately 10 miles per hour. Herbicides are not applied during rainfall.

Historically, the Falls and Narrows transmission line corridors have been maintained to a cleared width of approximately 100-150 ft. In a recent initiative to improve safety and enhance transmission line reliability, APGI cleared the Falls transmission line in 2004 to an average width of 200 ft. This clearing activity resulted in some short-term impacts to vegetation. In the long-term, the widening of the transmission line corridor can be expected to add additional mixed grass and shrub habitat for wildlife use (NAI, 2005g Appendix E-10). A similar widening of the Narrows transmission line corridor was completed in 2005.

The vegetation management program used by APGI for maintenance of its transmission lines and project facilities uses herbicides appropriate to the control of target species and sensitive environments (NAI, 2005g Appendix E-10). Continued facility maintenance using appropriately selected and applied herbicides should have no adverse impacts on the use of these areas by wildlife. However, to ensure that the desired effects are being achieved, the program should be periodically reviewed to ensure that impacts to rare and endangered species habitats and wetlands are minimized, and herbicide selection follows the approved label guidelines.

E.3.4 Rare, Threatened and Endangered Species

To determine the status of rare, threatened and endangered (RTE) species at the Yadkin Project, the resource agencies requested, and APGI conducted an RTE species survey at the Project. To streamline the effort, prior to conducting field surveys, APGI reviewed all historic records of RTE species known to exist in the Project vicinity, including recent Natural Heritage Program inventories and database. From this information, APGI worked with the Wetlands, Wildlife and Botanical IAG to develop a priority list of RTE species to be searched for as part of the Project survey. A total of 36 species were included on the final RTE species search list.

The RTE species searches were conducted at the Yadkin Project in 2004. The searches targeted habitats that were suspected to most likely support RTE species on the search list. Table E.3-22 summarizes the RTE species found at the Yadkin Project in 2004. As shown, a total of ten RTE species were located at the Yadkin Project including nine plants and one reptile. Most of the rare plant species found occurred in lightly forested to open, primarily herbaceous communities, often associated with steep slopes overhanging the water, or overhanging road cuts (NAI, 2005c Appendix E-14).

Table E.3-22: RTE Species Recorded in the Yadkin Project Study Area, 2004

Species	Common Name	State Status[1]	Federal Status[1]	Location
Plant Species				
Amorpha schwerinii	Piedmont Indigo-bush	SR-T		Falls Reservoir High Rock Reservoir Narrows Reservoir Tuckertown Reservoir
Baptisia alba	Thick-pod White Wild Indigo	SR-P		Falls Reservoir
Cirsium carolinianum	Carolina Thistle	SR-P		Falls Reservoir
Helianthus laevigatus	Smooth Sunflower	SR-P		Tuckertown Reservoir
Helianthus schweinitzii	Schweinitz's Sunflower	E	E	Falls Reservoir
Lotus helleri	Heller's Trefoil	SR-T	FSC	Falls Transmission Line
Porteranthus stipulatus (=*Gillenia stipulate*)	Indian Physic	SR-P		Tuckertown Reservoir
Ruellia purshiana	Pursh's Wild Petunia	SR-O		Falls Transmission Line
Solidago plumosa	Yadkin River Goldenrod	E	Candidate for federal listing, effective May 11, 2005	Falls Reservoir
Animal Species				
Crotalus horridus	Timber Rattlesnake	SC		Falls Transmission Line

[1] SR-T = Significant Rare Throughout (NC) SR-P = Significantly Rare Peripheral (NC)
SR-O = Significantly Rare Other (NC) E = Endangered
SC = Special Concern (NC) FSC = Federal Special Concern

Amorpha schwerinii, the piedmont indigo-bush, was the most abundant and widespread of the nine plant species. The indigo-bush was found at all four reservoirs, mostly at forest edge locations and often on steep slopes overhanging the water. Steep bedrock slopes appear to promote favorable conditions for *Amorpha schwerinii*, *Baptisia alba*, *Cirsium carolinianum* and *Helianthus schweinitzii*. All four of these species were found along Falls Reservoir, with *A. schwerinii* being recorded at all four reservoirs. Steep bedrock with periodic current scouring below the Narrows and Falls dams appears to promote favorable conditions for *Amorpha schwerinii* and *Baptisia alba.* Similarly, *Solidago plumosa* (Yadkin River goldenrod) was found in the scours below Narrows Dam and appears to be able to tolerate spill events/scouring to a greater degree than the other species found in this location. *Helianthus laevigatus*, *Lotus helleri* and *Ruellia purshiana* were recorded only in unforested locations such as the Falls transmission line (*L. helleri* and *R. purshiana*) and a mown roadway (*H. laevigatus*). *Porteranthus stipulatus* was found in only one place, a location of previous record constituting a steep, northwest-facing slope of young upland hardwoods bordering the Tuckertown Reservoir (NAI, 2005c Appendix E-14).

The only non-plant species found in these surveys was the timber rattlesnake (*Crotalus horridus*) which was observed along the Falls transmission line corridor (NAI, 2005c Appendix E-14). However, it is known that the Project also supports several breeding pairs of bald eagle (*Haliaeetus leucocephalus*) which is discussed in Exhibit E.3.2.1. Similarly, aquatic RTE species were reviewed through a different study report and are discussed in Exhibit E.3.1.

The RTE Study concluded that due to their upland locations, most of the RTE species found would not be impacted by the operation of the Project and the related changes in reservoir water levels. According to the RTE Study, the exceptions are those species found in the tailwater areas including *Solidago plumosa*, *Amorpha schwerinii* and *Baptisia alba* which were all found on Falls Reservoir in the vicinity of the Narrows tailwater. These three species seem to benefit from periodic scouring associated with high-flow releases from Narrows Dam that help to remove competing vegetation (NAI, 2005c Appendix E-14).

The effects of tailwater flows on *Solidago plumosa* (Yadkin River goldenrod) were the subject of a separate study conducted by APGI as part of the ongoing relicensing (APGI, 2006 Appendix E-15). The study focused on existing populations of *Solidago plumosa* with the selection of 14 representative plant locations, 12 in the Narrows tailwater area and two in the Falls tailwater area. The elevations of these representative plant locations were measured and an analysis was done to determine the river flows at which each site would be inundated.

Results of the study focusing on the Yadkin River goldenrod showed that the location of most of the plants is such that they are rarely directly affected by river flows or the scour-related effects of river flows. Of the 14 plant locations studied below Narrows and Falls dams, only three would be expected to be directly affected by flows less than 100,000 cfs. No sites were found to be inundated at flows of less than 10,000 cfs, the approximate hydraulic capacity of the powerhouses. These results demonstrate that Yadkin River goldenrod does not require frequent inundation or scouring to maintain viable habitat conditions. Instead, it appears that very infrequent inundation may be an important habitat component. The study results also demonstrate that none of the existing plant populations are in areas that are affected by generation flows. Inundation of all plant locations below both Narrows and Falls dams occur at flows in excess of the hydraulic capacity of the respective developments and so the plants are only affected during spill events outside the control of APGI (APGI, 2006 Appendix E-15).

The results of the flow duration analysis suggest that existing Project operations, as compared to simulated run-of-river operations, have reduced the average annual number of high flow events at which some Yadkin River goldenrod plant locations may be inundated. Since the current location of the plants suggest that they prefer sites that are infrequently inundated, it seems likely that the reduction in the number of high flow events, as a result of the storage operations at High Rock, may have created additional habitat for the Yadkin River goldenrod in the Narrows and Falls tailwater areas by allowing plants to colonize lower elevation sites that may be less frequently inundated than they would be under “unregulated” conditions.

E.3.5 Agency Recommended Protection or Mitigation Measures or Facilities

E.3.5.1 Fish and Aquatic Resources

At the outset of the consultation process, agencies, non-governmental organizations (NGOs) and other stakeholders raised a number of issues with respect to fish and aquatic resources. No specific recommendations were made at that time, but there were requests for fish and aquatic studies to be done by APGI. Ultimately, APGI conducted four different studies that fall into the category of fish and aquatics:

- Reservoir Fish and Aquatic Habitat Assessment – Appendix E-4
- Tailwater Fish and Aquatic Biota Assessment – Appendix E-5
- Fish Entrainment Study – Appendix E-7
- Yadkin Habitat Fragmentation Study – Appendix E-6

Information gained from these studies was used earlier in this section to describe existing fish and aquatic resources at the Project. The studies also provided the basis for examining the continuing impacts to fish and aquatic resources under both existing conditions and APGI's proposed future operation of the Project.

In addition to these studies specific to the Yadkin Project, agencies and NGOs requested an instream flow study to be conducted for the free-flowing reaches of the river below Progress Energy's Tillery and Blewett Falls developments (Yadkin-Pee Dee River Project, FERC No. 2206). As Progress Energy's Project was undergoing relicensing on the same time-schedule as the Yadkin Project, Progress Energy subsequently undertook the requested instream flow study. This study was also discussed earlier in this section and the study report is appended to Progress Energy's Application for New License for the Yadkin-Pee Dee River Project (FERC No. 2206).

In response to APGI's Draft License Application (DLA), several resource agencies provided additional comments and recommendations regarding fish and aquatic resources at the Yadkin Project. Many of the comments received from agencies were in regard to instream flow needs at the Project and the effects of flow releases from Falls Dam on habitat in the lower river below the Blewett Falls development.

In response to APGI's proposal to provide a year round, weekly average minimum flow at Falls of 900 cfs, the NCDWR (letter dated 1/4/06, Appendix E-25) commented that it had determined that a continuous minimum flow release was needed at both the Tillery and Blewett Falls developments, and that the minimum flow at Falls required to support the continuous minimum flow needs at the downstream developments was determined [by NCWRC] by deducting the monthly median accretion flows between the Falls, Tillery, and Blewett Falls dams, as determined in the hydrologic models developed by both Progress Energy and APGI. According to NCWRC, in some months the recommended release from the Yadkin Project is driven by instream flow needs below Tillery Dam (overall Falls release for January is 761 cfs, July is 1,252 cfs, August is 1,215 cfs, November is 1,313 cfs , and December is 1,217 cfs), and in the others it is driven by instream flow needs below Blewett Falls Dam (overall Falls release for February is

2,007 cfs, March is 2,439 cfs, April is 2,681cfs, May is 2,413 cfs, June is 2,070 cfs, September is 1,518 cfs, and October is 1,510 cfs). NCDWR went on to note that their recommended instream flow regime was developed from the results of site-specific studies using the IFIM, as well as studies of flows needed for navigation and freshwater mussel habitat.

NCWRC (letter dated 1/4/06, Appendix E-25) also commented on APGI's proposal to provide minimum flow from Falls on a weekly average basis. NCWRC stated that until hydrologic modeling can demonstrate that downstream flow targets and reservoir levels can be maintained with a particular delivery interval, NCDWR's recommendation would be that flows recommended for release from Falls Dam be provided on a daily, rather than weekly average, basis.

Among the resource agencies commenting on the DLA, the NCWRC, USFWS and USEPA all indicated that they were in agreement with the flows recommended by NCDWR for the Falls development. The USEPA (letter dated 1/4/06, Appendix E-25) went on to recommend that the recommended minimum flows be released from Falls on a daily average basis.

The SCDNR (letter dated 1/3/06, Appendix E-25) and South Carolina Department of Health and Environmental Control (SCDHEC) (letter dated 1/4/06, Appendix E-25) both commented that an instantaneous minimum flow of 1,200 cfs would be required at the Blewett Falls development in order to protect aquatic habitat, as well as navigation, water supply, and wastewater assimilation. Based on that need, both agencies expressed concerns about whether APGI's proposed minimum flow of 900 cfs at Falls, released on a weekly average basis, will be sufficient to allow Progress Energy to provide a continuous minimum flow release of 1,200 cfs at Blewett Falls. Both recommended that additional modeling is needed to ensure that sufficient water is delivered from the Falls development in order to achieve an instantaneous minimum flow release of 1200 cfs at Blewett Falls.

Several other non-agency parties also commented on instream flow needs for the lower river and APGI's proposed minimum flow. Progress Energy (letter dated 1/3/06, Appendix E-25) noted its concern with APGI's proposal to deliver the 900 cfs minimum flow at Falls on a weekly average basis. PE noted that the weekly average requirement would allow periods of little or no flow to be averaged with periods of high flows to achieve a weekly average. PE requested that flow levels exiting the Yadkin Project be subject to daily average and instantaneous minimum flow standards to assure that there will be a continuous flow from the Yadkin Project. In a letter dated 1/3/06 (Appendix E-25), TNC noted that it supports NCDWR's recommended minimum flows for the Yadkin Project and that it seems unlikely that weekly average releases can sustain the instantaneous releases required at the Blewett Falls Development.

Other agency comments and recommendations focused on fish and aquatic habitat in the Yadkin Project reservoirs and tailwaters. Regarding aquatic habitat in the reservoirs, the NCWRC (letter dated 1/4/06, Appendix E-25) recommended that APGI implement a rule curve for High Rock and Narrows with an operating band (drawdown) of 3 ft below full pool in the spring, summer and fall; and an operating band of 6 ft below full pool in the winter. According to NCWRC, this rule curve would ensure water levels that inundate the majority of the high quality littoral aquatic habitat in both reservoirs. The recommended rule curve would also benefit wetland habitat types on both reservoirs. The NCWRC recommended that the operating curves for Tuckertown and Falls should be same as the current curves. The NCWRC also recommended that APGI stabilize water levels at all four Project reservoirs during the spring spawning season, April 1 through May 15. Finally, NCWRC recommended that APGI establish and fund a Habitat Enhancement Program to improve fish and aquatic habitat conditions in the reservoirs. The fund would be used to install fish habitat enhancements, such as fish-friendly piers, large woody debris, and aquatic vegetation.

The USEPA (letter dated 1/4/06, Appendix E-25) made similar comments regarding reservoir water levels, recommending a rule curve for High Rock and Narrows with an operating band (drawdown) of 3 ft below full pool in the spring, summer, and fall; and an operating band of 6 ft below full pool in winter. At Tuckertown and Falls, USEPA recommended that the operating curve remain the same as it is currently. USEPA also recommended expansion of the current operating protocol designed to enhance fish spawning at the reservoirs for the period March 1 through May 31, with a stronger implementation commitment than “voluntary.”

In a letter dated 1/3/06 (Appendix E-25), the High Rock Lake Association (HRLA) commented that through the relicensing study process APGI has documented the negative effects of past operations at High Rock on fish and wildlife habitat, and suggested that the most important change needed for High Rock Reservoir is a mode of operation that would result in relatively stable water levels on a year round basis. Similarly, SaveHighRockLake.org (SHRLO) (letter dated 1/4/06, Appendix E-25) recommended that APGI’s proposed operation for the Project include reasonable allowable fluctuations at each impoundment based solely on the physical and environmental characteristics of that impoundment.

Other comments received from agencies on the DLA focused on other aspects of fish and aquatic resources at the Project. Regarding diadromous fish, USFWS (letter dated 1/27/06, Appendix E-25) noted that state and federal agencies have developed a Diadromous Fish Restoration Implementation Plan for the Yadkin-Pee Dee River and suggested that APGI contribute to a basinwide restoration effort for diadromous fish guided by both the basin plan and the agency implementation plan.

NCWRC (letter dated 1/4/06, Appendix E-25) expressed concerns about mussel populations at the Project and elsewhere in the basin and made some specific recommendations in that regard. First, NCWRC noted a concern about the lack of evidence showing that mussel reproduction is occurring in the Falls tailwater and recommended that APGI provide a continuous minimum flow below Falls Dam. NCWRC also recommended that APGI restore mussels in the Project tailwaters after the proposed flow regime and water quality enhancements are made. If such restorations are not successful, NCWRC further recommended that APGI restore mussels in suitable tributary streams in the Yadkin-Pee Dee basin in North Carolina. Finally, the NCWRC commented that it was still awaiting the results of the Habitat Fragmentation Study being conducted by APGI, but that should habitat fragmentation be shown to be adversely affecting any species, then NCWRC would expect APGI to contribute to the monitoring and restoration of that species.

E.3.5.2 Wildlife Resources

At the outset of the consultation process, agencies, NGOs and other stakeholders raised a number of issues with respect to wildlife resources. No specific recommendations were made at that time, but there were requests for wildlife resource studies to be done by APGI. Ultimately, APGI conducted two studies that fall into the category of wildlife resources:

- Avian Inventory – Appendix E-9
- Transmission Line and Project Facility Habitat Assessment – Appendix E-10

In addition, since 2001, APGI has been conducting annual bald eagle and great blue heron nesting surveys at the Yadkin Project. At the request of agencies, those annual surveys continued during the study phase of the relicensing process (in 2004 and 2005).

Information gained from these studies was used earlier in this section to describe existing wildlife resources and their habitats at the Project. The studies also provided the basis for examining the continuing impacts to wildlife resource habitats under both existing conditions and APGI's proposed future operation of the Project (discussed below).

In response to the DLA, APGI did receive some comments and recommendations from some agencies on wildlife resources at the Project, primarily regarding habitat management on the two Project transmission lines. NCWRC (letter dated 1/4/06, Appendix E-25) recommended that APGI protect wetlands, streams, and ponds located on the transmission line corridors and elsewhere within the Project boundary. NCWRC further recommended that APGI manage the transmission line corridors for quail and other early successional species through the planting of native warm-season food plants. USFWS (letter dated 1/27/06, Appendix E-25) also expressed concern about the management of the transmission line corridors and recommended that some protection and maintenance protocols, excluding the use of pesticides or other detrimental practices, be developed for maintaining the transmission line corridors.

E.3.5.3 Botanical Resources

At the outset of the consultation process, agencies, NGOs and other stakeholders raised a number of issues with respect to botanical resources. No specific recommendations were made at that time, but there were requests for certain studies of botanical resources to be done by APGI. Ultimately, APGI conducted two different studies that fall into the category of botanical resources:

- Wetland and Riparian Habitat Assessment – Appendix E-12
- Invasive Exotic Plant Pest Species Assessment – Appendix E-13

Information gained from these studies was used earlier in this section to describe existing botanical resources at the Project. The studies also provided the basis for examining the continuing impacts to botanical resources under both existing conditions and APGI's proposed future operation of the Project.

In response to the DLA, APGI received only one agency recommendation regarding invasive exotic flora and fauna at the Project. The NCWRC (letter dated 1/4/06, Appendix E-25) recommended that APGI monitor and manage hydrilla, other aquatic invasive plant species, and exotic invasive animal species in consultation with NCWRC and other agencies.

E.3.5.4 RTE Species

At the outset of the consultation process, agencies, NGOs and other stakeholders indicated a concern about the presence and status of RTE species at the Yadkin Project. No specific recommendations were made at that time, but there were requests for studies to be done by APGI that investigated the status of RTE species. In response to those concerns, APGI conducted several studies aimed at understanding the presence and status of RTE species and their habitats at the Project:

- Rare, Threatened and Endangered Species Survey – Appendix E-14
- Yadkin River Goldenrod Survey – Appendix E-15
- Bald Eagle Nesting Survey – Appendix E-11

In addition, specific objectives of the Tailwater Fish and Aquatic Biota Assessment included directed searches for rare fish species (Carolina and robust redhorse) and rare mussel species. Information gained from these studies was used earlier in this section to describe the status of RTE species and their habitats at the Project. The studies also provided the basis for examining the continuing impacts to RTE species and their habitats under both existing conditions and APGI's proposed future operation of the Project.

Two resource agencies made comments and recommendations regarding RTE species at the Yadkin Project. NCWRC (letter dated 1/4/06, Appendix E-25) recommended that APGI prepare management plans for RTE aquatic species within two years of the effective date of a new license. NCWRC also recommended that APGI continue its annual bald eagle and heron nesting surveys. The USFWS (letter dated 1/27/06, Appendix E-25) expressed similar concerns about bald eagle protection at the Project, and recommended that the measures designed to protect bald eagle habitat contained in the current Yadkin Project BEMP and Yadkin SMP be carried forward in the new license.

E.3.6 Existing Measures to be Continued and Applicant Proposed Measures for the Mitigation of Impacts on Fish, Wildlife, and Botanical Resources

APGI is proposing to continue to operate the Yadkin Project with certain changes in operations or measures undertaken to enhance non-power resources at the Project, including certain changes in Project operation and protection, mitigation or enhancement (PME) measures that will enhance fish, wildlife and botanical resources at the Project.

E.3.6.1 Existing Measures to be Continued

Fish Spawning Enhancement

Since 1997, APGI has worked with the NCWRC to develop a voluntary mode of reservoir operation that is designed to enhance fish spawning at the Yadkin Project reservoirs. Based on recommendations from NCWRC, during the prime fish spawning season (usually April 15 to May 15), APGI makes every effort to maintain reservoir water levels within $\pm$ 1 foot of the elevation of the reservoir on April 15. Typically, APGI has been able to maintain the reservoirs within the target elevation range throughout the period. This operation helps to maximize spawning success in the shallow water portions of the reservoirs, which provide the prime habitat for spawning. APGI proposes to continue a similar mode of operation during the fish spawning season throughout the term of a new Project license. Resulting reservoir water levels achieved at each reservoir during the fish spawning season will be reported to the NCWRC each year in a letter report that will provide an explanation of any conditions encountered during that period that prevented APGI from maintaining the target water levels.

Fish and Wildlife Habitat

APGI has worked cooperatively with the NCWRC, U.S. Forest Service (USFS), and local fishing clubs for many years to enhance fisheries and wildlife resources at the Project. APGI has provided resources to improve fish habitat along the High Rock and Narrows shorelines, such as the "cut and cable" of lap-trees along the shoreline. In addition to providing resources, APGI has improved habitat for wildlife by planting beneficial vegetation. APGI proposes to continue its cooperative work with resource agencies to provide habitat enhancements for fish at its reservoirs.

Bald Eagle Nesting Surveys

Since 2001, APGI has been conducting bald eagle and great blue heron nesting surveys at the Yadkin Project. These surveys have allowed resource agencies to closely track the status of breeding populations of these two species over time. In particular, the surveys allow resource agencies to closely monitor the status of the federally threatened bald eagle and its habitats; a species that has been of concern at the Project for a number of years.

APGI is proposing to continue to monitor bald eagle and great blue heron nesting at the Project by conducting annual nesting surveys in the spring of each year. As it has in the past, APGI will provide the results of each year's nesting survey in the form of an annual written report to state and federal resource agencies. The resulting reports will not be made readily available to the public to help protect information on the location of heron colonies and eagle nesting sites.

Transmission Line and Facility Habitat Management

Historically, the Falls and Narrows transmission line corridors have been maintained to a cleared width of approximately 100-150 ft. In a recent initiative to improve safety and enhance transmission line reliability, APGI cleared the Falls transmission line in 2004 to an average width of 200 ft. A similar widening of the Narrows transmission line was completed in 2005. In the long-term, the widening of the transmission line corridor can be expected to add additional mixed grass and shrub habitat for wildlife use and is expected to benefit game species such as white-tailed deer, turkey, and bobwhite as well as some non-game species (NAI, 2005g Appendix E-10). A widened transmission line corridor, especially one that has been recently cleared, may reduce or eliminate the crossing movements of some animals (e.g., small birds and mammals) that now may include both forested edges in one territory.

The current vegetation management program used by APGI for maintenance of its transmission lines and Project facilities uses herbicides appropriate to the control of target species and sensitive environments (NAI, 2005g Appendix E-10). APGI proposes to continue to use similar techniques to manage vegetation along the transmission line corridors in the future. Continued facility maintenance using appropriately selected and applied herbicides should have no adverse impacts on the use of these areas by wildlife.

To address concerns expressed by resource agencies about several aspects of transmission line corridor management, APGI proposes to prepare, in consultation with resource agencies, a Transmission Line Corridor Management Plan which will be filed with FERC within three years of the effective date of a new license.

E.3.6.2 New Measures Proposed

E.3.6.2.1 Operational Measures

As outlined in Exhibits B.2 and E.2.7, APGI is proposing to operate the Yadkin Project with certain changes in Project operations designed to enhance Project resources including fish, wildlife and botanical resources. In summary, these proposed changes include:

- Operating the Project with a year round, weekly average minimum flow of 900 cfs at Falls (Exhibit B.6.1);
- Operating High Rock Reservoir in accordance with a revised guide curve (Exhibit B.2.1.2);
- Operating the Project in accordance with a Low Inflow Protocol (LIP) (Exhibit B.6.3); and
- Installing and operating aeration technology designed to improve dissolved oxygen conditions in the Project tailwaters (Exhibit E.2.7).

E.3.6.2.2 Non-Operational Measures

APGI is also proposing to undertake several non-operational measures to enhance fish, wildlife and botanical resources at the Project.

Diadromous Fish Restoration and Fish Passage

APGI proposes to work in consultation with the USFWS and other fishery agencies to develop a Diadromous Fish Passage Plan for the Yadkin Project that is consistent with the goals of the agencies' Diadromous Fish Restoration Plan for the Yadkin-Pee Dee River. The primary focus of the Diadromous Fish Passage Plan will be on supporting the overall restoration effort for

American shad and American eel, and for providing appropriate passage, when needed. The Fish Passage Plan will be filed with FERC within three years of a new license.

RTE Species

As there are several rare, threatened and endangered species found at the Yadkin Project, APGI is proposing to develop an RTE Species Management Plan for the Project. The plan will be developed in consultation with state and federal resource agencies. The plan will be developed and submitted to FERC within one year of the effective date of a new license. The plan will detail any specific actions to be taken by APGI and/or resource agencies to protect RTE species and their habitats at the Yadkin Project over the term of a new FERC license.

Tailwater Mussel Monitoring

In response to the DLA, NCWRC raised a number of concerns regarding mussels at the Yadkin Project. To address these concerns, APGI proposes to work with NCWRC to periodically monitor mussel populations and reproduction in the four Project tailwaters. The focus of the monitoring effort will be to examine mussel population response to anticipated improvements in tailwater dissolved oxygen conditions.

Invasive, Exotic Aquatic Species Management

APGI's study of IEPPs at the Yadkin Project demonstrated that there are numerous IEPP species at the Project, including a few aquatic IEPPs that resource agencies are concerned could become problematic, if they are not monitored closely. In addition, the NCWRC has indicated that there are invasive exotic animals, such as the Chinese mystery snail, which are also of concern at the Project. Accordingly, APGI is proposing to work in cooperation with the NCDWR and NCWRC to monitor invasive exotics of concern and to periodically undertake control activities, as needed. The primary focus of the monitoring program will be on invasive aquatic plants, such as hydrilla, but will also consider other invasive aquatic species that may become established in the reservoirs. APGI will help fund efforts to be undertaken by NCDWR or NCWRC to survey the Yadkin Project reservoirs annually for the presence and extent of invasive, exotic aquatic species of concern. If at any time NCDWR or NCWRC identifies the presence of invasive exotics in any of the Yadkin Project reservoirs to an extent that is of concern to the agencies, APGI will work with NCDWR and NCWRC to identify and undertake appropriate control actions on a cost-share basis.

E.3.7 Design Drawings of Any Fish Passage and Collection Facilities

At this time, APGI is not proposing any fish passage and collection facilities at the Yadkin Project, so no design drawings are provided as part of this License Application.

E.3.8 Operation and Maintenance Procedures for Any Existing or Proposed Measures or Facilities

No new facilities are being specifically proposed for the protection, enhancement or mitigation of fish, wildlife or botanical resources, so there are no new operation or maintenance procedures being considered. As discussed in Exhibit E.2.7, APGI is proposing to install and operate new aeration technologies to improve tailwater dissolved oxygen conditions at the Project, which in turn will enhance tailwater aquatic habitat and fisheries. Details on the operation and maintenance of the proposed new aeration equipment were provided earlier in Exhibit E.2.7.

APGI is proposing to prepare a Transmission Line Corridor Management Plan for the two Yadkin Project transmission lines. Appropriate operation and maintenance measures for the transmission line corridors will be outlined in that plan which will be developed in consultation with resource agencies and filed with FERC.

E.3.9 Implementation or Construction Schedule for Any Proposed Measures or Facilities

APGI is proposing no new facilities specifically for the protection, enhancement or mitigation of fish, wildlife or botanical resources. APGI is proposing facilities and measures for the improvement of tailwater and reservoir dissolved oxygen conditions and the implementation schedule for these measures was discussed previously in Exhibit E.2.7.

E.3.10 Estimate of the Costs of Construction, Operation, and Maintenance of Implementation of Any Proposed Measures

APGI is making several significant proposals for the protection and enhancement of fish, wildlife and botanical resources in this License Application. The estimated cost of both the operational and non-operational measures being proposed is outlined in Table E.3-23.

Table E.3-23: Estimated Cost of Measures Proposed for the Protection, Mitigation and Enhancement of Fish, Wildlife and Botanical Resources

PME Proposals for Fish, Wildlife and Botanical Resources	Estimated Annual Cost	Estimated One-Time Cost
Operate High Rock in accordance with a revised guide curve that maintain reservoir within 6 ft of full 4/1-10/31 (with "soft" Recreation Season Guide Curve) and within 12 ft of full 11/1-3/31, with transition periods for fill and drawdown during March and November, except as need to meet minimum flow requirements, LIP, or Hydro Project Maintenance and Emergency Protocol (HPMEP). Operate Narrows generally within 3.0 ft. of full year round with the ability to go to 6.6 ft., except as needed to meet minimum flow requirements, LIP or HPMEP. Operate Tuckertown and Falls within 3.0 ft. and 4.0 ft., respectively.	$440,000 (in conjunction with minimum flow)	
Operate the Yadkin Project so as to provide a weekly average minimum flow from the Falls Development of 900 cfs, year round.		
Prepare an RTE Species Management Plan including provisions for certain RTE enhancement measures.	$12,000	$50,000
Prepare and implement a Transmission Line Corridor Management Plan for the Yadkin Project transmission lines.	$10,000	$20,000
Cooperative effort with NCWRC to periodically monitor tailwater mussel populations ($50,000 every 5 years)	$10,000	
Work cooperatively with NCDWR and NCWRC to monitor and manage invasive, exotic aquatic species at the Project.	$25,000	
In consultation with fishery agencies, develop and implement a Diadromous Fish Passage Plan for the Yadkin Project.	$25,000	$50,000
Continue voluntary operation of reservoirs during the fish spawning season (April 15-May 15) to try to maintain water levels within ± 1 foot of the elevation of the reservoir on April 15.		
Continue cooperative work with agencies to improve habitat at the Project, e.g., cut and cable trees, plant buttonbush.		

E.3.11 Maps and Drawings

As APGI is proposing no new facilities specifically for the protection, mitigation and enhancement of fish, wildlife and botanical resources, there are no relevant maps or drawings to present in this section.

E.3.12 Explanation of Why the Applicant Has Rejected Any Measures or Facilities Recommended by an Agency

In response to APGI's proposal in its DLA to provide a year round, weekly average minimum flow at Falls of 900 cfs, NCWRC and several other resource agencies recommended alternative minimum flows for the Yadkin Project. These same agencies recommended that minimum flows be released from Falls on a daily average, rather than a weekly average, basis.

APGI does not agree that the flows recommended by NCDWR and the other agencies are required in order to enhance and protect fish and aquatic habitat in the free-flowing river downstream of the Blewett Falls development. The flows recommended by NCDWR for release from the Falls development are based on the agencies' recommended flows for release from Blewett Falls. In turn the Blewett Falls flows are being recommended by the NCWRC in order to achieve an increased level of aquatic habitat for certain critical aquatic habitat types (aka, "driver species"). NCDWR's policy is to recommend a minimum flow regime that will support 80 percent of the Index C habitat value that would be found under unregulated flow conditions. The flow recommendations made by NCDWR are based primarily on NCDWR's analysis of Index C conditions for the driver species in the river reaches below Blewett Falls, as well as on consideration of needs for mussels and navigation. As discussed in Exhibit E.3.1.2.4, APGI believes that the "static flow" method NCDWR used to calculate Index C values for various species/lifestages/habitat guilds is flawed and does not provide a true picture of habitat conditions in these river reaches under a given minimum flow regime. Accordingly, APGI prepared an alternative analysis of habitat conditions, including calculation of Index C values, for the driver species, which was discussed in detail earlier in Exhibit E.3.1.2.4 and is provided in Appendix E-8. Based on the results of this analysis, APGI remains convinced that its proposal to release a weekly average minimum flow of 900 cfs at Falls has the potential to produce excellent habitat conditions for most of the species/lifestages/habitat guilds of concern in the river below Blewett Falls.

Nor does APGI agree that flows need to be released from Falls on a daily average basis. The combined storage capacity available at the Tillery and Blewett Falls reservoirs, along with expected contribution to flows from tributaries between Falls and Blewett Falls dams, is sufficient for Progress Energy to reregulate flows from Falls delivered under typical project operations on a weekly average basis in order to release a continuous minimum flow downstream of Blewett Falls Dam of 1,200-1,500 cfs the majority of the time.

Regarding aquatic habitat in the reservoirs, the NCWRC and USEPA have recommended that APGI implement a rule curve for High Rock and Narrows with an operating band (drawdown) of 3 ft below full pool in the spring, summer and fall; and an operating band of 6 ft below full pool in the winter. According to these agencies, this rule curve would ensure inundation of the majority of the high quality littoral aquatic habitat and would also benefit wetlands on both reservoirs.

APGI believes that its proposal to operate High Rock Reservoir in accordance with a revised guide curve (see Exhibit B.2.1.2) that includes a Hard Guide, a Soft Guide, and a Recreation Season Guide (April 15 to September 15) will protect existing aquatic resources and wetlands in the reservoir. The proposed guide curve will also provide some enhancement to aquatic habitats and wetlands by extending the season during which the reservoir is operated within 6 ft of full (April 1 through October 31) and by reducing the magnitude of the winter drawdown to a maximum of 12 ft. Further restrictions on reservoir water levels such as those recommended by NCWRC and USEPA will significantly reduce the value of High Rock as a storage-and-flow regulation facility. The ability to store water and regulate flow from High Rock is valuable both for hydropower production and for downstream flow regulation and augmentation for purposes of enhancing water quality, aquatic habitats, and recreation.

The NCWRC also recommended that APGI continue its efforts to maintain more stable reservoir water levels during the spring fish spawning season but to extend the spawning season to April 1 through May 15. USEPA recommended that the season be extended from March 1 through May 31.

APGI is proposing to continue its stabilization of reservoir water levels during the spring spawning season as a voluntary measure. APGI opposes the concept of mandatory restrictions on reservoir water levels during the spring spawning period because of the potential adverse effects on Project operations. Spring flows can be highly variable, and any additional mandatory restrictions on reservoir water level fluctuations during this period could significantly hinder APGI's ability to make necessary store and release adjustments to avoid significant spills and control river flows. In order to operate High Rock Reservoir effectively as a storage facility, APGI must maintain flexibility during the spring period, when it is simultaneously attempting to refill the reservoirs, helping to reduce downstream flooding potential and minimize spill. In the past, APGI has been very successful at maintaining stable water levels during this period to enhance spring spawning. But there have been occasions when conditions require APGI to fluctuate reservoir water levels more than the +/- 1 foot target. When this occurs, APGI has reported (in an annual letter report) to NCWRC the circumstances that caused the greater water level fluctuations. Examples of the types of circumstances that have affected APGI's efforts to maintain stable water levels during the spawning season include reduced inflows due to dry periods or drought, extreme high inflow events, and the need to meet FERC-licensed flow or generation requirements.

APGI also does not agree that the targeted fish spawning season needs to be extended, as recommended by USEPA to March 1 through May 31. NCWRC has indicated in the past that the spawning season at the Yadkin Project reservoirs for largemouth bass, the species of most interest for enhanced spawning, is mid-April through mid-May. Since spawning is generally triggered by water temperature, the exact onset of prime spawning conditions varies somewhat from year to year. However, there is no reason to extend the stable water level period to include March and May, as well. Moreover, any attempt made by APGI to try to stabilize reservoir water levels during March could seriously hinder APGI's ability to refill High Rock Reservoir.

NCWRC expressed concerns about mussel populations at the Project and elsewhere in the basin and made some specific recommendations in that regard. First, NCWRC noted a concern about the lack of evidence showing that mussel reproduction is occurring in the Falls tailwater and recommended that APGI provide a continuous minimum flow below Falls Dam. NCWRC also recommended that APGI restore mussels in the Project tailwaters after the proposed flow regime and water quality enhancements are made. If such restorations are not successful, NCWRC further recommended that APGI restore mussels in suitable tributary streams in the Yadkin-Pee Dee basin in North Carolina. Finally, the NCWRC commented that it was still awaiting the results of the Habitat Fragmentation Study being conducted by APGI, but that should habitat fragmentation be shown to adversely affect any species, then NCWRC would expect APGI to contribute to the monitoring and restoration of that species.

APGI has serious concerns about all of the NCWRC's recommendations regarding mussels at the Yadkin Project. APGI does not agree that it needs to provide a continuous minimum flow below Falls Dam to enhance mussel reproduction. There is no evidence in any of the studies conducted by APGI (or Progress Energy) that the lack of a continuous minimum flow at Falls Dam is adversely impacting mussels or mussel reproduction in that tailwater. Nor has NCWRC provided any information or data that suggest that mussel reproduction is not occurring in the Falls tailwater, or that providing a continuous minimum flow at the dam will enhance mussel reproduction. Because there is no evidence to suggest that mussel reproduction would be enhanced by a continuous minimum flow, APGI believes that such a requirement would be imprudent given the significant cost associated with having to provide a continuous minimum flow at the Falls development.

Nor does APGI agree that it should be required to restore mussel populations to the Project tailwaters or elsewhere in the basin. There are many factors that may be affecting the distribution and viability of mussels in the Project area. In the tailwaters, water quality, particularly DO conditions, may be affecting mussel diversity, but other factors beyond the control of the licensee may also be a factor. Since, there are so many unknowns surrounding the distribution and diversity of mussels, APGI believes that it is premature to conclude that mussel restoration is necessary or would be successful, if attempted. In lieu of a requirement to restore mussels to the Project tailwaters, APGI is proposing to work with NCWRC to periodically monitor mussels in the tailwaters throughout the term of the new license.

E.3.13 Impact of Continued Project Operation as Proposed on Fish, Wildlife, and Botanical Resources

The Yadkin Project currently provides a wide array of important fish and wildlife habitats, and supports healthy and diverse warmwater reservoir fisheries, significant areas of vegetative wetlands, diverse riparian and edge habitat for both game and non-game species of wildlife, and habitat for rare species. The continued operation of the Yadkin Project will maintain the existing reservoir ecosystem and the biological communities that have evolved around the reservoirs over the past 80 years. Moreover, APGI is proposing to continue its operation of the Yadkin Project with several measures undertaken that will provide significant enhancement to the fish, wildlife and botanical resources at the Yadkin Project and elsewhere in the Yadkin-Pee Dee River basin. The anticipated impacts to fish, wildlife and botanical resources expected to occur as a result of the continued operation of the Project, as proposed, are discussed in more detail in the following sections.

E.3.13.1 Effects of Proposed Reservoir Operations on Fish and Aquatic Habitat

APGI is proposing to operate the Yadkin Project reservoirs in accordance with a revised guide curve (see Exhibit B.2.1). Under the proposed operation there will be no significant change to reservoir water levels anticipated at Tuckertown, Narrows or Falls reservoirs. Generally, these reservoirs will continue to be operated as they have in the past, with no seasonal drawdowns and minimal short-term fluctuations in reservoir water levels. Accordingly, there will be no impacts to the existing fish, wildlife or botanical resources found in and around these reservoirs.

At High Rock Reservoir, the proposed guide curve will result in some changes in reservoir water levels, which in turn are expected to enhance habitat conditions for fish, wildlife and botanical resources in this reservoir. The most significant changes to the water level regime that will result from the proposed High Rock guide curve will be an extended season of water levels within 6 ft of full, and a somewhat reduced winter drawdown from a current typical drawdown range of average of 12-15 ft, to a winter drawdown maximum of 12 ft. These changes are anticipated to enhance habitat conditions for fish and wildlife.

As part of the Reservoir Fish and Aquatic Habitat Assessment conducted by APGI, NAI evaluated how changes in Project operations, including both increasing and decreasing short and long-term reservoir drawdowns would impact reservoir fish and aquatic habitat. To do this, APGI used several simplified water level regimes that were developed to encompass the range of operational alternatives for High Rock Reservoir that might be considered in the relicensing process (NAI, 2005d Appendix E-4). One of the water level regimes evaluated by NAI in the Reservoir Fish and Aquatic Habitat Study (Alternative 2) is similar to APGI's proposed guide curve for High Rock. Figure E-9 illustrates the water level scenario examined by Alternative 2 in the Reservoir Fish and Aquatic Habitat Study. As can be seen, like the proposed guide curve for High Rock Reservoir, Alternative 2 features an extended period of near full water levels in the spring and fall, and a reduced winter drawdown (10 ft) relative to what typically occurs under existing Project operations (typically 12-15 ft). These two features of the proposed guide curve for High Rock are expected to provide significant enhancement to High Rock fisheries.

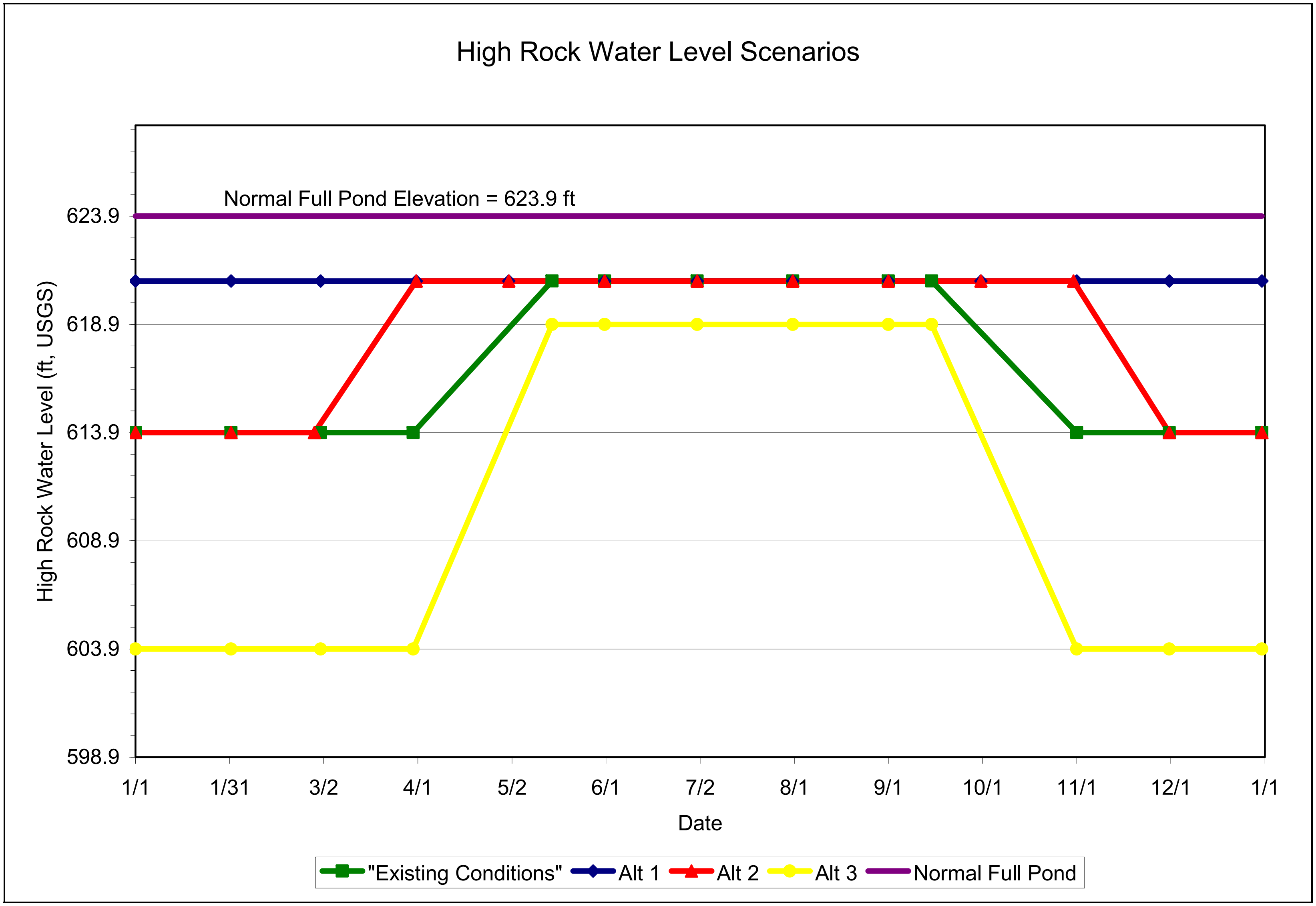
In general, NAI concluded that High Rock Reservoir operated with an extended season of near-full water levels that is refilled in March and drawn down an average of 10 ft in November would enhance fish populations in High Rock (NAI, 2005d Appendix E-4). Filling the reservoir in March will improve spawning conditions for important management species such as largemouth bass and black and white crappies and many other fish that spawn in shallow water during April and May (see Exhibit E.3.1.2.1). Also, extending the near full season until November will help increase the survival rates of young of the year fish. In addition, NAI concluded that a water level regime similar to Alternative 2 would improve survival of more young-of-the-year fish compared to the current drawdown scenario while still providing the benefit of preventing certain fish species such as sunfish and carp from becoming severely overpopulated. Also, because Alternative 2 is similar to the current drawdown regime, the percent composition of the current fish populations in the reservoir would be expected to remain the same. Important game fish such as black crappie, bluegill, and largemouth bass would continue to dominate the catches, because they have done well under the current drawdown regime. Gizzard and threadfin shad, the primary forage fishes in the reservoir, would also continue to do well under the proposed High Rock guide curve, given their high abundance under the current drawdown regime.

E.3.13.2 Effects of Proposed Reservoir Operations on Wetlands

As part of the Wetlands Study conducted by APGI (Appendix E-12), NAI evaluated how significant changes in Project operations, including both increasing and decreasing short-term and long-term reservoir drawdowns, would impact existing wetlands, or would allow for additional wetland development. As with the Reservoir Fish and Aquatic Study, NAI used several simplified water level regimes that were developed to encompass the range of operational alternatives for High Rock Reservoir. One of the water level regimes evaluated by NAI in the Wetlands Study (Alternative 2) is similar to APGI’s proposed future operation of High Rock Reservoir under the proposed guide curve (see Figure E-9). Under the proposed guide curve for High Rock the extension of the near full season and the resulting shorter period of winter drawdown would likely enhance wetland development around the perimeter of High Rock, probably similar to Narrows with water willow dominating the emergent wetlands.

As no significant changes in reservoir operating regimes are being proposed by APGI for the Tuckertown, Narrows and Falls developments, no impacts to existing wetlands are expected to occur as a result of continued Project operations.

Figure E-9: Water Level Scenario Alternatives Analyzed in the Reservoir Fish and Aquatic Habitat Assessment



E.3.13.3 Effects of Proposed Minimum Flows on Downstream Habitat

APGI is proposing to operate the Yadkin Project with a year round, weekly average minimum flow at Falls of 900 cfs. As water from the Falls Development is released into Tillery Reservoir and there is no free-flowing river reach downstream of Falls, the proposed minimum flow is expected to have no effect on existing fish and aquatic resources in the Falls tailwater area. This area will continue to support a vital warmwater fishery and the aquatic habitat conditions that currently allow freshwater mussels and a wide array of macroinvertebrate species to exist there.

APGI's proposal to provide a 900 cfs weekly average minimum flow at Falls has the potential to significantly enhance aquatic habitat for fish and mussels in the lower river, downstream of Blewett Falls Dam. Although the actual effect of flows on habitat below Blewett Falls will primarily be determined by Progress Energy's operation of the Blewett Falls Development, APGI's proposed minimum flow has the potential to produce habitat conditions that are significantly enhanced over the habitat produced under existing Project operations (see Exhibit E.3.1.2.4).

As discussed in Exhibit B, APGI is also proposing to operate the Yadkin Project in accordance with a Low Inflow Protocol (LIP). The LIP is anticipated to include provisions for APGI to reduce (to specified amounts) its flow releases to help balance water levels in the reservoirs during periods of extreme low inflow or drought. As the details of the proposed LIP are still being worked out with agencies and other stakeholders, it is not possible at this time to consider the specific effects on Project resources expected to occur. However, in general, the LIP is predicated on the idea that during periods of limited water availability, that the water be used equitably to help preserve both reservoir and tailwater resources during periods of drought. In that sense, then, the proposed LIP would be expected to benefit fish, wildlife, and botanical resources throughout the Project.

E.3.13.4 Effects of Proposed Project Operations on RTE Species

The continued operation of the Yadkin Project as proposed will have no adverse impacts to RTE species or their habitats. APGI is proposing some modifications to existing Project operations (minimum flow and High Rock guide curve), but implementation of these changes is not expected to have any significant impact (positive or negative) on RTE species. As part of the RTE Species Survey (Appendix E-14), NAI evaluated the potential impact of reservoir operations on the RTE species and habitats located during the study. NAI concluded that due to their upland locations, most of the rare species found would not be impacted by the operation of the Project and the related changes in reservoir water levels. The exceptions were those species found in the tailwater areas including *Solidago plumosa*, *Amorpha schwerinii* and *Baptisia alba* which were all found on Falls Reservoir in the vicinity of the Narrows tailwater. These three species seem to benefit from periodic scouring associated with extreme high flow releases from Narrows Dam that help to remove competing vegetation (NAI, 2005c Appendix E-14).

APGI is also proposing to prepare an RTE Species Management Plan for the Project, which will detail actions to be taken by APGI and others to help protect RTE species and their habitats over the term of a new license.

*Bald Eagl*es

Continued operation of the Project reservoirs as proposed will continue to provide habitat for both resident and transitory bald eagles. The high quality warmwater fishery found in the Project reservoirs provides eagles with an excellent forage resource. Proposed modifications to reservoir water levels, as a result of implementing new reservoir operating guides and minimum flow requirements are not expected to have any adverse impact on the fishery resource, and, in fact are expected to enhance the High Rock Reservoir fishery. Bald eagles should continue to find suitable nesting habitat on tracts of undeveloped and preserved lands (e.g., Uwharrie National Forest) that are located outside the Project boundary but in close proximity to the reservoirs.

E.3.14 Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. The following table summarizes the consultation record related to fish, wildlife and botanical resources at the Yadkin Project. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.3-24: Summary of Consultation Record Related to Fish, Wildlife and Botanical Resources

Agency/Party	Date	To	Description
South Carolina Department of Natural Resources, Robert Duncan	January 9, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
North Carolina Division of Water Resources, John Morris	January 9, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
High Rock Lake Association, Larry Jones	January 9, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
North Carolina Watershed Coalition, Scott Jackson	January 9, 2003	APGI	Initial relicensing comments
U.S. Fish and Wildlife Service, Garland Pardue	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments and study requests
U.S. Forest Service, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
Yadkin-Pee-Dee Lakes Project, Ann Liebenstein Bass	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
North Carolina Wildlife Resources Commission, Chris Goudreau	January 12, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments and “Hydropower Relicensing Issues, Standards, and Mitigation”
South Carolina Coastal Conservation League and American Rivers, Gerrit Jobsis and David Sligh	January 12, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
APGI, Jody Cason	March 25, 2003	All IAGs	Agenda for April 9, 2003 Fish and Aquatics IAG meeting (email)
APGI, Jody Cason	April 4, 2003	F&A IAG	Distribution of F&A IAG draft study plans: Reservoir Fish and Aquatic Habitat Assessment, Tailwater Fish and Aquatic Biota Assessment, and Fish Entrainment Study (email)
High Rock Lake Association, Larry Jones	April 4, 2003	APGI, Jody Cason	Comments on F&A IAG draft study plans (email)
APGI, Jody Cason	April 18, 2003	WWB IAG	Distribution of WWB IAG draft study plans: Wetland and Riparian Habitat Assessment, RTE Species Survey, Invasive Exotic Plant Species, and Transmission Line Habitat Assessment (email)
APGI, Jody Cason	April 29, 2003	WWB IAG	Distribution of Avian Inventory draft study plan (email)
NC Wildlife Resources Commission, Chris Goudreau	April 30, 2003	WWB IAG	Comments on WWB IAG draft study plans (email)

Table E.3-24: Summary of Consultation Record Related to Fish, Wildlife and Botanical Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	May 22, 2003	F&A IAG	Distribution of revised F&A IAG study plans (Reservoir Fish and Aquatic Habitat Assessment, Tailwater Fish and Aquatic Biota Assessment, and Fish Entrainment Study) for final review and comment (email)
NC Wildlife Resources Commission, Chris Goudreau	June 3, 2003	F&A IAG	Comments (email) on revised F&A IAG study plans (Tailwater Fish and Aquatic Biota Assessment, and Fish Entrainment Study)
APGI, Jody Cason	June 5, 2003	F&A IAG	Final summary of March 12, 2003 F&A IAG meeting (email)
APGI, Jody Cason	June 5, 2003	WWB IAG	Final summary of March 13, 2003 WWB IAG meeting (email)
APGI, Jody Cason	June 9, 2003	WWB IAG	Revised WWB IAG study plans for final review and comment (email)
APGI, Jody Cason	June 10, 2003	F&A IAG	Final summary of April 9, 2003 F&A IAG meeting (email)
APGI, Jody Cason	June 23, 2003	F&A IAG	Email about rescheduling tailwaters site visit
APGI, Jody Cason	June 26, 2003	F&A IAG	Emailed final study plans for the Fish Entrainment Study, Reservoir Fish and Aquatic Habitat Assessment, and Tailwater Fish and Aquatic Biota Assessment
APGI, Jody Cason	June 30, 2003	WWB IAG	Distribution (email) of final study plans for the Avian Inventory, Wetlands and Riparian Habitat Assessment, Transmission Line and Project Facility Habitat Assessment, IEPP Species Inventory, and RTE Species Survey
APGI, Jody Cason	July 2, 2003	WWB IAG	Final summary of April 25, 2003 WWB IAG meeting (email)
APGI, Jody Cason	September 23, 2003	F&A IAG and WQ IAG	Agenda for October 7, 2003 Water Quality IAG and Fish & Aquatics IAG joint meeting (email)
APGI, Jody Cason	September 23, 2003	WWB IAG	Agenda for October 8, 2003 WWB IAG meeting (email)
APGI, Wendy Bley	November 3, 2003	USFWS, John Ellis	Email request for USFWS review of RTE Species List
USFWS, John Ellis	November 3, 2003	APGI, Wendy Bley	Email response to request for USFWS review of RTE Species List
APGI, Jody Cason	December 2, 2003	F&A IAG and WQ IAG	Final summary of October 7, 2003 F&A IAG and Water Quality IAG joint meeting (email)
APGI, Jody Cason	December 2, 2003	WWB IAG	Final summary of October 8, 2003 WWB IAG meeting (email)

Table E.3-24: Summary of Consultation Record Related to Fish, Wildlife and Botanical Resources (continued)

Agency/Party	Date	To	Description
APGI, Wendy Bley	February 18, 2004	USFWS, Mark Cantrell	Email request for USFWS comments on RTE species list
U.S. Fish and Wildlife Service, Mark Cantrell	March 4, 2004	APGI, Wendy Bley	Comments on RTE Species list for RTE Survey (e-mail)
APGI, Jody Cason	April 19, 2004	F&A IAG and WQ IAG	Final summary of February 3, 2004 F&A IAG and Water Quality IAG joint meeting (email)
APGI, Jody Cason	May 3, 2004	F&A IAG	Announcement of meeting on May 4, 2004 to discuss habitat fragmentation
APGI, Jody Cason	June 25, 2004	WWB IAG	Distribution of the RTE Species Survey Final Study Plan; RTE Species Survey Study Plan Addendum; and the final list of RTE species (email)
APGI, Jody Cason	July 30, 2004	F&A IAG	Draft study plan for the Yadkin Project Habitat Fragmentation Study (email)
APGI, Jody Cason	August 1, 2004	WWB IAG	Draft Study Plan for Yadkin River Goldenrod Survey and invitation for site visit (email)
APGI, Jody Cason	August 4, 2004	WWB IAG	Details about site visit on August 5, 2004 for the Yadkin River goldenrod (email)
High Rock Lake Association, Larry Jones	August 9, 2004	APGI, Jody Cason	Comments on Habitat Fragmentation Draft Study Plan (email)
NC Wildlife Resources Commission, Todd Ewing	August 27, 2004	APGI, Jody Cason	Comments on Yadkin River Goldenrod Draft Study Plan (email)
NC Wildlife Resources Commission, Todd Ewing	September 1, 2004	APGI, Jody Cason	Comments on Habitat Fragmentation Draft Study Plan (email)
APGI, Jody Cason	September 2, 2004	F&A IAG	Final meeting summary of May 4, 2004 Fish & Aquatics IAG Meeting (email)
APGI, Jody Cason	September 23, 2004	F&A IAG	Distribution of Yadkin Project Fish Entrainment Assessment Draft Report (email)
APGI, Jody Cason	October 1, 2004	WWB IAG	Final study plan for the Yadkin River Goldenrod Survey (email)
APGI, Jody Cason	October 1, 2004	F&A IAG	Final study plan for the Yadkin Project Habitat Fragmentation Study (email)
APGI, Jody Cason	October 13, 2004	WWB IAG	Final revised study plan for the Yadkin River Goldenrod Survey (email)

Table E.3-24: Summary of Consultation Record Related to Fish, Wildlife and Botanical Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	December 22, 2004	WWB IAG	Distribution of Bald Eagle and Great Blue Heron Final Report (email)
APGI, Gene Ellis	February 18, 2005	WWB IAG	Distribution of draft study reports: Wetlands and Riparian Habitat Assessment, Transmission Line and Project Facility Habitat Assessment, Invasive Exotic Plant Pest (IEPP) Species Inventory, and Rare, Threatened, and Endangered (RTE) Species Survey (letter)
APGI, Jody Cason	February 20, 2005	WWB IAG	Draft agenda for the March 2, 2005 WWB IAG meeting (email)
APGI, Gene Ellis	March 18, 2005	F&A IAG	Distribution of draft study reports: Reservoir Fish and Aquatic Habitat Assessment and Tailwater Fish and Aquatic Biota Assessment (letter)
APGI, Jody Cason	March 18, 2005	F&A IAG	Draft meeting agenda for April 5, 2005 F&A IAG Meeting (email)
Land Trust for Central North Carolina, Andy Abramson	March 24, 2005	APGI, Jody Cason	Comments on RTE Species Draft Report (email)
Land Trust for Central North Carolina, Andy Abramson	March 24, 2005	APGI, Jody Cason	Comments on Wetlands and Riparian Habitat Assessment Draft Report (e-mail)
APGI, Jody Cason	April 12, 2005	WWB IAG	Email reminder of comment deadline on reports: Wetlands and Riparian Habitat Assessment, Transmission Line and Project Facility Habitat Assessment, IEPP Species Inventory, and RTE Species Survey
NC Wildlife Resources Commission, Todd Ewing	April 15, 2005	WWB IAG	Comments on WWB IAG Draft Study Reports (e-mail)
NC Division of Water Quality, Darlene Kucken	April 29, 2005	F&A IAG	Comments on Reservoir Fish and Aquatic Habitat Assessment Draft Report and Tailwater Assessment Draft Report (e-mail)
APGI, Jody Cason	June 20, 2005	F&A IAG	Final summary of April 5, 2005 F&A IAG Meeting (email)
APGI, Jody Cason	June 20, 2005	WWB IAG	Final summary of March 2, 2005 WWB IAG Meeting (email)
APGI, Jody Cason	June 22, 2005	WWB IAG	Distribution of IEPP Species Assessment Final Report (email)

Table E.3-24: Summary of Consultation Record Related to Fish, Wildlife and Botanical Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	June 24, 2005	WWB IAG	Distribution of RTE Species Study Final Report (email)
APGI, Jody Cason	June 28, 2005	WWB IAG	Distribution of Transmission Line and Project Facility Habitat Assessment Final Report (email)
APGI, Gene Ellis	July 6, 2005	WWB IAG	Distribution of Wetlands and Riparian Habitat Assessment Final Report (letter)
APGI, Gene Ellis	July 22, 2005	F&A IAG	Distribution of final study reports: Reservoir Fish and Aquatic Habitat Assessment and Tailwater Fish and Aquatic Biota Assessment (letter)
APGI, Jody Cason	September 6, 2005	F&A IAG	Distribution of Fish Entrainment Assessment Final Report (email)
APGI, Jody Cason	December 1, 2005	WWB IAG	Distribution of the Avian Inventory Draft Study Report (email)
NC Wildlife Resources Commission, Todd Ewing	January 3, 2006	APGI, Jody Cason	Comments on Avian Inventory Draft Study Report (email)
APGI, Jody Cason	January 9, 2006	WWB IAG	Distribution of the Yadkin River Goldenrod Survey Draft Study Report (email)
U.S. Fish and Wildlife Service, Carolyn Wells	February 13, 2006	APGI, Jody Cason	Comments on the Yadkin River Goldenrod Survey Draft Study Report (email)
APGI, Jody Cason	February 17, 2006	WWB IAG	Distribution of the Avian Inventory Final Study Report (email)
APGI, Gene Ellis	March 16, 2006	WWB IAG	Distribution of Habitat Fragmentation Study Draft Report (letter)

Notes: APGI - Alcoa Power Generating Inc.
IAG - Issue Advisory Group
F&A IAG - Fish and Aquatics Issue Advisory Group
USFWS - U.S. Fish and Wildlife Service
WWB IAG - Wetlands, Wildlife and Botanical Issue Advisory Group

Exhibit E.4

Historical and Archaeological Resources

E.4 Historical and Archaeological Resources

E.4.1 Sites Listed on or Determined Eligible for the National Register of Historic Places

E.4.1.1 Historic Resources

Section 106 of the National Historic Preservation Act (NHPA) requires that the Federal Energy Regulatory Commission (FERC) take into account the effects of its relicensing decision on historic properties, and to allow the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on FERC's relicensing decision. In North Carolina, the State Historic Preservation Office (NCSHPO) is located in the North Carolina Department of Cultural Resources' (NCDCR) Office of Archives and History and is responsible for administration of the Section 106 Program of the NHPA.

To meet the SHPO's requirements, a thorough review of the history and architecture of the Yadkin Project's (Project) hydroelectric developments was undertaken along with evaluations and recommendations for properties meeting the criteria of the National Register of Historic Places (NRHP). APGI developed a study plan with input from the Cultural Resources Issue Advisory Group (CR IAG) and evaluated the Project's four hydroelectric developments to determine their eligibility for the NRHP (Thomason and Associates, 2005 Appendix E-16). Because one of the properties in the Yadkin Project, the Narrows Dam and Power Plant Complex, was already listed on the NRHP in 1983 as part of the Badin Multiple Resource Area nomination for its architectural and engineering significance, a reassessment of its eligibility and a reevaluation of its NRHP-listed boundaries were conducted.

The evaluation of the Project's four hydroelectric developments consisted of architectural and historical surveys, including a physical inventory, photography of properties, historical research, an evaluation of each development as a complex of facilities including powerhouses, dams, penstocks, gatehouses, and other associated properties, and recommendations for NRHP eligibility in accordance with National Register criteria. In addition to the evaluation of the four hydroelectric developments, at the request of the CR IAG, an assessment of the cultural landscape of the Yadkin River within the FERC Project boundary was also completed, extending from the Beard's Bridge ruins in the Trading Ford vicinity on the north to the Falls Development on the south. The FERC Project boundary generally follows the normal full pool elevation of the reservoirs. For purposes of the cultural landscape assessment, properties which were fifty years old or older along the shoreline or readily visible from the shoreline were assessed for their National Register eligibility.

In addition to the Narrows Development, the dams, powerhouses, and adjacent ancillary buildings and structures of the Falls, High Rock, and Tuckertown developments were determined to meet the criteria of the NRHP.

All four of the Project developments were found to be eligible for listing on the NRHP under criteria A and D for their historical and engineering significance. Under National Register criterion A, the properties are significant in the industrial development of North Carolina. By the mid-20th century, Alcoa emerged as one of the leading manufacturers in the state, and the development of the Alcoa facility at Badin contributed to the growth and development of this region of the state. During the mid-20th century Alcoa employed over a thousand workers in its Badin Plant, and its hydroelectric facilities made this possible. All four developments are also significant under criterion D for the information they contain concerning the engineering and construction of 20th century hydroelectric plants.

Three of the developments were determined to meet National Register criterion C for their engineering and architectural design. The Narrows Development was listed on the National Register in 1983 in recognition of its architectural significance. Both Falls and High Rock developments also possess architectural significance as intact examples of dam and powerhouse complexes of the early 20th century. The three developments possess excellent examples of concrete dams of the period as well as Colonial Revival style influenced powerhouses. The three developments retain much of their integrity and sense of time and place from their era of construction, including dams that possess their original poured concrete exterior surface along with ancillary structures such as gatehouses and gantry cranes. The powerhouses are similar in integrity with each retaining most of their original windows, decorative detailing, and interior floor plan and layout. With the exception of replacement doors at some locations, the character of the powerhouses remains largely intact. The properties within the proposed Yadkin Hydroelectric Project Multiple Property Documentation Form (MPDF) maintain their sense of time and place as a planned and integrated early- to mid-20th century hydroelectric complex.

As part of the study of historic resources at the Yadkin Project, Thomason Associates also undertook a cultural landscape assessment of the Project. The cultural landscape assessment provides information on how this section of the Yadkin River has been transformed over time and what remains on the landscape. The cultural landscape of the Yadkin Project is representative of the 20th century effects of the dam and powerhouse construction, and reservoir impoundment. The impoundment of the four reservoirs resulted in the demolition of all of the buildings within the reservoir basins. Dwellings, outbuildings, mills, commercial buildings, and other structures were removed prior to the impoundment of the reservoirs, while the impoundment inundated historic ferry crossings, landings, and fords. No comprehensive photographic documentation was undertaken to record these properties prior to their demolition.

Despite the changes to this section of the Yadkin River, in addition to the four Yadkin Project developments, a number of properties remain extant within the FERC Project boundary or in the nearby landscape that are potentially eligible for listing on the NRHP. These properties were identified as potentially eligible during the study and their eligibility was concurred with by the NCDCR.

1. The Whitney Dam and Canal on the south shoreline of Narrows Reservoir. The Whitney Dam and Canal was constructed in the early 1900s as part of the proposed industrial development of the Narrows region. The granite dam and canal were largely completed when the Whitney Company went bankrupt in 1907 and the dam and canal were inundated by the impoundment of Narrows Reservoir in 1917. During the drawdown of Narrows Reservoir in December of 2003, both the dam and canal were readily visible and remain in good condition. The workmanship of the dam is especially noteworthy and

large sections of the canal along with railroad bridge abutments also remain on the landscape from the site of Whitney to south of Palmer Mountain. This property is significant under National Register criteria A, C and D for its role in the industrial development of the Narrows and for information it may yield on hydroelectric development of the early 20th century. This property is located wholly within the FERC Project boundary. Most of the old dam site is inundated under Narrows Reservoir at the normal full pool elevation. A drawdown of approximately 18 ft (el. 492 U.S. Geological Survey (USGS) datum), undertaken for purposes of relicensing studies conducted in December 2003, exposed portions of the old dam and canal works. However, normal operation of Narrows Reservoir with water level fluctuations in the one to six-foot range has no impact on this site.

2. The L'Aluminum Francais area at Narrows Dam and Powerhouse Complex on the west shoreline of Narrows Reservoir. The Narrows Dam and Powerhouse Complex boundary was drawn to include the dam, powerhouse, and foundations of the original L'Aluminum Francais powerhouse when the property was listed on the National Register in 1983. To the west of this boundary are additional properties associated with the L'Aluminum Francais development of the early 1910s. These properties include a railroad line, the site of worker's housing, and the foundations of support buildings. The area also contains the concrete footings of a large aluminum smelter that were erected before the French abandoned the project. Primarily archaeological in character, this area is potentially eligible for the National Register under criteria A and C for its significance in industry and for the information it may yield on early 20th century industrial development. Routine operation of Narrows Development has no impact on this site. Routine maintenance activities undertaken by Alcoa Power Generating Inc. (APGI) in the vicinity of the Narrows Development including parking lot and road maintenance, mowing and vegetation removal would not be expected to impact the site. Ground disturbing activities are minimal, and APGI has no plans to undertake any major construction activities at the Narrows Development that would impact this site.

3. The Bald Mountain Quarry Conveyor Ruins on the east shoreline of Tuckertown Reservoir. Built in the early 20th century, these imposing ruins are the remains of the conveyor and loading buildings for the Bald Mountain Quarry. This quarry produced slate and gravel commercially for many decades and provided the stone used in the construction of High Rock Dam and Powerhouse. The property is significant under criteria A and D in industry for the information it may yield on early 20th century stone quarrying operations in North Carolina. The Bald Mountain Quarry site is located immediately adjacent to the Tuckertown Reservoir shoreline, but a large portion of the site is located outside the FERC Project boundary. As the important features of the site are located above the normal full pool elevation of the reservoir, the operation of Tuckertown Development and the resulting minimal fluctuation in reservoir water level have no impact on this site. In addition, since the Yadkin Shoreline Management Plan does not allow the development of private recreation facilities on Tuckertown Reservoir, the site will not be impacted by shoreline development activity.

Several additional properties that lie outside of the Project boundary, but within the cultural landscape were also determined to be eligible (Thomason and Associates, 2005 Appendix E-16). These include:

- The L'Aluminum Francais Farmhouse located in Stanly County on Old Whitney Dam Road to the west of Narrows Reservoir.
- The Frick-Starnes Farm in Rowan County on the north shore of Second Creek and High Rock Reservoir.
- The David Linn House in Rowan County on the west shoreline of High Rock Reservoir.
- The Trading Ford Road section west of the Duke Steam Plant along the south shoreline of High Rock Reservoir.

An additional area of interest discussed in the Thomason report (Appendix E-16) is the Trading Ford Historic District at the north end of High Rock Reservoir along a 1.5-mile section of the Yadkin River. Once the site of the Trading Path of Native American tribes, the Trading Ford has served as one of North Carolina's primary transportation corridors for hundreds of years and is one of the oldest documented roads in North Carolina. The Trading Ford includes at least three different ford and ferry crossings and was one of two primary ferry crossings over the Yadkin River in the 18th and 19th centuries. The Trading Ford continued to be used in the late 19th and early 20th centuries. After the Trading Ford shoreline was purchased by the Tallassee Power Company in the 1920s as part of the development of the High Rock Hydroelectric Development, the use of the fords and ferries in the Trading Ford vicinity came to an end.

The Trading Ford area has been the subject of several studies over the past few years due to the proposed construction of a new bridge for Interstate 85 over the Yadkin River. These studies include assessments completed by the North Carolina Department of Transportation (NCDOT), the URS Corporation, and analysis conducted as part of the NRHP Eligibility Study conducted by APGI.

Through the NCDOT studies, two properties in the Trading Ford area have been identified as meeting National Register criteria; the Wil-Cox Bridge and Camp Yadkin (Fort York). The Wil-Cox Bridge was built in 1922 northwest of the Yadkin Ford. The Wil-Cox Bridge is a concrete arch bridge with eleven spans and the seven main spans are open spandrel arches. This type of bridge design and construction is rare in North Carolina and this bridge was deemed eligible for the National Register under criterion C in 1999 (Thomason and Associates, 2005 Appendix E-16). The partial remains of Camp Yadkin, also known as Fort York, continue to exist on the hillside directly north of the Yadkin Ford site. This Civil War fortification was partially removed in the 20th century due to the construction of US 29 and Interstate 29. Despite the removal of some sections of the fort, it retains sufficient integrity to meet the criteria of the National Register (Thomason and Associates, 2005 Appendix E-16).

On recommendation of the CR IAG, the cultural landscape assessment conducted as part of the NRHP Eligibility Study included the Trading Ford area (Thomason and Associates, 2005

Appendix E-16). As part of this survey, accessible, above ground structures and sites such as the ford and ferry crossings, and roadbeds leading to these sites were examined. Based on the results, Thomason determined that a 1.5-mile section of the Yadkin River in the Trading Ford vicinity may meet National Register criteria A, C, and D as an historic district. From the Beard's Bridge ruins on the north to the Trading Ford on the south, this section of the river contains structures and sites reflective of the evolution of transportation from the 17th century to the 1950s. Extant on the landscape are the sites of the Trading Ford, Yadkin Ford and other significant fords and ferries, the ruins of the Beard's Bridge, the 1896 Southern Railway Bridge, the National Register-eligible Wil-Cox Bridge, and a bridge from 1951 reflecting the expansion of the state's U. S. highway system. Some of these contributing elements lie within or partially within the FERC Project boundary for the Yadkin Project. In October 2004, the Keeper of the NRHP determined that there was insufficient information to make a formal determination of eligibility of four properties in the Trading Ford area: Trading Path and Trading Ford, Yadkin Ford and Ferry, Greene's Crossing at Trading Ford, and Battle at Camp Yadkin.

With the exception of these properties, no other buildings, structures, sites or districts were identified as meeting National Register criteria within the Yadkin Project area. As noted above, continued operation of the Yadkin Project under the current reservoir water level regime would have no impact on the properties identified as eligible or potentially eligible for the National Register. Similarly, APGI has no plans for Project lands or waters that would result in effects to the eligible properties. The pool levels of the reservoirs are not anticipated to fluctuate in a way which could result in the inundation of these resources and there are no projects now underway or in the planning stages that would affect the existing condition and integrity of the properties within the Project boundary.

E.4.1.2 Archaeological Resources

E.4.1.2.1 Existing or Known Archaeological Resources

There are numerous archaeological sites in the Project vicinity, many of which are found adjacent to the reservoirs, since the river provided a source of food and water and was an important travel route. The NCDCR, Office of State Archaeology, maintains a listing of all known archaeological sites in the state. Its records indicate many known archaeological sites along the shorelines or in the vicinity of the Project reservoirs. Some of these sites have been investigated thoroughly, but others have not been studied and little is known about them. A few of the most important sites in the immediate Project area include the Hardaway Site, Doerschuk Site, and Talbert Site. Because of the potential destruction of these sites through vandalism, the locations of these sites are kept confidential, and APGI protects and restricts access to the sites.

Hardaway Site

This site, one of only two archaeological sites in North Carolina designated a National Historic Landmark, is located in the vicinity of Narrows Dam. The site is located at sufficient height above the reservoir that it is not affected by Project waters or operations. At this site, 12,000 year old prehistoric Native American artifacts have been excavated. The Hardaway Site is considered nationally significant for its contribution in defining prehistoric cultural sequences for the Paleo-Indian and Early Archaic periods and their associated artifacts. These artifacts have been important in dating other prehistoric archaeological sites of similar age throughout the eastern United States.

The Hardaway Site has been on the NRHP since 1984 and was designated a National Historic Landmark in 1990. In 1991, APGI granted NCDCR an exclusive license to preserve archaeological remains and to mine and excavate for Native American relics at the site. The license agreement expires June 1, 2008. In 1998, Alcoa entered into a Donation Agreement with the University of North Carolina at Chapel Hill in which it donated to the University the Hardaway Archaeological Collection artifacts that were excavated at the site between 1948 and 1980.

Doerschuk Site

This significant site, located in the vicinity of Falls Dam, was occupied by Native Americans from before 7,000 BC until the 18th century. The Doerschuk Site is significant for having provided type materials and for its contribution in defining prehistoric cultural sequences for several Archaic and Woodland complexes. It has been on the NRHP since 1985. In 1991, APGI granted NCDCR an exclusive license to preserve archaeological remains and to mine and excavate for Native American relics at the site. The license agreement expires June 1, 2008.

Talbert Site

Located on the eastern shore of Narrows Reservoir, the Talbert Site totals 27 acres. This site is also considered a significant site, and prehistoric use of the site may be associated with the Hardaway Site, which is located nearby. In 1991, APGI granted NCDCR an exclusive license to preserve archaeological remains and to mine and excavate for Native American relics at the site. The license agreement expires June 1, 2008.

E.4.1.2.2 Cultural Probability Zones

Many prehistoric and historic cultural sites have already been found in the Project region and archaeologists believe that many others exist. Because the locations of these archaeological sites are not known and finding them involves very intensive survey efforts, archaeologists believe the best way to determine the location of sites is to use knowledge of cultural history and patterns of human behavior to predict where prehistoric archaeological sites are most likely to exist. In this way, areas that are most likely to harbor significant archaeological sites can be identified without the cost and time required to survey large shoreline areas. During the development of the Yadkin Shoreline Management Plan (SMP), the NCDCR assisted APGI in conducting such an assessment of the Project reservoir shorelines by developing a cultural probability model to predict the likelihood of certain reservoir shoreline areas harboring archaeological sites.

The cultural probability model developed by NCDCR examined site characteristics such as soils, slopes, orientation, and distance from the water to classify shoreline areas into High, Medium, and Low probability zones. A fourth category, Developed, was used to describe areas that have already been developed and where cultural sites have likely already been destroyed or disturbed, and so are of limited importance. The results of the NCDCR cultural probability model have been mapped on the Cultural Resources Probability Zones Maps (see Figures E-10 through E-13). Given the archaeological richness of the surrounding area, much of the undeveloped portions of the reservoir shorelines have been determined to be High and Medium probability. Low probability zones are generally those that are on very steep terrain and/or north facing. In addition, the locations of known archaeological sites have also been mapped by the NCDCR and provided to APGI. Maps of known sites are used by APGI in the management of the reservoir shorelines but are not available to the public because of concerns by NCDCR about revealing the location of known sites and exposing them to possible vandalism.

APGI, in consultation with NCDCR, uses the designation of cultural resource probability zones in its evaluation of the potential impacts of proposed shoreline development on cultural resources. In general, the NCDCR does not require further cultural resource evaluation for areas designated as Low probability or Developed, but will require evaluation for areas of Medium or High probability.

As outlined in the Yadkin SMP, for private individual facilities (piers, etc.), an adjoining property owner must obtain a permit from APGI before installing any private facilities within the Project boundary or on the Yadkin-Managed Buffer[1]. Moreover, only certain types of private recreation facilities and activities are currently permitted by APGI. NCDCR has determined that the construction of any private facility currently permitted by APGI would have minimal impact on cultural resources. Therefore, installation of private recreation facilities or undertaking activities in accordance with APGI's Shoreline Stewardship Policy and all other applicable APGI procedures and requirements (see Table E.4-1) will be permitted in any probability zone, so long as the proposed activity is not located in the immediate vicinity of a known archaeological site.

APGI's Specifications for Private Recreation Facilities provide that during the mandatory on-site visit for a new pier, APGI will check the location of the planned pier with respect to known archaeological sites to determine that no known sites are located in close proximity to the proposed pier location. If there is a known archaeological site near to the proposed location of the pier, APGI will consult with NCDCR to determine what measures should be taken to protect the known site.

[1] The first 100 ft of APGI or Alcoa-owned land from the normal full pool elevation of the reservoir is managed by APGI as buffer and is referred to in the SMP as the Yadkin-Managed Buffer.

Figure E-10: Cultural Resources Probability Zones (1 of 4)

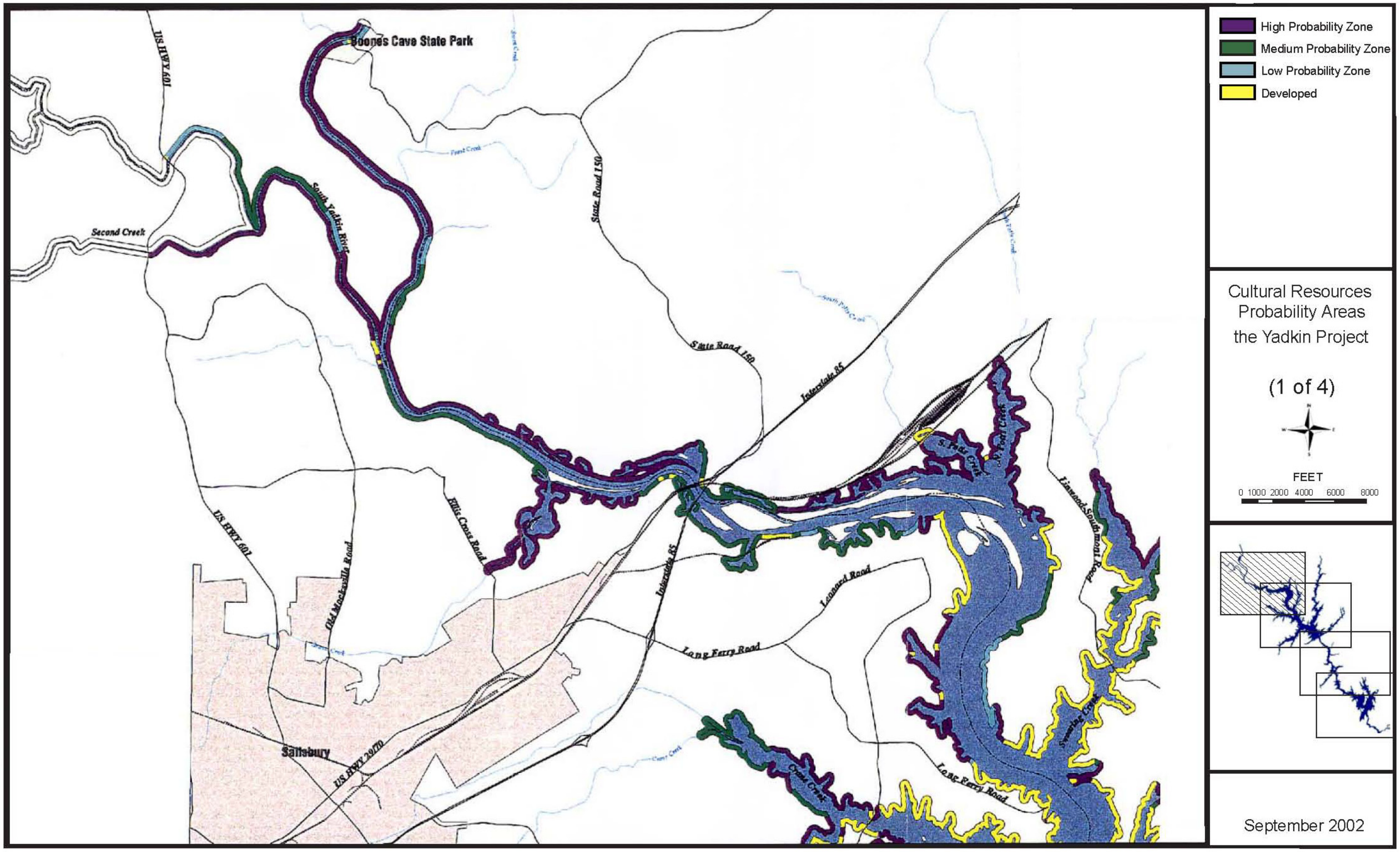


Figure E-11: Cultural Resources Probability Zone (2 of 4)

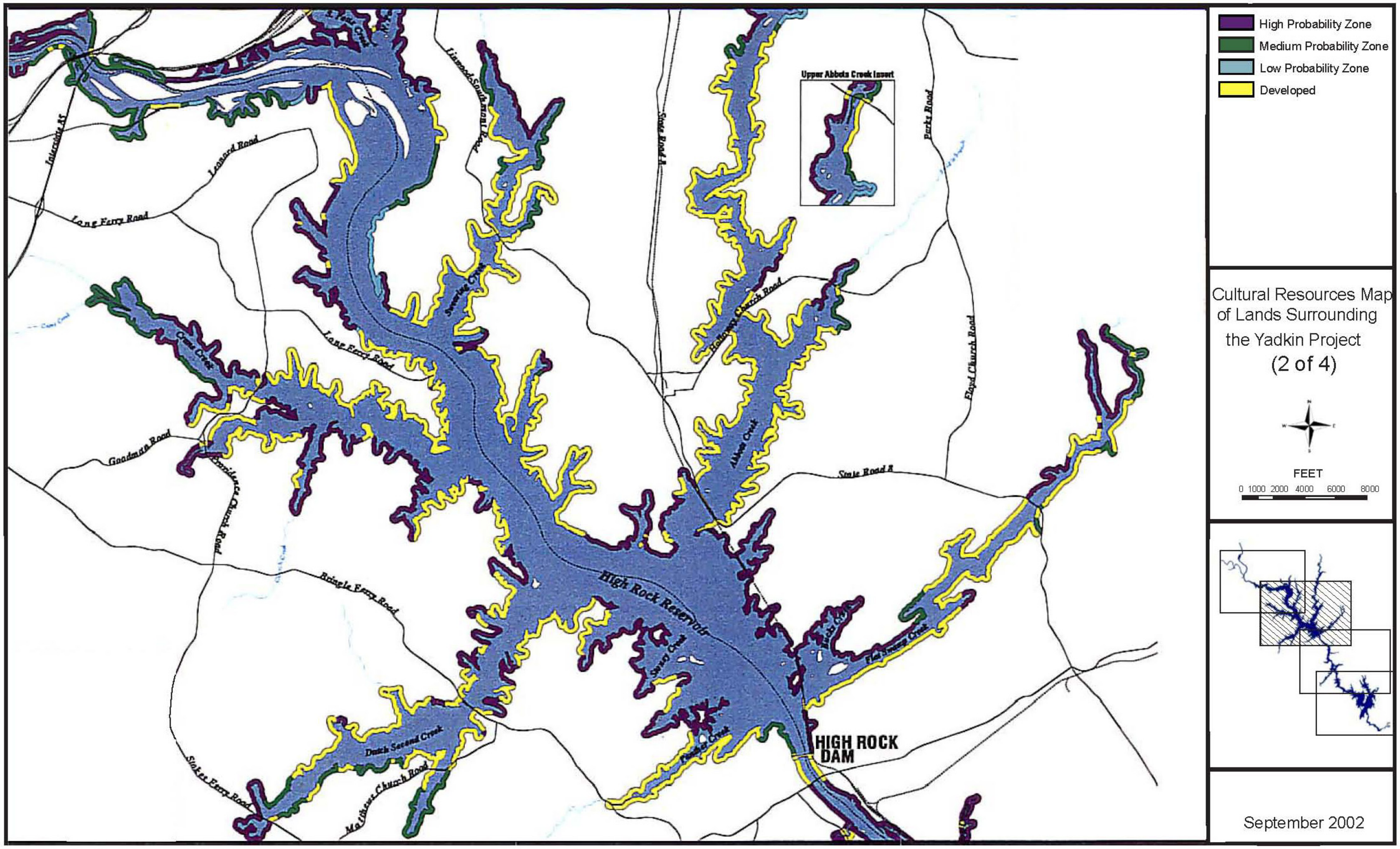


Figure E-12: Cultural Resources Probability Zones (3 of 4)

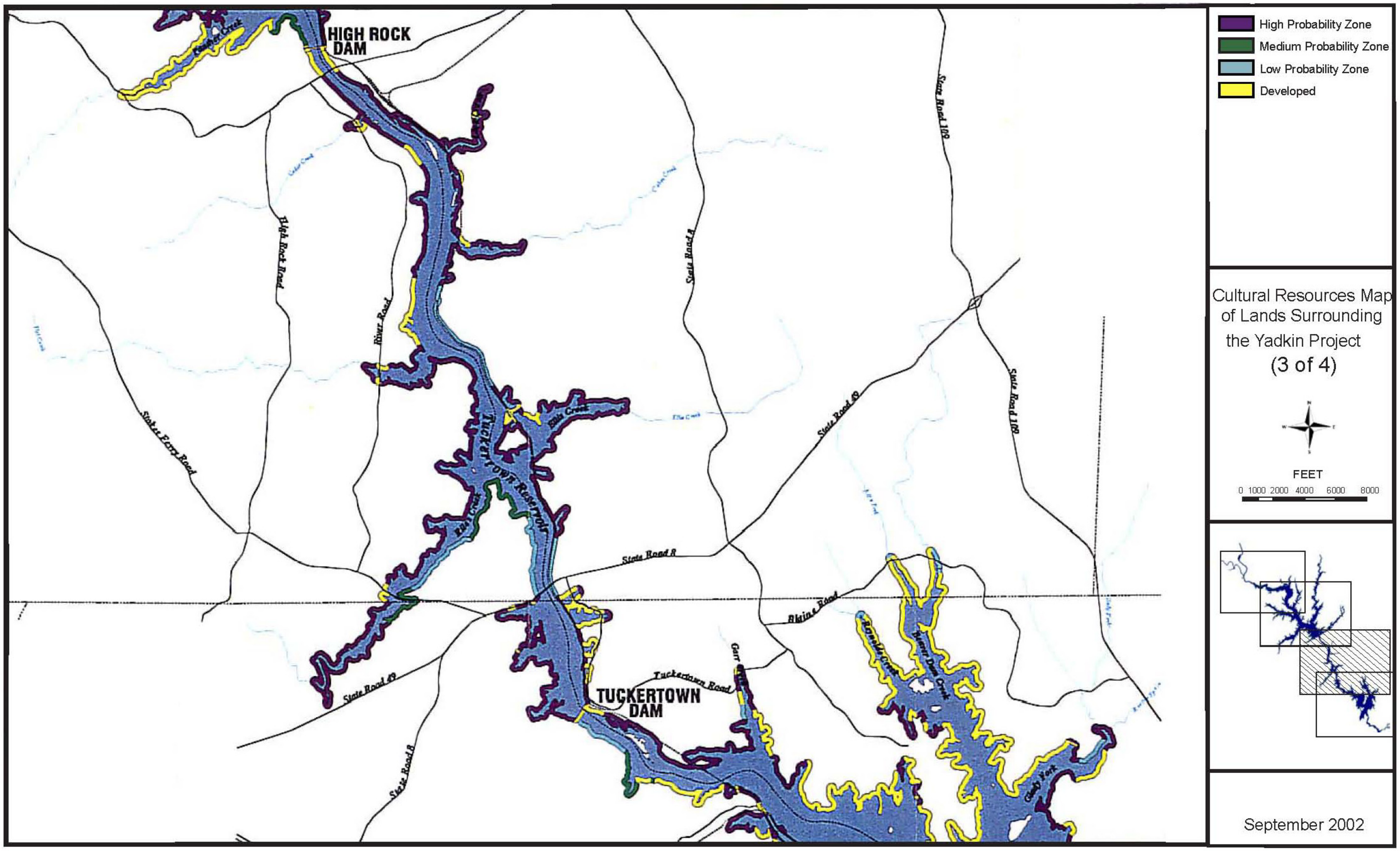


Figure E-13: Cultural Resources Probability Zones (4 of 4)

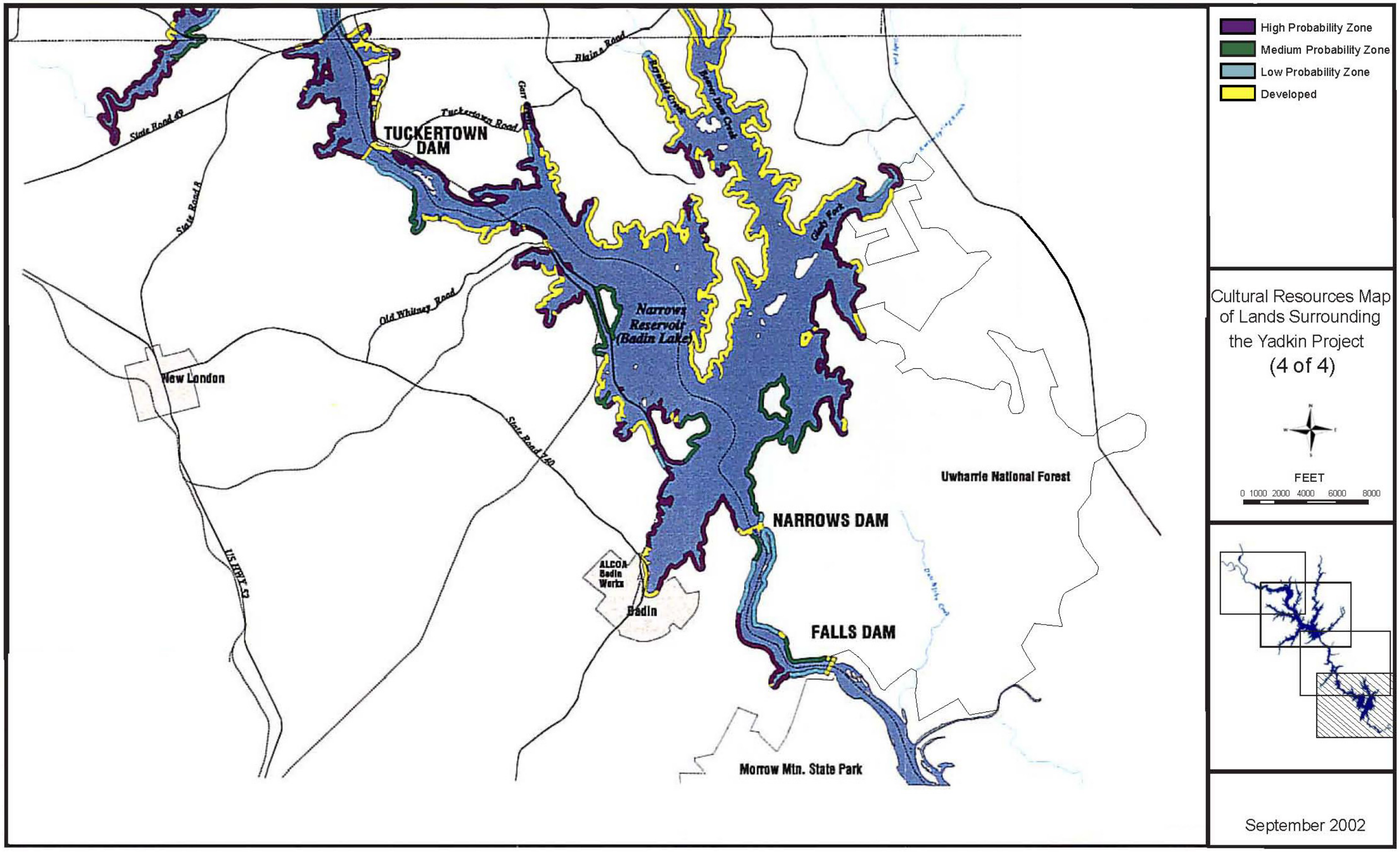


Table E.4-1: Private Recreation and Access Facilities Permitted in High, Medium, and Low Cultural Probability Zones

Private Facility/Use Type	Conditions
Pier with floating section up to 75 ft	In accordance with APGI's Specifications for Private Recreation Facilities.
Pathway	In accordance with APGI's Shoreline Stewardship Policy.
Shoreline erosion control (vegetative plantings, riprap, retaining wall)	In accordance with APGI's Shoreline Stewardship Policy AND so long as installation results in no removal of shoreline material. If removal of shoreline material is necessary, consultation with the NCDCR will be required.
Irrigation system	In accordance with APGI's Shoreline Stewardship Policy.

For multi-use recreation or industrial facilities proposed for shoreline areas designated as High or Medium probability zones, APGI requires prior evaluation of potential impacts to cultural resources located within 100 ft of the reservoir's normal full pool elevation. Typically, such an evaluation is done as part of the Environmental Assessment process or the Agency Consultation Process, as outlined in the Yadkin SMP. Similarly, developers of new subdivisions located on property adjoining the reservoirs in High or Medium probability zones are required to conduct an evaluation of potential impacts to cultural resources located within 100 ft of the normal full pool elevation of the reservoir.

E.4.1.2.3 Archaeological Studies

Although much is already known about archaeological resources in the immediate vicinity of the Yadkin Project, during initial consultation, the U.S. Forest Service (USFS) expressed concern over the potential impact of recreational use and shoreline erosion on possible archaeological sites of significance located along the Narrows Reservoir shoreline at the interface with Uwharrie National Forest. The USFS subsequently requested APGI conduct a study to examine four specific areas of the Project shoreline for several previously identified shoreline archaeological sites to determine their potential eligibility and to assess any ongoing impacts being incurred related to Project operation or use.

The study plan for this study was developed in consultation with the North Carolina State Historic Preservation Office (NCSHPO), the USFS, and other members of the Cultural Resources IAG. The study objectives included: (1) conducting background research for the Project study area and (2) conducting field surveys at four selected areas on Narrows Reservoir in order to locate (or relocate) and evaluate previously recorded and unrecorded archaeological sites within the study area that may be subject to direct and indirect effects from Project operations. The study was conducted by Legacy Research Associates, Inc. (Legacy) (Legacy, 2006 Appendix E-17)[2]. The four areas surveyed are located along the Narrows Reservoir shoreline, adjacent to Uwharrie National Forest USFS land.

[2] In order to protect the location of any significant archaeological sites, Appendix E-17 has been included in Volume IV (D) of this License Application which has been filed with FERC as confidential (e.g, privileged) material that will not be distributed to the public. This report has already been provided separately to the NCSHPO, USFS, and the Catawba Indian Nation Tribal Historic Preservation Office.

- Area A: This area is primarily used for bank fishing and camping and can be accessed by boat and by foot from the Holt's Cabin Picnic Area.

- Area B: This area is used for both camping and bank fishing. It is accessible via boat but is primarily accessed by foot on a hiking trail.

- Area C: This area is used for dispersed camping and bank fishing and is predominantly accessed by boat.

- Area D: This area is used for both dispersed camping and bank fishing and is located along a hiking trail.

Field surveys at the four selected survey areas along the Narrows Reservoir shoreline resulted in relocating three previously recorded archaeological sites and identifying one new archaeological site. Three of the four sites were determined by Legacy not to be eligible for listing on the National Register and no further work was recommended. One site located in Area C was recommended by Legacy as being eligible for the NRHP under Criterion D due to its extensive size; diversity and density of materials and artifact types; and intact soils that suggest potentially intact subsurface artifact deposits may be present at the site. Legacy reported that this site appears to have the potential to yield significant information about the prehistory of the area, and additional work was recommended for this site because it is being affected by shoreline erosion, recreational activity, and pot-hunting activities.

E.4.2 Agency Recommended Survey and Salvage Measures

To date, no agency has made any formal recommendations regarding cultural resource protection at the Project. During initial consultation with the Cultural Resources IAG, the USFS requested that APGI conduct an investigation of possible impacts to a few potentially eligible archaeological sites located on the Narrows shoreline. As outlined in Exhibit E.4.1.2.3, APGI conducted the requested study. Also, during initial consultation, the NCSHPO requested that APGI evaluate the potential eligibility of the Project developments (dams and powerhouses) for listing on the NRHP. This work was also completed by APGI as requested.

During initial consultation, the Cultural Resources IAG recommended that a cultural landscape evaluation of the Project, including an evaluation of the entire Trading Ford area, be conducted by APGI. Based on this recommendation, APGI did conduct a reconnaissance level cultural landscape evaluation of the area within the Yadkin Project boundary, with an emphasis on approximately 6.2 miles of river (upper end of High Rock Reservoir) located in the vicinity of the I-85 bridge crossing and the Trading Ford area. Results of this evaluation were summarized earlier in Exhibit E.4.1.1.

In response to the Draft License Application (DLA), no agencies or tribes provided APGI with comments regarding cultural issues. APGI did receive extensive comments from the Trading Ford Historic District Preservation Association (TFHDPA) (letter dated 1/3/06, Appendix E-25). Additionally, the Catawba Indian Nation (CIN) provided a statement of interests in the relicensing (hand delivered 2/7/06, Appendix E-25).

The TFHDPA comments were focused on some basic areas of concern: 1) the studies conducted by APGI as part of the relicensing process did not thoroughly examine cultural landscapes in the Project area and, more specifically, did not consider a portion of the Trading Ford area; 2) the studies conducted by APGI did not consider all the available information on the history of the Trading Ford area that may have been collected by TFHDPA or others; 3) the TFHDPA was not afforded adequate opportunity to participate in the study design process due to the limited number of Cultural IAG meetings that were held; and 4) the future development at the upper end of High Rock Reservoir has the potential to impact potentially significant elements of the Trading Ford landscape. TFHDPA also noted concerns regarding the potential for flooding at the upper end of High Rock Reservoir and associated impacts to cultural sites, as well as similar concerns about dredging in High Rock Reservoir.

Based on these comments, the TFHDPA made some specific recommendations regarding cultural resources at the Yadkin Project including: 1) additional study of cultural landscapes in the Trading Ford area; 2) inclusion of historic sites and cultural landscapes in the Cultural Resources Probability Model; 3) inclusion of protection measures for historic sites and cultural landscapes in the Yadkin SMP; 4) further cultural evaluation of the York Hill Boat Access area; and 5) revised operation of High Rock Reservoir to reduce flooding at the upper end of High Rock Reservoir.

The CIN identified the following interests in the Project relicensing: 1) archaeological site protection, monitoring, and mitigation, 2) management of unanticipated/inadvertent discoveries of human remains and/or Native American burials, 3) artifact curation, 4) endangered flora and fauna, 5) the Trading Ford area, and 6) the development of a Historic Properties Management Plan. The CIN also provided APGI a copy of the *Catawba Indian Nation Tribal Historic Preservation Office (THPO) Burial Policy Position Statement.*

E.4.3 Applicant Proposed Survey and Salvage Measures

APGI is proposing no specific survey and salvage measures at this time. Instead, APGI proposes to develop a Historic Properties Management Plan (HPMP) for the Project, which will include the details of any specific survey or salvage measures recommended by the NCSHPO or other agencies or tribes. The HPMP will be developed in consultation with the NCSHPO and other resource agencies and tribes that have a known interest cultural resources at the Yadkin Project. APGI will file a final HPMP with FERC.

In response to comments from the TFHDPA, APGI is also proposing to update the Cultural Probability Zone maps for the Yadkin Project, to reflect new information on significant or potentially significant historic sites and cultural landscapes that were identified during the recent relicensing studies. Once completed, the revised Cultural Probability Zone maps will be incorporated into the Yadkin SMP.

E.4.3.1 Schedule for Activities

The schedule of any activities to be carried out under the HPMP will be detailed in the HPMP. APGI estimates the cost of developing the HPMP to be $50,000.

E.4.3.2 Estimate of Costs

As no specific activities regarding additional survey, salvage or protection of cultural resources have been identified yet, there are no other costs to report.

E.4.4 Explanation of Why the Applicant Has Rejected Any Measures Recommended by an Agency

APGI has not rejected any measures thus far recommended by an agency or tribe. As noted earlier, the TFHDPA did provide detailed comments in response to the DLA along with some specific recommendations for the protection of cultural resources at the Yadkin Project, particularly those located in the Trading Ford area. Regarding the Cultural Probability Model for the Yadkin Project, APGI agrees that the model should be updated to reflect new information about the location of significant, or potentially significant historic sites or cultural landscapes identified at the Yadkin Project. APGI further agrees that this revised probability model should be reflected in the SMP, so that provision in the SMP for the protection of potentially significant archaeological resources can be extended to include historic resources and cultural landscapes as well.

E.4.5 Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. The following table summarizes the consultation record related to cultural resources at the Yadkin Project. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.4-2: Summary of Consultation Record Related to Cultural Resources

Agency/Party	Date	To	Description
North Carolina Department of Cultural Resources, State Historic Preservation Office, Renee Gledhill-Earley for David Brook	December 17, 2002	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
U.S. Forest Service, National Forests in North Carolina, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
Yadkin-Pee-Dee Lakes Project, Ann Liebenstein Bass	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
Catawba Indian Nation Tribal Historic Preservation Office, Wenonah Haire	February 25, 2003	APGI, Gene Ellis	Letter expressing interest in the Yadkin Project relicensing
APGI, Gene Ellis	July 8, 2003	USFS, John Ramey	Letter in response to USFS comments on Yadkin Project ICD
U.S. Forest Service, John Ramey	August 19, 2003	APGI, Gene Ellis	Letter describing comments on cultural resources
APGI, Jody Cason	August 25, 2003	CR IAG	National Register of Historic Places Eligibility Draft Study Plan (email)
North Carolina Department of Cultural Resources, State Historic Preservation Office, Renee Gledhill-Earley	September 26, 2003	APGI, Gene Ellis	Comments on National Register of Historic Places Eligibility Draft Study Plan (letter)
APGI, Gene Ellis	October 20, 2003	FERC, Secretary Magalie Salas	Letter requesting initiation of Section 106 consultation
APGI, Jody Cason	October 27, 2003	CR IAG	Final summary of August 27, 2003 CR IAG Meeting (email)
APGI, Sarah Verville	October 30, 2003	CR IAG	Revised National Register of Historic Places Eligibility Draft Study Plan (email)
North Carolina Department of Cultural Resources, Andrea Lee Novick	November 7, 2003	APGI, Jody Cason	Comments on revised National Register of Historic Places Eligibility Draft Study Plan (email)
North Carolina Department of Cultural Resources, State Historic Preservation Office, Renee Gledhill-Earley	November 7, 2003	APGI, Jody Cason and Sarah Verville	Comments on revised National Register of Historic Places Eligibility Draft Study Plan (email)
Trading Ford Historic District Preservation Association, Ann Brownlee	November 8, 2003	APGI, Sarah Verville	Comments on revised National Register of Historic Places Eligibility Draft Study Plan (email)
U.S. Forest Service, Mike Harmon	November 12, 2003	APGI, Sarah Verville	Comments on revised National Register of Historic Places Eligibility Draft Study Plan (email)

Table E.4-2: Summary of Consultation Record Related to Cultural Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	November 25, 2003	CR IAG	Final study plan for National Register of Historic Places Eligibility Study (email)
FERC, Edward Abrams	December 22, 2003	APGI, Gene Ellis	Letter granting APGI permission to initiate Section 106 consultation
APGI, Jody Cason	December 29, 2003	CR IAG	Final summary of November 5, 2003 CR IAG Meeting (email)
APGI, Gene Ellis	July 30, 2004	CR IAG	Distribution of National Register of Historic Places Eligibility Study Draft Report (letter)
APGI, Jody Cason	August 2, 2004	CR IAG	Email informing the CR IAG that the National Register of Historic Places Eligibility Study Draft Report was mailed on July 30, 2004
Trading Ford Historic District Preservation Association, Ann Brownlee	August 3, 2004	CR IAG	Comments on NRHP Draft Study Report (email)
Trading Ford Historic District Preservation Association, Ann Brownlee	August 3, 2004	APGI, Gene Ellis, Bob Smet, Jody Cason	Email request for consulting party status
Trading Ford Historic District Preservation Association, Ann Brownlee	September 24, 2004	APGI, Gene Ellis and Bob Smet	Email request for consulting party status
APGI, Jody Cason	September 28, 2004	CR IAG	Draft agenda for October 6, 2004 CR IAG Meeting
North Carolina Department of Cultural Resources, State Historic Preservation Office, Renee Gledhill-Earley	September 28, 2004	APGI, Gene Ellis	Letter recommending no further archaeological work is necessary at Yadkin Project
APGI, Gene Ellis	September 29, 2004	TFHDPA, Ann Brownlee	APGI acknowledgement of TFHDPA as an "additional consulting party"
APGI, Gene Ellis	October 1, 2004	Catawba Indian Nation THPO, Wenonah Haire	Letter suggesting a meeting to discuss relicensing and Tribe's interests
APGI, Gene Ellis	October 1, 2004	Eastern Band of Cherokee Indians, Principal Chief Hicks	Letter suggesting a meeting to discuss relicensing and Tribe's interests

Table E.4-2: Summary of Consultation Record Related to Cultural Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	October 18, 2004	CR IAG	Email transmitting a copy of letter sent to the Keeper of the National Register of Historic Places
APGI, Jody Cason	November 4, 2004	CR IAG	Email extending comment deadline for the NRHP Eligibility Study Draft Report
Trading Ford Historic District Preservation Association, Ann Brownlee	November 4, 2004	APGI, Gene Ellis	Comments on the NRHP Eligibility Study Draft Report (letter)
NC Department of Cultural Resources, Renee Gledhill Earley	November 12, 2004	APGI, Gene Ellis and Jody Cason	Comments on NRHP Eligibility Draft Report (emailed letter)
APGI, Jody Cason	November 30, 2004	CR IAG	Draft study plan for Archaeological Surveys of Four Areas along the UNF on Narrows Reservoir (email)
APGI, Jody Cason	November 30, 2004	CR IAG	Final meeting summary of October 6, 2004 CR IAG Meeting (email)
APGI, Jody Cason	January 17, 2005	CR IAG	Final study plan for Archaeological Surveys of Four Areas along the UNF on Narrows Reservoir (email)
APGI, Jody Cason	April 15, 2005	CR IAG	Email informing IAG of the distribution of the NRHP Final Study Report on CD
APGI, Gene Ellis	April 15, 2005	CR IAG	Distribution of the NRHP Final Study Report (letter)
Trading Ford Historic District Preservation Association, Ann Brownlee	April 16, 2005	APGI, Gene Ellis, Bob Smet, Jody Cason, Phil Thomason	Comments on NRHP Final Study Report (email)
Trading Ford Historic District Preservation Association, Ann Brownlee	April 24, 2005	APGI, Gene Ellis, Bob Smet, Jody Cason, Phil Thomason	Additional comments on the NRHP Study (email)
Trading Ford Historic District Preservation Association, Ann Brownlee	May 1, 2005	IAGs	Comments on NRHP Eligibility Final Report (email)
APGI and Trading Ford Historic District Preservation Association	May 24, 2005		Bullets from meeting between APGI and the TFHDPA
APGI, Gene Ellis	June 29, 2005	TFHDPA, Ann Brownlee	Letter to TFHDPA as follow-up to May 24, 2005 meeting
APGI, Gene Ellis	July 26, 2005	FERC, Secretary Salas	Letter to FERC responding to letters submitted by Ann Brownlee, TFHDPA
Catawba Indian Nation Tribal Historic Preservation Office, Wenonah Haire	September 20, 2005	APGI, Gene Ellis	Letter thanking APGI for keeping the Catawba Indian Nation THPO informed about the Project

Table E.4-2: Summary of Consultation Record Related to Cultural Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	November 10, 2005	CR IAG	Distribution of Management Summary of the Draft Study Report for the field surveys conducted at four areas on Narrows Reservoir selected by the USFS (email)
Trading Ford Historic District Preservation Association, Ann Brownlee	November 10, 2005	APGI, Jody Cason, and CR IAG	Email requesting more information than the Management Summary of the Draft Archaeological Study Report
Catawba Indian Nation Tribal Historic Preservation Office, Beckee Garris	November 11, 2005	APGI, Jody Cason, and CR IAG	Email requesting additional information on steps to protect pre-contact sites
APGI, Gene Ellis	January 9, 2006	TFHDPA, Ann Brownlee	Email providing black-line version of the Draft Archaeological Study Report to protect confidential site information
Catawba Indian Nation, Beckee Garris	January 24, 2006	APGI, Jody Cason	Comments on Draft Archaeological Study Report Management Summary recommending use of South Carolina's guidelines for archaeological investigations and recommendations for treatment of human remains
APGI, Jody Cason	February 1, 2006	Catawba Indian Nation, Beckee Garris	Email response to Catawba Indian Nation recommendations
Catawba Indian Nation	February 7, 2006	APGI	Catawba Indian Nation statement of interests in relicensing and the Catawba Indian Nation Tribal Historic Preservation Office Burial Policy Position Statement (hand delivered)
APGI, Jody Cason	April 2, 2006	CR IAG	Distribution of black-line version of the Archaeological Survey of Four Areas Along the Narrows Reservoir and in the Uwharrie National Forest Final Report (email)

Notes: APGI - Alcoa Power Generating Inc.
CR IAG - Cultural Resources
IAG - Issue Advisory Group
NRHP - National Register of Historic Places
TFHDPA - Trading Ford Historic District Preservation Association
THPO - Tribal Historic Preservation Office
UNF - Uwharrie National Forest
USFS - U.S. Forest Service

Exhibit E.5

Recreation Resources

E.5 Recreation Resources

E.5.1 Existing Recreation Facilities

There are numerous existing public and private recreation facilities at the Yadkin Project (Project). The following sections describe both public and private recreation facilities and use.

E.5.1.1 Public Recreation Facilities

During the study phase of the relicensing process, Alcoa Power Generating Inc. (APGI) conducted a comprehensive inventory of the public recreation facilities at the Yadkin Project. The resulting information complemented and updated previous inventories that had been done, including inventories undertaken as part of the Federal Energy Regulatory Commission's (FERC) periodic Form 80 reporting requirement.

The recreation facility inventory was carried out in accordance with a study plan that was developed in close consultation with the Recreation, Aesthetics, and Shoreline Management Issue Advisory Group (RASM IAG). The objectives of the study were to:

- Inventory existing public recreation areas that provide direct access to Yadkin Project lands and/or waters.
- Describe the available recreation facilities, the condition of the recreation facilities, and identify any operational, maintenance, or safety issues at each recreation area
- Assess the present adequacies and future accessibility needs for people with disabilities to recreation facilities at public recreation areas (see Exhibit E.5.2)

Yadkin Project recreation areas provide opportunities to the public for motorized and non-motorized boating, bank and pier fishing, swimming, camping, picnicking, and hiking. Public recreational facilities available at the recreation areas generally include boat launching ramps, boat docks, fishing piers, swimming areas, picnic areas, campgrounds, and canoe portage trails. Table E.5-1 provides a listing of the public recreation areas of the Yadkin Project (LVA, 2005a Appendix E-18).

Currently, there are 40 major public recreation areas (excluding sites considered "closed") that provide direct access to Yadkin Project lands and/or waters. These recreation areas are located in Davidson, Davie, Montgomery, Rowan, and Stanly counties. With 26 boat ramps, 15 boat docks, and 40 bank fishing areas, boating and fishing facilities are well-dispersed. Generally, the ramps and docks are distributed evenly around the Project with Davidson, Montgomery, Rowan, and Stanly having 7, 7, 5, and 6 boat ramps respectively. Similarly, picnic areas (15 total) are also well-dispersed among the four counties. Fishing piers are available in Montgomery and Stanly counties, swim areas are available in Davidson, Montgomery, and Stanly counties, and campgrounds are available in Montgomery County (LVA, 2005a Appendix E-18).

Table E.5-1: Public and Commercial Recreation Areas on Yadkin Project Reservoirs

Recreation Area No.	Recreation Area	Reservoir
Public Access Recreation Areas		
H1	Highway 601 Access Area	High Rock
H3	Rowan County Pump Station	High Rock
H8	York Hill Boat Access	High Rock
H16	Crane Creek Fishing Access Pull-off[1]	High Rock
H19	Little Crane Creek Fishing Access	High Rock
H28	Southmont Boat Access Area	High Rock
H36	Highway 47 Fishing Pull-off	High Rock
H39	Buddle Creek Boat Access Area	High Rock
H44	Abbotts Creek/NC 8 Bridge Pull-off[1]	High Rock
H48	Dutch Second Creek Boat Access	High Rock
H64	Flat Swamp Boat Access	High Rock
H67	High Rock Dam Canoe Portage	High Rock
T1	High Rock Dam Tailrace Access (Rowan)	Tuckertown
T2	High Rock Dam Tailrace Access (Davidson)	Tuckertown
T3	Bringle Ferry Boat Access	Tuckertown
T4	Cedar Creek Fishing Pull-off	Tuckertown
T6	Lick Creek Fishing Pull-off[1]	Tuckertown
T8	Flat Creek Boat Access Area	Tuckertown
T9	Flat Creek Fishing Access Area	Tuckertown
T10	Newsome Road Access	Tuckertown
T12	Riles Creek Recreation Area	Tuckertown
T14	Highway 49 Boat Access Area	Tuckertown
T15	Tuckertown Pull-off Fishing Access	Tuckertown
T16	Tuckertown Dam Canoe Portage	Tuckertown
N1	Tuckertown Dam Tailrace Access	Narrows/Badin
N2	Garr Creek Access Area	Narrows/Badin
N5	Old Whitney NCWRC Fishing Pier	Narrows/Badin
N6	Old Whitney Boat Access Area	Narrows/Badin
N13	Circle Drive Boat Access Area	Narrows/Badin
N16	Lakemont Access Area	Narrows/Badin
N24	UNF Holt's Cabin Picnic Area	Narrows/Badin
N25	UNF Kings Mountain Point Day Use Area[2]	Narrows/Badin
N26	UNF Badin Lake Campground	Narrows/Badin
N27	UNF Cove Boat Landing	Narrows/Badin
N28	Palmerville Access Area	Narrows/Badin
N29	Badin Lake Swim/Picnic Area	Narrows/Badin
N30	Badin Boat Access	Narrows/Badin
N31	Narrows Dam Canoe Portage	Narrows/Badin
N36	Badin Lake Group Camp	Narrows/Badin
N38	UNF Arrowhead Campground	Narrows/Badin
F1	UNF Deep Water Trail Access	Falls
F2	Falls Boat Access	Falls
F3	Falls Dam Canoe Portage	Falls
Commercial Recreation Areas		
H31	High Rock Marina and Campground	High Rock

Table E.5-1: Public and Commercial Recreation Areas on Yadkin Project Reservoirs (continued)

Recreation Area No.	Recreation Area	Reservoir
H47	Tamarac Marina	High Rock
N9/N10	Lake Forest CG/Fish Tales Marina	Narrows

[1] These areas are now closed due to potentially unsafe vehicular/pedestrian interactions.
[2] Also referred to as "UNF Walk-in Fishing Pier."

In addition to the recreation areas listed in Table E.5-1, 41 dispersed recreation areas have been identified on all four reservoirs. Generally, these dispersed recreation areas are used for bank fishing and camping (see Exhibit E.5.1.4).

Recently, APGI began discouraging use at several of the pull-off fishing areas because of the potentially unsafe vehicular/pedestrian interactions. Three of the sites listed in Table E.5-1 are sites at which use has been discouraged: Crane Creek Fishing Access Pull-off, Abbotts Creek/ NC 8 Bridge Pull-off, and Lick Creek Fishing Pull-off. These three areas are now considered "closed" and will no longer be considered official public recreation areas (LVA, 2005a Appendix E-18).

E.5.1.1.1 High Rock Development Recreational Facilities

There are 10 public recreation areas and four commercial recreation areas located on High Rock Reservoir that provide direct access to the reservoir. The recreation areas on High Rock Reservoir are listed in Table E.5-2 and the location of each area is shown in Figures E-14 and E-15.

There are major recreation facilities at 7 of the 10 public recreation areas (not including commercial sites) with three areas having no major facilities. Highway 47 Fishing Pull-off, Little Crane Creek Fishing Access, and the High Rock Dam Canoe Portage are the three recreation sites without major facilities. Crane Creek Fishing Pull-off, and Abbotts Creek/NC 8 Bridge Pull-off have historically been reported in FERC Form 80 Reports, but are currently considered "closed" and are not listed as "major facilities." Boat launch ramps (does not include unimproved, dirt ramps), boat docks, fishing piers, swim areas, campgrounds, and picnic areas are all considered major recreation facilities. On High Rock Reservoir, there are 9 boat ramps, 4 boat docks, 2 swim areas, and 4 picnic areas. Of these major recreation facilities on High Rock, 2 boat ramps and 1 boat dock are located in Rowan County and 1 boat ramp is located in Davie County. The remaining 6 boat ramps, 3 boat docks, 2 swim areas, and 4 picnic areas are located in Davidson County (Table E.5-2) (LVA, 2005a Appendix E-18).

Table E.5-2: Major Public Facilities on High Rock Reservoir by County and Access Area

High Rock Reservoir		Major Facilities					
Site Name	**County**	**Boat Ramp**[1]	**Boat Dock**	**Fishing Pier**	**Swim Area**	**Camp-ground**	**Picnic Area**
York Hill Boat Access	Davidson	2	0	0	0	0	0
Southmont Boat Access Area	Davidson	2	1	0	0	0	1
Highway 47 Fishing Pull-off	Davidson	0	0	0	0	0	0
Buddle Creek Boat Access Area	Davidson	1	1	0	1	0	2
Flat Swamp Boat Access	Davidson	1	1	0	1	0	1
Highway 601 Access Area	Davie	1	0	0	0	0	0
Rowan County Pump Station Access Area	Rowan	1	0	0	0	0	0
Little Crane Creek Fishing Access	Rowan	0	0	0	0	0	0
Dutch Second Creek Boat Access	Rowan	1	1	0	0	0	0
High Rock Dam Canoe Portage	Rowan	0	0	0	0	0	0
Davidson Co. Totals	5 areas	6	3	0	2	0	4
Davie Co. Totals	1 area	1	0	0	0	0	0
Rowan Co. Totals	4 areas	2	1	0	0	0	0
High Rock Reservoir Totals	**10 areas**	**9**	**4**	**0**	**2**	**0**	**4**

[1] "Boat ramp" is specific to ramps and does not consider individual launch lanes (e.g., one boat ramp may have two launch lanes).

Figure E-14: Yadkin Project Recreation Areas (Upper High Rock Reservoir)

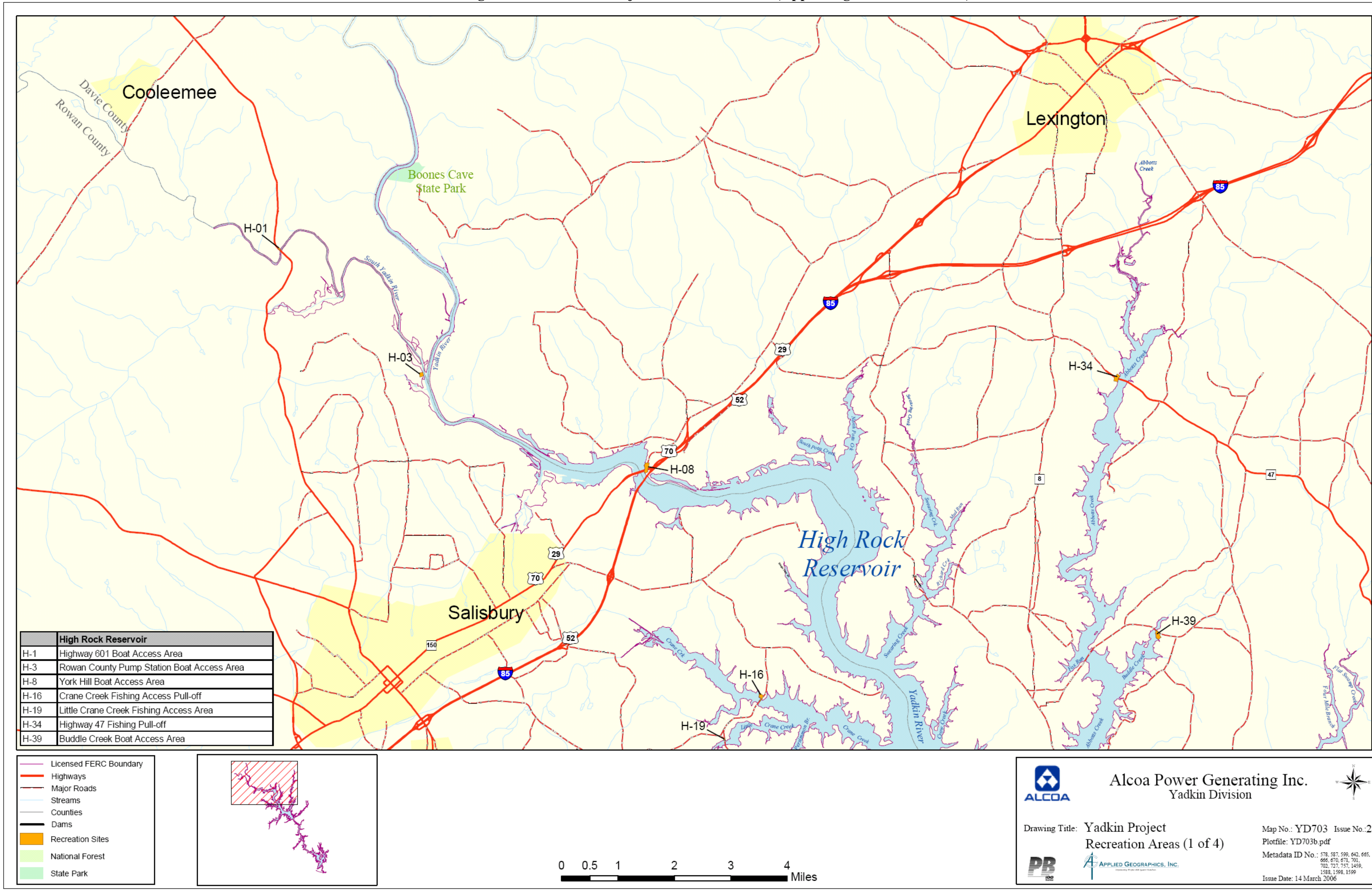
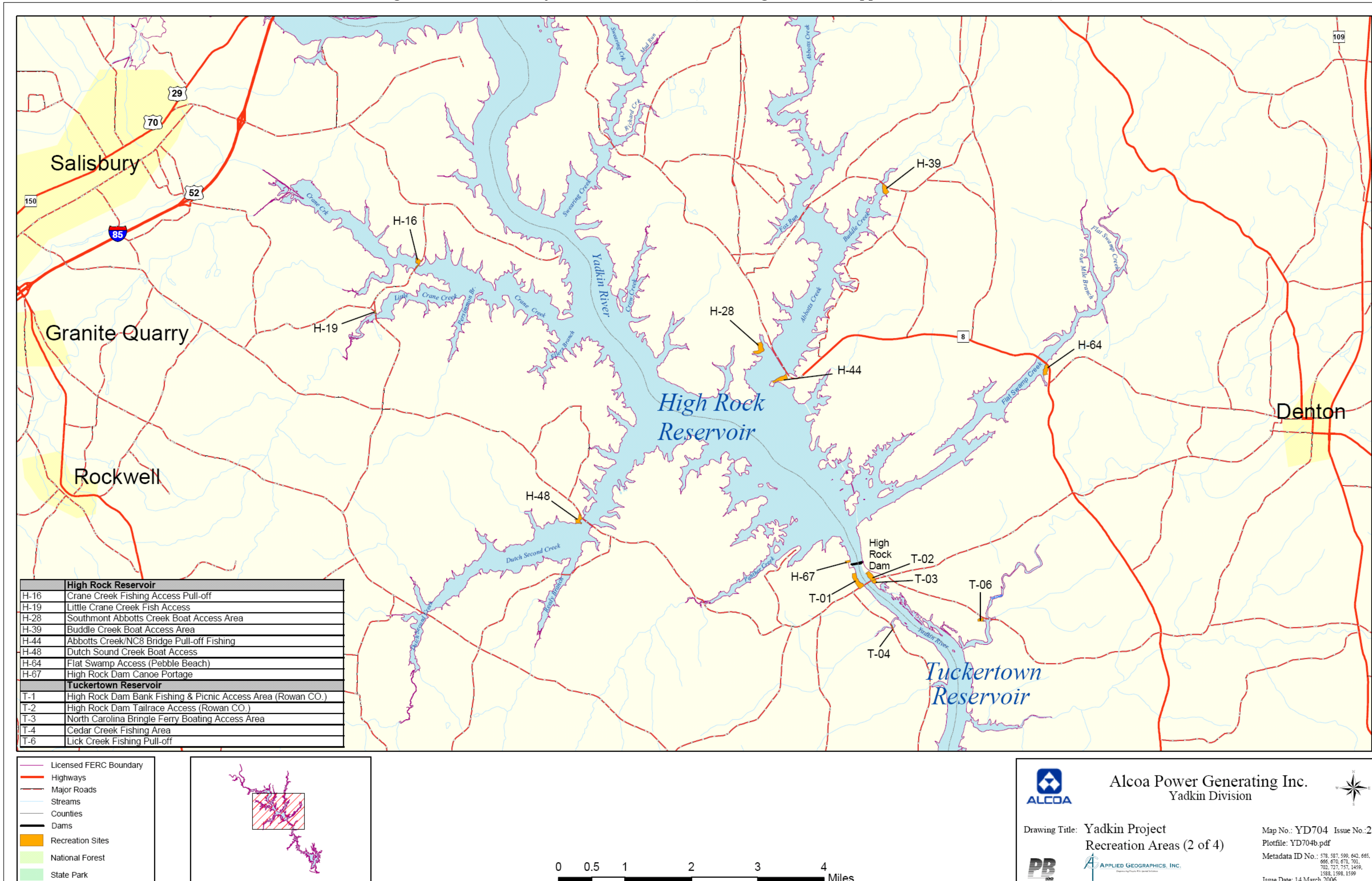


Figure E-15: Yadkin Project Recreation Areas (Lower High Rock and Upper Tuckertown Reservoirs)



	High Rock Reservoir
H-16	Crane Creek Fishing Access Pull-off
H-19	Little Crane Creek Fish Access
H-28	Southmont Abbotts Creek Boat Access Area
H-39	Buddle Creek Boat Access Area
H-44	Abbotts Creek/NC8 Bridge Pull-off Fishing
H-48	Dutch Sound Creek Boat Access
H-64	Flat Swamp Access (Pebble Beach)
H-67	High Rock Dam Canoe Portage
	Tuckertown Reservoir
T-1	High Rock Dam Bank Fishing & Picnic Access Area (Rowan CO.)
T-2	High Rock Dam Tailrace Access (Rowan CO.)
T-3	North Carolina Bringle Ferry Boating Access Area
T-4	Cedar Creek Fishing Area
T-6	Lick Creek Fishing Pull-off

Recreation facilities at the 10 public recreation areas on High Rock Reservoir are generally in good condition. The condition of each recreation area is summarized in Table E.5-3 below (LVA, 2005a Appendix E-18).

Table E.5-3: Summary of Facilities Condition at High Rock Reservoir Recreation Areas

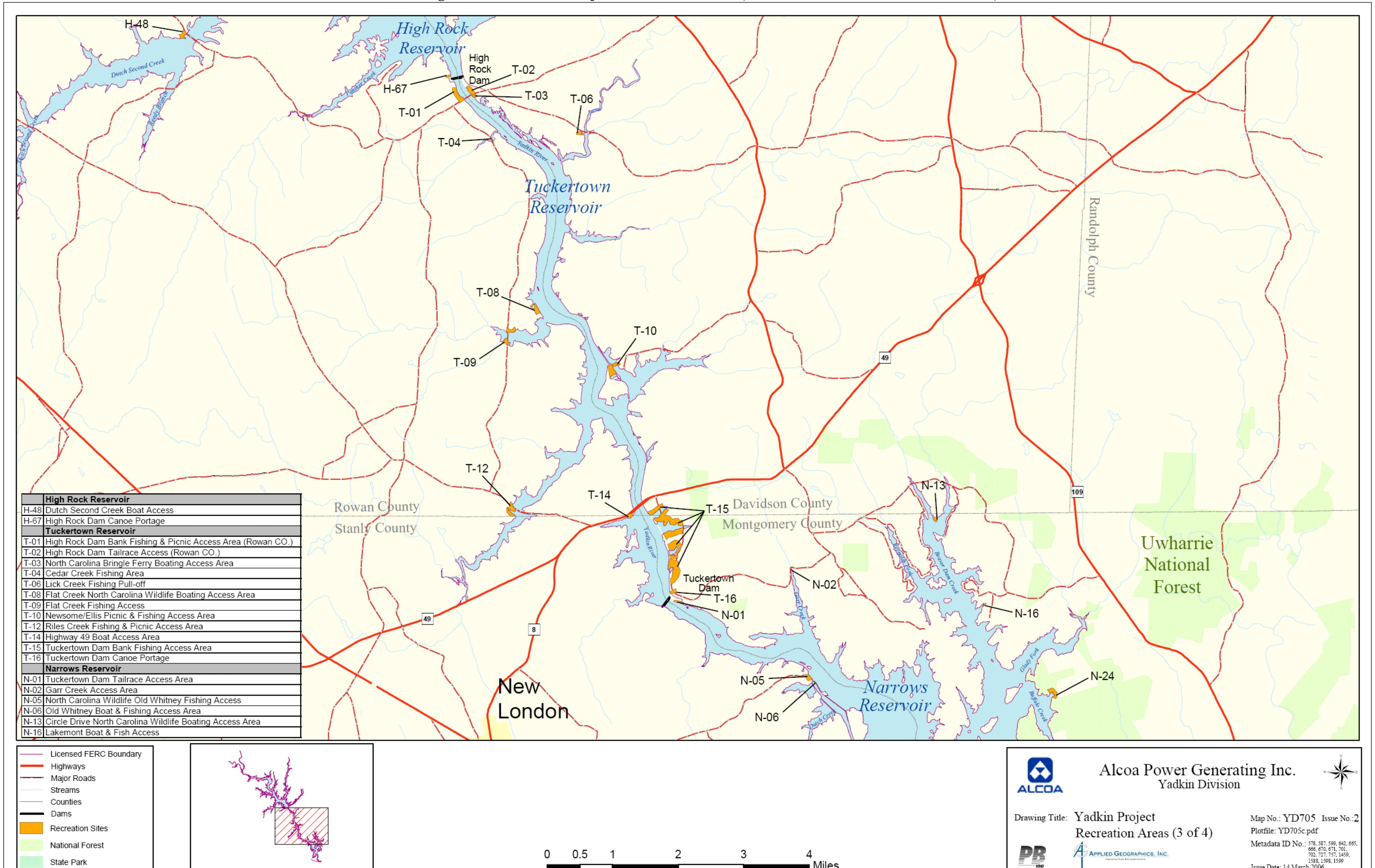
Recreation Area	Notes on Condition
Highway 601 Access Area	Generally in good condition; ramp needs maintenance
Rowan County Pump Station	Improvements needed; site is in general disrepair
York Hill Boat Access	Generally in good condition; needs some maintenance (smaller boat ramp) and repair (access road)
Crane Creek Fishing Access Pull-off	Area is closed
Little Crane Creek Fishing Access	Improvements needed; significant erosion in vehicular access areas.
Southmont Boat Access Area	Generally in good condition; boat ramp needs significant repairs
Highway 47 Fishing Pull-off	Area is closed
Buddle Creek Boat Access Area	Generally in good condition; swimming area needs improvements; other minor repair and maintenance work needed
Abbotts Creek/NC 8 Bridge Pull-off	Area is closed
Dutch Second Creek Boat Access	Good condition
Flat Swamp Boat Access	Good condition
High Rock Dam Canoe Portage	Good condition

E.5.1.1.2 Tuckertown Development Recreational Facilities

Located in Davidson, Montgomery, Rowan, and Stanly counties, Tuckertown Reservoir has 11 major public recreation areas and no commercial recreation areas that provide direct access to the reservoir. Table E.5-4 is a summary of the major facilities on Tuckertown Reservoir and Figure E-16 shows the location of the facilities on the reservoir.

Of the 11 public recreation areas, six have major facilities and five do not. The six sites with major facilities include High Rock Dam Tailrace Access (Rowan), Bringle Ferry Boat Access, Flat Creek Boat Access Area, Newsome Road Access, Riles Creek Recreation Area, and Highway 49 Boat Access Area. Lick Creek Fishing Pull-off has historically been represented in FERC Form 80 Reports, but is currently considered “closed” and is not listed as a “major facility.” On Tuckertown Reservoir, there are a total of 7 boat ramps, 4 boat docks, and 3 picnic areas. Of the major recreation facilities on Tuckertown; 3 boat ramps, 2 boat docks, and 2 picnic areas are located in Rowan County, 2 boat ramps and 1 picnic area are located in Davidson County, and 2 boat ramps and 2 boat docks are located in Stanly County. There are no major recreation facilities on Tuckertown Reservoir in Montgomery County (LVA, 2005a Appendix E-18).

Figure E-16: Yadkin Project Recreation Areas (Tuckertown and Narrows Reservoirs)



	High Rock Reservoir
H-48	Dutch Second Creek Boat Access
H-67	High Rock Dam Canoe Portage
	Tuckertown Reservoir
T-01	High Rock Dam Bank Fishing & Picnic Access Area (Rowan CO.)
T-02	High Rock Dam Tailrace Access (Rowan CO.)
T-03	North Carolina Bringle Ferry Boating Access Area
T-04	Cedar Creek Fishing Area
T-06	Lick Creek Fishing Pull-off
T-08	Flat Creek North Carolina Wildlife Boating Access Area
T-09	Flat Creek Fishing Access
T-10	Newsome/Ellis Picnic & Fishing Access Area
T-12	Riles Creek Fishing & Picnic Access Area
T-14	Highway 49 Boat Access Area
T-15	Tuckertown Dam Bank Fishing Access Area
T-16	Tuckertown Dam Canoe Portage
	Narrows Reservoir
N-01	Tuckertown Dam Tailrace Access Area
N-02	Garr Creek Access Area
N-05	North Carolina Wildlife Old Whitney Fishing Access
N-06	Old Whitney Boat & Fishing Access Area
N-13	Circle Drive North Carolina Wildlife Boating Access Area
N-16	Lakemont Boat & Fish Access

Table E.5-4: Major Public Facilities on Tuckertown Reservoir by County and Access Area

Tuckertown Reservoir		Major Facilities					
Site Name	**County**	**Boat Ramp**	**Boat Dock**	**Fishing Pier**	**Swim Area**	**Camp-ground**	**Picnic Area**
High Rock Dam Tailrace Access (Davidson)	Davidson	0	0	0	0	0	0
Newsome Road Access	Davidson	2	0	0	0	0	1
Tuckertown Road Pull-off Fishing Access	Davidson, Montgomery	0	0	0	0	0	0
Tuckertown Dam Canoe Portage	Montgomery	0	0	0	0	0	0
High Rock Dam Tailrace Access (Rowan)	Rowan	0	0	0	0	0	1
Bringle Ferry Boat Access Area	Rowan	1	1	0	0	0	0
Cedar Creek Fishing Pull-off	Rowan	0	0	0	0	0	0
Flat Creek Boat Access Area	Rowan	2	1	0	0	0	0
Flat Creek Fishing Access	Rowan	0	0	0	0	0	0
Riles Creek Recreation Area	Rowan	0	0	0	0	0	1
Highway 49 Boat Access Area	Stanly	2	2	0	0	0	0
Davidson Co. Totals	3 areas	2	0	0	0	0	1
Rowan Co. Totals	6 areas	3	2	0	0	0	2
Montgomery Co. Totals	2 areas	0	0	0	0	0	0
Stanly Co. Totals	1 area	2	2	0	0	0	0
Tuckertown Reservoir Totals	**11 areas**	**7**	**4**	**0**	**0**	**0**	**3**

Recreation facilities at the 11 public recreation areas on Tuckertown Reservoir are generally in good condition. The condition of each recreation area is summarized in Table E.5-5 below (LVA, 2005a Appendix E-18).

Table E.5-5: Summary of Facilities Condition at Tuckertown Reservoir Recreation Areas

Recreation Area	Notes on Condition
High Rock Dam Tailrace Access (Rowan)	Good condition
High Rock Dam Tailrace Access (Davidson)	Improvements needed; significant erosion, general maintenance and litter problems
Bringle Ferry Boat Access	Generally in good condition; access road needs maintenance
Cedar Creek Fishing Pull-off	Generally in good condition; some maintenance problems
Lick Creek Fishing Pull-off	Area is closed
Flat Creek Boat Access Area	Good condition
Flat Creek Fishing Access Area	Generally in good condition; parking area needs maintenance
Newsome Road Access	Improvements needed; boat ramps are of deteriorated quality
Riles Creek Recreation Area	Improvements needed; vandalism and erosion problems
Highway 49 Boat Access Area	Generally in good condition; boat ramps need resurfacing
Tuckertown Pull-off Fishing Access	Maintenance improvements needed
Tuckertown Dam Canoe Portage	Good condition

E.5.1.1.3 Narrows Development Recreational Facilities

Located in Davidson, Montgomery, and Stanly counties, Narrows Reservoir has 16 public recreation areas and one commercial recreation area[1] that provide direct access to the reservoir. The Uwharrie National Forest (UNF) also borders the reservoir on the east. The UNF maintains several recreation areas that provide access to Narrows Reservoir. A summary of the major facilities on Narrows Reservoir is included in Table E.5-6, and the locations of the areas on reservoir are shown in Figure E-17.

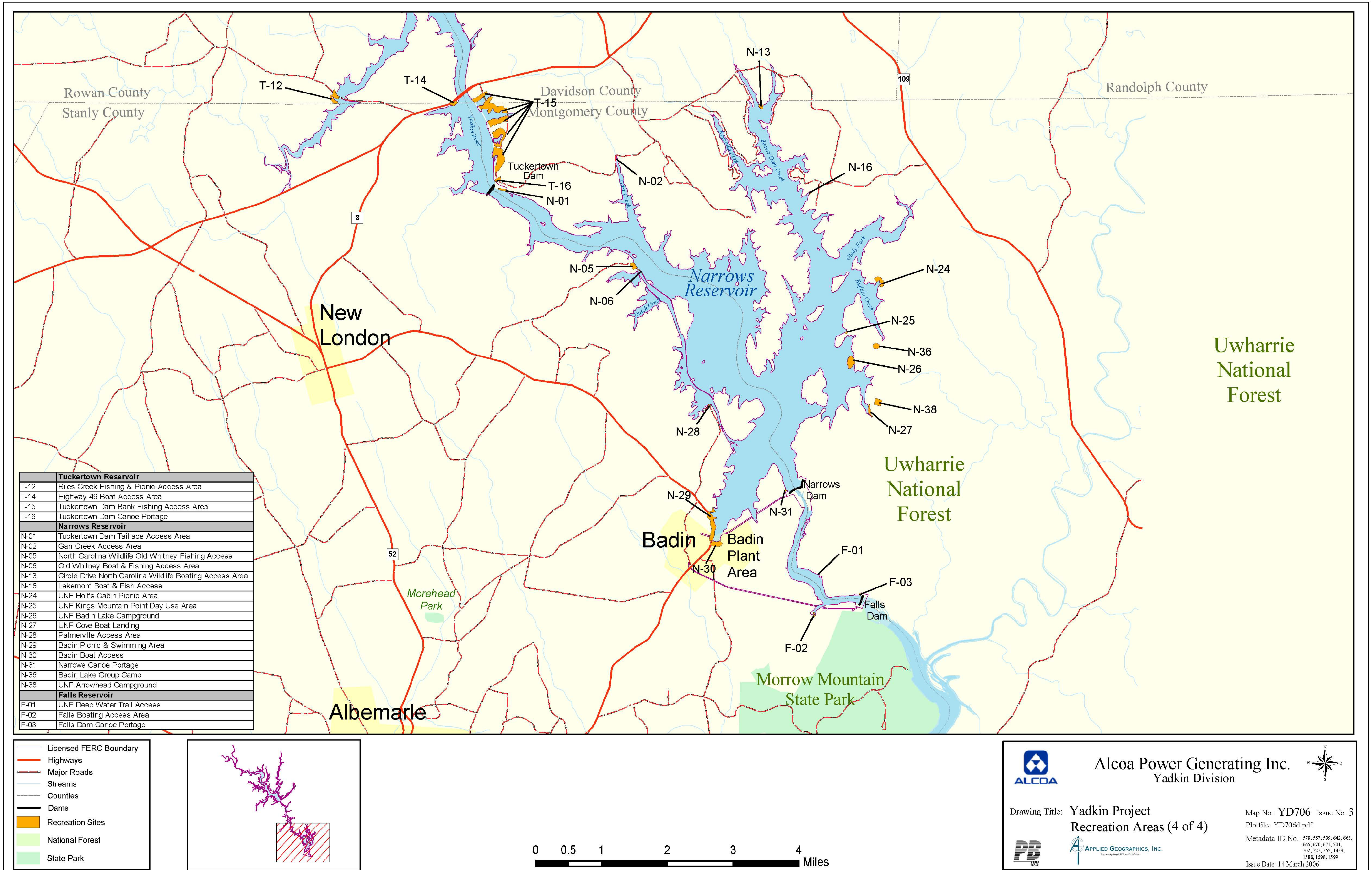
Fourteen of the 16 public recreation areas have major facilities; the only two areas without major facilities are Tuckertown Dam Tailrace Access Area and the Narrows Dam Canoe Portage. There are 10 boat ramps, 7 boat docks, 5 fishing piers, 2 swim areas, 3 campgrounds, and 8 picnic areas on Narrows Reservoir. Individually, 7 boat ramps, 4 boat docks, 4 fishing piers, 1 swim area, 3 campgrounds, and 4 picnic areas are located in Montgomery County and 3 boat ramps, 3 boat docks, 1 fishing pier, 1 swim area, and 4 picnic areas are located in Stanly County. There are no public recreation areas on Narrows Reservoir located in Davidson County (LVA, 2005a Appendix E-18).

Table E.5-6: Major Public Facilities on Narrows Reservoir by County and Access Area

Narrows Reservoir		**Major Facilities**					
Site Name	**County**	**Boat Ramp**	**Boat Dock**	**Fishing Pier**	**Swim Area**	**Camp-ground**	**Picnic Area**
Tuckertown Dam Tailrace Access Area	Montgomery	0	0	0	0	0	1
Garr Creek Access	Montgomery	1	0	0	0	0	0
Circle Drive Boat Access	Montgomery	3	3	0	0	0	0
Lakemont Access	Montgomery	2	0	0	0	0	0
UNF Holt's Cabin Picnic Area	Montgomery	0	0	0	0	0	1
UNF Kings Mountain Point Day Use Area	Montgomery	0	0	4	1	0	1
UNF Badin Lake Campground	Montgomery	0	0	0	0	1	0
UNF Arrowhead Campground	Montgomery	0	0	0	0	1	0
UNF Cove Boat Landing	Montgomery	1	1	0	0	0	1
Badin Lake Group Camp	Montgomery	0	0	0	0	1	0
Old Whitney Fishing Pier	Stanly	0	0	1	0	0	1
Old Whitney Boat Access	Stanly	1	1	0	0	0	1
Palmerville Access	Stanly	1	0	0	0	0	0
Badin Lake Swim and Picnic Area	Stanly	0	0	0	1	0	1
Badin Lake Boat Access	Stanly	1	2	0	0	0	1
Narrows Dam Canoe Portage	Stanly	0	0	0	0	0	0
Montgomery Co. Totals	10 areas	7	4	4	1	3	4
Stanly Co. Totals	6 areas	3	3	1	1	0	4
Narrows Reservoir Totals	**16 areas**	**10**	**7**	**5**	**2**	**3**	**8**

[1] Lake Forest Campground/Fish Tales Marina was included in the Recreation Facility Inventory and Condition Assessment (LVA, 2005a Appendix E-18).

Figure E-17: Yadkin Project Recreation Areas (Narrows and Falls Reservoirs)



Recreation facilities at the 16 public recreation areas on Narrows Reservoir are generally in good condition. The condition of each recreation area is summarized in Table E.5-7 below (LVA, 2005a Appendix E-18).

Table E.5-7: Summary of Facilities Condition at Narrows Reservoir Recreation Areas

Recreation Area	Notes on Condition
Tuckertown Dam Tailrace Access	Good condition
Garr Creek Access Area	Improvements needed; boat ramps need significant repair
Old Whitney NCWRC Fishing Pier	Good condition
Old Whitney Boat Access Area	Good Condition
Circle Drive Boat Access Area	Generally in good condition; some minor maintenance issues
Lakemont Access Area	Improvements needed; ramps need replacement, vehicular access needs maintenance/repair, general aesthetic improvements needed
UNF Holt's Cabin Picnic Area	General reconstruction needed
UNF Kings Mountain Point Day Use Area	Good condition (new); reconstruction recently completed
UNF Badin Lake Campground	Good condition (new); reconstruction recently completed
UNF Cove Boat Landing	Under reconstruction
Palmerville Access Area	Improvements needed; maintenances issues (picnic area and boat ramp), lack of identifiable parking area
Badin Lake Swim/Picnic Area	Good condition
Badin Boat Access	Good condition
Narrows Dam Canoe Portage	Improvements needed; steep terrain and often narrow (especially along fence toward put-in)
Badin Lake Group Camp	Improvements needed; gravel and grading improvements needed
UNF Arrowhead Campground	Generally in good condition; repairs needed for many living spaces and access pathways, some grills/fire rings and ID posts also need repair

E.5.1.1.4 Falls Development Recreational Facilities

Located in Montgomery and Stanly counties, Falls Reservoir has three public recreation areas: UNF Deep Water Trail Access, Falls Boat Access, and the Falls Dam Canoe Portage (see Table E.5-8 and Figure E-17). A single boat launch ramp at Falls Boat Access in Stanly County is the only major facility available on Falls Reservoir. There are no commercial recreation areas on Falls Reservoir.

Table E.5-8: Major Public Facilities on Falls Reservoir by County and Access Area

Narrows Reservoir		**Major Facilities**					
Site Name	**County**	**Boat Ramp**	**Boat Dock**	**Fishing Pier**	**Swim Area**	**Camp-ground**	**Picnic Area**
Deep Water Trail Access	Montgomery	1	0	0	0	0	0
Falls Dam Canoe Portage	Montgomery	0	0	0	0	0	0
Falls Boat Access	Stanly	1	0	0	0	0	0
Montgomery Co. Totals	2 areas	1	0	0	0	0	0
Stanly Co. Totals	1 area	1	0	0	0	0	0
Falls Reservoir Totals	**3 areas**	**2**	**0**	**0**	**0**	**0**	**0**

The condition of each recreation area is summarized in Table E.5-9 (LVA, 2005a Appendix E-18).

Table E.5-9: Summary of Facilities Condition at Falls Reservoir Recreation Areas

Recreation Area	Notes on Condition
UNF Deep Water Trail Access	Improvements needed; steep terrain
Falls Boat Access	Generally in good condition; boat ramp needs resurfacing
Falls Dam Canoe Portage	Improvements needed; uneven terrain, extremely steep and difficult put-in

E.5.1.2 Other Public Recreation Sites

Yadkin-Pee Dee River Canoe Trail

The Yadkin-Pee Dee River Canoe Trail is a 230-mile river trail on the Yadkin and Pee-Dee Rivers from Wilkesboro, North Carolina to the South Carolina border. The 230-mile trail has numerous access points at public recreation areas on the Project reservoirs and includes the entire 38-mile stretch within the Project. Specifically, the Yadkin-Pee Dee River Trail map lists 31 of the inventoried public recreation areas on the Project reservoirs as either providing boat access or providing some other facilities (e.g., bathroom, picnic tables, camping). In addition to the public areas, the trail map also lists High Rock Campground and Marina as providing boating access, camping, bathrooms, and picnic tables.

Eagle Point Nature Preserve

The Eagle Point Nature Preserve is located on High Rock Reservoir in Rowan County. The preserve falls under the management of Rowan County Parks and Recreation. The preserve consists of approximately 100 acres of public land owned by Rowan County and over 80 acres on lease from APGI at no cost. The preserve, which is open to the public daily, has hiking trails, a canoe access (to High Rock Reservoir), and wildlife observation sites (LVA, 2005a Appendix E-18).

E.5.1.3 Commercial Recreation Areas

On High Rock and Narrows reservoirs, five commercial recreation areas were identified and included in the Recreation Facility Inventory and Condition Assessment (Table E.5-10). Four areas are located on High Rock Reservoir, and one is located on Narrows Reservoir. Combined, the five commercial areas provide four marinas including five boat ramps and five boat docks, one fishing pier, one campground, and two picnic areas. As commercial recreation areas, these sites are generally available to the public for a fee (LVA, 2005a Appendix E-18).

Table E.5-10: Major Facilities at Commercial Recreation Areas

Site Name	Reservoir	Boat Ramp	Boat Dock	Fishing Pier	Swim Area	Camp-ground	Picnic Area
High Rock Marina and Campground	High Rock	1	0	1	0	1	1
Tamarac Marina	High Rock	1	2	0	0	0	1
High Rock Boat and Ski Club	High Rock	1	1	0	0	0	0
Boat Dock Marina	High Rock	1	1	0	0	0	0
Fish Tales Marina	Narrows	1	1	0	0	0	0
High Rock Reservoir Totals	4 areas	4	4	1	0	1	2
Narrows Reservoir Totals	1 area	1	1	0	0	0	0
Commercial Area Totals	**5 areas**	**5**	**5**	**1**	**0**	**1**	**2**

E.5.1.4 Dispersed Recreation Sites

Dispersed recreation sites are areas where recreation occurs outside the boundaries of an established public recreation area. While no survey could document all dispersed recreation sites along the reservoirs, APGI's inventory identified 41 dispersed sites of varying lengths of shoreline that were obviously receiving routine use. These 41 sites are scattered throughout the shorelines and islands of all four reservoirs: 5 on Falls Reservoir, 12 on Narrows Reservoir, 12 on Tuckertown Reservoir, and 12 on High Rock Reservoir. At the 41 specifically identified dispersed recreation areas, bank fishing and camping are the only activities known to occur (LVA, 2005a Appendix E-18).

While specific dispersed areas were surveyed where recreation is known to occur routinely, it should be noted that dispersed recreation can and probably does occur (at varying use levels) along the entire shoreline of all four reservoirs. Dispersed recreation use is particularly prevalent on islands and along forested shorelines that are not directly adjacent to private property. The 41 sites identified in the Recreation Facility Inventory and Condition Assessment are considered to be sites where use is most obvious and significant. Also, although it may not always be the predominant method of access, all dispersed recreation areas can be accessed by means of boat. Likewise, although camping may be noted as the predominant activity that occurs at a site, it is assumed that bank fishing occurs at nearly every dispersed recreation site. APGI does not allow camping on APGI lands and considers "dispersed camping" to be unauthorized. "No camping" signs have been posted but are frequently vandalized and/or removed. Additionally, many of the sites documented as dispersed recreation are recreation areas that extend beyond the bounds of established public access sites. Although not all such sites were addressed in the Recreation Facility Inventory and Condition Assessment, it should be noted that at nearly all public access areas, bank fishing extends beyond the established facilities of that recreation site (LVA, 2005a Appendix E-18).

E.5.1.5 Private Recreation Facilities

In addition to the recreation facilities available to the general public, there are numerous privately owned and operated multi-use (group) recreation facilities located around the Project reservoirs. These facilities include private boat clubs, private campgrounds, day use areas and facilities for private organizations such as the Elks Lodge or Moose Lodge, and private facilities that are maintained by homeowner associations.

There are also numerous private individual and shared recreation facilities on High Rock and Narrows reservoirs. Most of these facilities are private individual piers. According to permit records, there are approximately 2,700 private piers on High Rock and approximately 1,084 private piers on Narrows. While private individual boat houses and boat ramps are no longer allowed (under the Yadkin Shoreline Management Plan), some of the older shoreline properties already have these facilities.

E.5.2 Opportunities for the Handicapped

In the Recreation Facility Inventory and Condition Assessment, a disabled access assessment was made at each public access recreation area. A "barrier-free" facility is a facility where access is free of impediments to safe use and passage by persons with disabilities or handicaps[2]. Typical impediments at boating and fishing facilities include the absence of cuts in the curb around parking lots, improperly surfaced walks and decking, poor transitions from pathways to structures such as boat docks and fishing piers, and steeply graded access ways (LVA, 2005a Appendix E-18).

Facilities classified as barrier-free, such as a boat ramp, courtesy dock, fishing pier, or a picnic area should be designed so that it can be approached, entered, and used by people with disabilities. Factors that were considered in conducting the disabled access assessment at each recreation area included: the availability of signed handicapped parking; the surface and slope of accessible pathways; access to boat transfer facilities (courtesy docks); the design of existing fishing piers; the accessibility to side or end-approach picnic tables; and the availability of barrier-free restroom facilities at each recreation area. Tables E.5-11 through E.5-14 summarize the barrier-free opportunities at the Yadkin Project public recreation areas for each reservoir and suggest possible improvements to help meet barrier-free status at sites where it is not currently met (LVA, 2005a Appendix E-18).

E.5.2.1 High Rock Reservoir

High Rock Reservoir currently has no fully accessible recreation areas (Table E.5-11). Nevertheless, there are numerous facilities that have been designed to be barrier-free but lack important features. Boating facilities at Southmont Boat Access Area, Buddle Creek Boat Access Area, Dutch Second Creek Boat Access Area, and Flat Swamp Boat Access Area need designated parking spaces and accessible pathways in order to make them accessible. All other facilities and recreation areas are completely not accessible[3] (LVA, 2005a Appendix E-18).

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[2] Definition from "Guidelines for the Design of Barrier-Free Recreational Boating and Fishing Facilities" prepared for the States Organization for Boating Access, 1992.

[3] "Completely not accessible" is used to describe those areas without paved/accessible parking, accessible pathways to any facilities, and courtesy docks (for those areas with boating facilities). Such areas would need all of the above mentioned additions to be barrier-free.

Table E.5-11: Summary of Barrier-Free Areas and Possible Improvements to Achieve Barrier-Free Accessibility at High Rock Reservoir

Recreation Area	Accessible (yes/no)	Notes; Possibilities for Accessibility
Highway 601 Access Area	No	Completely not accessible
Rowan County Pump Station	No	Completely not accessible
York Hill Boat Access	No	Completely not accessible
Crane Creek Fishing Access Pull-off	No	Completely not accessible
Little Crane Creek Fishing Access	No	Completely not accessible
Southmont Boat Access Area	No	Designated parking space and accessible pathway would make boating facilities accessible.
Highway 47 Fishing Pull-off	No	Completely not accessible
Buddle Creek Boat Access Area	No	Designated parking space and accessible pathway would make boating facilities accessible.
Abbotts Creek/NC 8 Bridge Pull-off	No	Completely not accessible
Dutch Second Creek Boat Access	No	Designated parking space and accessible pathway would make boating facilities accessible.
Flat Swamp Boat Access	No	Designated parking space and accessible pathway would make boating facilities accessible.

E.5.2.2 Tuckertown Reservoir

Tuckertown Reservoir currently has one fully accessible recreation area: Flat Creek Boat Access Area (Table E.5-12). Additionally, there are numerous facilities that have been designed to be barrier-free but lack important features. Boating facilities at Bringle Ferry Boat Access Area and Highway 49 Boat Access Area need designated parking spaces and accessible pathways in order to make them accessible. All other facilities and recreation areas are completely not accessible (LVA, 2005a Appendix E-18).

Table E.5-12: Summary of Barrier-Free Areas and Possible Improvements to Achieve Barrier-Free Accessibility at Tuckertown Reservoir

Recreation Area	Accessible (yes/no)	Notes; Possibilities for Accessibility
High Rock Dam Tailrace Access (Rowan)	No	Completely not accessible
High Rock Dam Tailrace Access (Davidson)	No	Completely not accessible
Bringle Ferry Boat Access	No	Designated parking space, accessible pathways and barrier-free transitions would make boating facilities accessible.
Cedar Creek Fishing Pull-off	No	Completely not accessible
Lick Creek Fishing Pull-off	No	Completely not accessible
Flat Creek Boat Access Area	Yes	Accessible; transition plates are recommended
Flat Creek Fishing Access Area	No	Completely not accessible
Newsome Road Access	No	Completely not accessible
Riles Creek Recreation Area	No	Completely not accessible
Highway 49 Boat Access Area	No	Designated parking space and accessible pathway would make boating facilities accessible
Tuckertown Pull-off Fishing Access	No	Completely not accessible

E.5.2.3 Narrows Reservoir

Narrows Reservoir currently has three fully accessible recreation areas: Circle Drive Boat Access Area, UNF Cove Boat Landing, and UNF Kings Mountain Point Day Use Area (Table E.5-13). Additionally, there are numerous facilities that have been designed to be barrier-free but lack important features. Facilities at Old Whitney Boat Access Area, Badin Boat Access, and UNF Arrowhead Campground need minimal improvements in order to make them accessible. Similarly, Badin Lake Campground has been reconstructed and provides barrier-free toilet facilities. All other facilities and recreation areas are completely not accessible (LVA, 2005a Appendix E-18).

Table E.5-13: Summary of Barrier-Free Areas and Possible Improvements to Achieve Barrier-Free Accessibility at Narrows Reservoir

Recreation Area	Accessible (yes/no)	Notes; Possibilities for Accessibility
Tuckertown Dam Tailrace Access	No	Completely not accessible
Garr Creek Access Area	No	Completely not accessible
Old Whitney NCWRC Fishing Pier	No	Completely not accessible
Old Whitney Boat Access Area	No	Designated parking space, accessible pathways and gaps in courtesy dock curb would make boating facilities accessible
Circle Drive Boat Access Area	Yes	Accessible
Lakemont Access Area	No	Completely not accessible
UNF Holt's Cabin Picnic Area	No	Completely not accessible
UNF Kings Mountain Point Day Use Area	Yes	Accessible
UNF Badin Lake Campground	N/A	Reconstruction recently completed; new facilities include barrier-free toilets
UNF Cove Boat Landing	Yes	It is intended that reconstruction will fully provide barrier-free facilities
Palmerville Access Area	No	Completely not accessible
Badin Lake Swim/Picnic Area	No	Completely not accessible
Badin Boat Access	No	Paved, designated parking space, accessible pathway to ramp and floating dock, and transition plates and gaps in dock curb are needed to achieve barrier free status
Badin Lake Group Camp	No	Completely not accessible
UNF Arrowhead Campground	No	Campsite parking areas must be wider to be barrier-free. Picnic tables, lantern poles, and living spaces are not barrier-free. Bathhouse currently meets barrier free guidelines

E.5.2.4 Falls Reservoir

Falls Reservoir currently has no fully accessible recreation areas (Table E.5-14). Boating facilities at Falls Boat Access need a courtesy dock, an accessible pathway, and designated parking spaces to make them accessible. Facilities at UNF Deep Water Trail Access are completely not accessible (LVA, 2005a Appendix E-18).

Table E.5-14: Summary of Barrier-Free Areas and Possible Improvements to Achieve Barrier-Free Accessibility at Falls Reservoir

Recreation Area	Accessible (yes/no)	Notes; Possibilities for Accessibility
UNF Deep Water Trail Access	No	Completely not accessible
Falls Boat Access	No	Addition of a courtesy dock, accessible pathway, and designated parking spaces are needed.

Although limited, barrier-free opportunities do exist at the Project. The Circle Drive Boat Access Area, managed by the North Carolina Wildlife Resources Commission (NCWRC), is a good example of a barrier-free boating facility. The area has a designated and signed handicapped parking space, which is along an accessible pathway (concrete) that leads to accessible boat ramps and courtesy docks (one with a handicapped accessible handrail). The restroom facilities at this area are not barrier-free (LVA, 2005a Appendix E-18).

Several access areas, such as the Highway 49 Boat Access Area on Narrows Reservoir (Badin Lake), are designed to be barrier-free, but lack some necessary elements. The courtesy boat docks at the Highway 49 Boat Access Areas were constructed to be barrier-free, but there is currently no signed handicapped parking space or accessible pathway to the facilities. In most cases, the absence of an accessible pathway and/or a designated parking space is the only remaining improvements required to make facilities barrier-free. Because the predominant uses at the reservoirs are boating and fishing, efforts to improve barrier-free accessibility should focus on these uses (LVA, 2005a Appendix E-18).

E.5.3 Public Safety Measures

In 1968, to help ensure public safety around dams, "Exclusionary Zones" were established by the NCWRC below Tuckertown and Falls dams. These zones prohibit fishing, swimming, and boating within 100 feet upstream and downstream of the dams and are enforced by the NCWRC. In 2001, APGI petitioned the NCWRC to designate similar exclusionary zones at High Rock and Narrows dams, but the petition was denied. In 2003, APGI asked the NCWRC to reconsider its previous petition for exclusionary zones at High Rock and Narrows dams. Unsuccessful in its attempts to designate exclusionary zones at these dams, APGI posted additional safety signs at all four dams to reinforce the importance of water safety. The signs, posted in both English and Spanish, inform individuals that swimming, boating, or entry between the sign and the dam is potentially dangerous. APGI strongly encourages users to take additional caution in these areas (LVA, 2005a Appendix E-18).

In December 2003, APGI filed a revised Public Safety Plan with FERC. Generally, the Public Safety Plan outlines the safety precautions taken at the Project dams and around the Project reservoirs. Such precautions include, but are not limited to, warning signs, "no wake" and "no boat" buoy lines, and lights. FERC inspects these facilities at the Yadkin Project on a regular basis to ensure that they are maintained (LVA, 2005a Appendix E-18).

In addition to the Public Safety Plan, APGI developed a plan to promote swimming safety at all of its swimming areas in June 2001. The plan limits swimming from sunrise to sunset from May 15 through September 15 and requires children under the age of 16 to be supervised by an adult. In 2001, APGI restricted the size of the swimming areas and installed a two-line buoy system in an effort to improve public safety. APGI also installed public telephones, posted emergency procedures, and provided safety equipment (rescue throw bags) at the swimming areas. APGI provides funding to local governments to support additional law enforcement patrols at the recreation areas and local swimming safety programs. Over the past several years, APGI has donated patrol boats to Davidson, Montgomery, and Stanly counties. APGI has also provided throw bags to county law enforcement departments to use in their boats. APGI has provided funds to the U.S. Coast Guard Auxiliary sites on High Rock and Narrows (LVA, 2005a Appendix E-18).

In May 2004, APGI installed a life jacket station to promote water safety at the Buddle Creek Access Area in cooperation with SAFE KIDS in Davidson County. A similar life jacket station was installed at the Flat Swamp Access Area in 2003. The stations are designed to offer free use of life jackets for children and other inexperienced swimmers. APGI has offered to install a similar life jacket rack in Rowan County in cooperation with SAFE KIDS (LVA, 2005a Appendix E-18).

There are several areas around the Project reservoirs, especially at bridge crossings, where fishermen like to bank fish. Concerned about the potentially unsafe pedestrian and vehicular interactions along roadways, APGI is discouraging this use in some areas. In cooperation with the North Carolina Department of Transportation (NCDOT), APGI has posted numerous "No Parking" signs along the NC Highway 8 at Abbotts Creek to discourage fishing from the bridge. Additionally, APGI provides no facilities (e.g., trash receptacles) at this area. Other fishing pull-offs areas where use has been discouraged through "No Parking" signs and the absence of improved facilities include Crane Creek Fishing Access Pull-off, and Lick Creek Fishing Pull-off. These areas are considered "closed" and will no longer be considered official public recreation areas (LVA, 2005a Appendix E-18).

Boating safety at the bridges that pass over High Rock Reservoir has been identified by the relicensing participants as a potential safety issue. At higher reservoir elevations, the clearance height for boats moving underneath the bridge overpasses decreases. To help address this issue, APGI has installed strips of reflective tape on all the bridges at High Rock to make them more visible.

The relicensing participants have also identified the need for more and better navigational aids on the Project reservoirs to mark potentially dangerous areas such as exposed tree stumps and/or low water areas. The participants have also requested that flashing lights be added to existing "no wake" and "danger buoys" to make them more visible. APGI does not have the authority to install and maintain buoys and other navigational aids on the Project reservoirs. North Carolina General Statute 75A-15 governs the adoption of local water safety rules. NCWRC promulgates and enforces rules that establish safety zones and provide for the placement of buoys as informational markers in waters of the state. Such markers may indicate swimming or no wake zones, channel paths, restrictions on certain activities, and other designations. Only a unit of local government (county or city), or an agency empowered by authority of local government with jurisdiction over the area may request the NCWRC to promulgate local water safety regulations. The NCWRC may also establish no wake zones in waters of the state where an investigation by a NCWRC enforcement officer demonstrates that water safety hazards exist (NCWRC, Boating and Waterways website).

E.5.4 Signage

FERC requires licensees to take the appropriate actions, including placing the appropriate signage, to safeguard the public from harm at and around hydropower projects. To this end, FERC requires that licensees develop and file a Public Safety Plan (discussed in Exhibit E.5.3), which includes a list of safety devices and their location at the Project. APGI has posted and maintains numerous safety signs at the Project. These signs warn against rapidly rising water, overhead transmission lines, shallow water, no swimming, etc. In addition to signs aimed at improving public safety at the Project, APGI posts signs required by Part 8 of FERC's regulations at every recreation area that provides access to the Project. In many cases, signs are posted in both English and Spanish. Every sign at the Yadkin Project meets FERC's requirements.

E.5.5 Recreational Use

During the initial consultation phase of the relicensing process, APGI was requested by resource agencies and others to evaluate recreational use at the Yadkin Project. In response to this request, APGI undertook a Recreational Use Assessment, which was carried out in accordance with a study plan developed in close consultation with the RASM IAG. The objectives of the study were to:

- Estimate total annual recreation use at each of the four reservoirs.
- Characterize the type of recreational activities.
- Evaluate recreation issues and facility condition.
- Estimate peak recreational use and recreational carrying capacity.
- Assess the effects of Project operations on tailwater recreational use.

A variety of data collection measures were used to obtain information regarding recreational use of the Project area including spot counts and numerous use surveys. All recreational use was measured in terms of recreation days. A "recreation day" was defined as "each visit by a person to a development for recreation purposes during any portion of a 24-hour period." In other words, any and all recreation during a 24-hour period by one person would equal one recreation day.

E.5.5.1 Total Project Use

Based on the results of the Recreation Use Assessment, annual recreational use for the entire Yadkin Project was estimated at over 2.5 million recreation days for the one year study period (May 2003 through April 2004). High Rock and Narrows received the most use (60 percent and 37 percent, respectively). Tuckertown and Falls reservoirs received about 2 percent and 1 percent of total Project recreational use, respectively (ERM, 2005b Appendix E-19).

Table E.5-15: Total Project Recreational Use (in recreation days)

Reservoir	Visitor Use	Waterfront Resident Use	Non-Waterfront Resident Use	Businesses and Organization Use	Portage Use	Total Use	Percent of Total
High Rock	82,846	1,058,585	269,448	132,982	30	1,543,891	60%
Tuckertown	51,887	0	0	2,465	0	54,352	2%
Narrows	127,561	285,993	450,009	95,570	20	959,153	37%
Falls	4,159	0	0	0	20	4,179	<1%
Total	266,453	1,344,578	719,457	231,017	70	2,561,575	100%
% of Total	10%	52%	28%	9%	<1%	100%	

Waterfront residents at High Rock and Narrows reservoirs were estimated to represent about 52 percent of the total recreation days at the Project. Non-waterfront residents (28 percent), commercial businesses and private organizations (9 percent), and visitors (10 percent) represented nearly all of the remaining use. Use data collected via the canoe registries that were established at the portage trails around the four dams indicate that the portage trails received very light use (estimated at 70 recreation days per year) (ERM, 2005b Appendix E-19).

The four Project reservoirs are used primarily for boating and fishing (from boats and along the shoreline), with swimming, sunbathing, picnicking, waterskiing, and camping also popular. High Rock and Narrows reservoirs are used for a wide variety of recreational activities. The predominant use at Tuckertown Reservoir is fishing, while Falls Reservoir is popular for both camping and fishing. Recreational use at High Rock and Narrows reservoirs primarily occurs during May through September. These five months (May through September) represented 71 percent of the total recreation days at High Rock Reservoir and 67 percent at Narrows Reservoir. Tuckertown and Falls Reservoirs do not have any waterfront residents with pier permits, are smaller, and are primarily used for fishing and camping. Recreational use at these reservoirs increased earlier in the year (early April) than at High Rock and Narrows reservoirs. Recreational use also decreased earlier at Tuckertown and Falls reservoirs (August) than at High Rock or Narrows reservoirs (ERM, 2005b Appendix E-19).

E.5.5.1.1 High Rock Reservoir

Total annual recreation use at High Rock Reservoir was estimated at 1,543,891 recreation days. The highest use levels were May through September and these months accounted for more than 70 percent of the total recreation use. The months of June through August received the highest recreation use (ERM, 2005b Appendix E-19).

Table E.5-16: Estimated Annual High Rock Reservoir Recreation Use (in recreation days)

Month	Public Access Rec Use	Waterfront Resident Rec Use	Private Community Rec Use	Commercial and Club Rec Use	Canoe Portage Use	Total	Percent of Total Use
May	13,899	119,768	15,949	14,673	4	164,293	11
June	14,251	176,930	33,576	18,148	4	242,909	16
July	14,925	181,013	33,576	22,245	2	251,761,	16
August	11,802	185,096	33,576	21,511	2	251,987	16
September	7,557	144,266	25,555	11,060	4	188,442	12
October	5,756	103,436	25,555	10,474	4	145,225	9
November	1,023	7,077	25,555	10,020	2	43,677	3
December	2,304	7,077	14,736	2,739	2	26,858	2
January	961	7,077	14,736	2,733	0	25,507	2
February	971	7,077	14,736	2,639	0	25,423	2
March	2,103	38,108	15,949	7,809	2	63,971	4
April	7,294	81,660	15,949	8,931	4	113,838	7
Total	**82,846**	**1,058,585**	**269,448**	**132,982**	**30**	**1,543,891**	**100**

Fishing (by boat and along the shoreline) was the most popular activity at High Rock Reservoir with approximately 85 percent of all survey respondents participating. Fishing was more popular with visitors than residents; whereas activities such as motor boating and swimming were more popular with residents than visitors (ERM, 2005b Appendix E-19).

Table E.5-17: High Rock Resident and Visitor Recreational Activities (percent of total recreation days)

Recreational Activity	Public Access Areas	Waterfront Residents	Non-Waterfront Residents
Motor boating	15%	26%	22%
Boat fishing	33%	10%	30%
Bank fishing	22%	14%	19%
Canoeing/kayaking	0%	3%	0%
Swimming	9%	13%	11%
Personal Watercraft use	2%	9%	0%
Camping	3%	1%	0%
Windsurfing	0%	0%	0%
Waterskiing	1%	4%	1%
Picnicking	3%	5%	2%
Hiking	1%	1%	11%
Sunbathing	8%	11%	3%
Sailing	0%	1%	0%
Other	3%	2%	1%
Total	**100%**	**100%**	**100%**

Although High Rock Marina and Campground is the only public recreation area with camping facilities, some survey respondents indicated that they were camping on the reservoir. Additionally, there are numerous private organizations with camping facilities along the reservoir. The total number of overnight users at High Rock Reservoir was estimated at 69,235 recreation days (nights) or approximately 4 percent of total recreational use (ERM, 2005b Appendix E-19).

E.5.5.1.2 Tuckertown Reservoir

Ninety-five percent of total recreation use at Tuckertown Reservoir was conducted through public access use and totals over 50,000 recreation days. The highest use levels were April through August and these months accounted for approximately 81 percent of the total recreation use. July received the highest recreation use of any month (ERM, 2005b Appendix E-19).

Table E.5-18: Estimated Annual Tuckertown Reservoir Recreation Use (in recreation days)

Month	Public Access Rec Use	Waterfront Resident Rec Use	Private Community Rec Use	Commercial and Club Rec Use	Canoe Portage Use	Total	Percent of Total Use
May	8,674	0	0	379	0	9,053	17
June	8,476	0	0	465	0	8,941	16
July	10,973	0	0	530	0	11,503	21
August	7,513	0	0	550	0	8,063	15
September	2,749	0	0	97	0	2,846	5
October	2,204	0	0	39	0	2,243	4
November	1,761	0	0	40	0	1,801	3
December	952	0	0	0	0	952	2
January	98	0	0	0	0	98	<1
February	408	0	0	0	0	408	1
March	1,637	0	0	183	0	1,820	3
April	6,442	0	0	182	0	6,624	12
Total	**51,887**	**0**	**0**	**2,465**	**0**	**54,352**	**100**

Fishing (by boat and along the shoreline) is the primary recreational activity at all public access areas along Tuckertown Reservoir. Other popular activities include picnicking, swimming, and motor boating (ERM, 2005b Appendix E-19).

Although there are no public recreation areas with camping facilities, some survey respondents indicated that they were camping on the reservoir. The total number of overnight users at Tuckertown Reservoir was estimated at 3,952 recreation days (nights) or approximately 7 percent of total recreational use (ERM, 2005b Appendix E-19).

E.5.5.1.3 Narrows Reservoir

Recreation use at Narrows Reservoir was conducted by a combination of public access recreation use (13 percent), waterfront residents (30 percent), private communities (47 percent), and commercial and club uses (10 percent) and totaled over 950,000 recreation days. The highest use levels were June through September and these months accounted for approximately 59 percent of the total recreation use. July received the highest recreation use of any month (ERM, 2005b Appendix E-19).

Table E.5-19: Estimated Annual Narrows Reservoir Recreation Use (in recreation days)

Total	Public Access Rec Areas	Waterfront Resident Rec Use	Private Community Rec Use	Commercial and Club Rec Use	Canoe Portage Use	Grand Total	Percent of Total Use
May	20,297	19,133	26,636	5,545	2	71,613	8
June	23,816	44,308	56,076	14,030	2	138,232	14
July	23,974	74,015	56,076	39,000	2	193,067	20
August	18,701	44,308	56,076	15,475	2	134,562	14
September	10,670	42,294	42,680	4,330	2	99,976	11
October	6,626	18,630	42,680	4,260	2	72,198	8
November	3,810	5,539	42,680	2,440	2	54,471	6
December	1,382	5,539	24,611	854	2	32,388	3
January	998	5,539	24,611	881	0	32,029	3
February	1,604	5,539	24,611	855	0	32,609	3
March	7,219	4,029	26,636	3,150	2	41,036	4
April	8,464	17,120	26,636	4,750	2	56,972	6
Total	**127,561**	**285,993**	**450,009**	**95,570**	**20**	**959,153**	**100**

Boat and bank fishing were the primary recreational activities (over 40 percent participation) at public access recreation areas at Narrows Reservoir. Other common recreational activities included swimming, picnicking, camping, and motor boating (ERM, 2005b Appendix E-19).

Table E.5-20: Narrows Resident and Visitor Recreational Activities (percent of total recreation days)

Recreational Activity	Public Access Areas	Waterfront Residents	Non-Waterfront Residents
Motor boating	9%	26%	23%
Boat fishing	19%	9%	19%
Bank fishing	18%	12%	17%
Canoeing/kayaking	3%	1%	2%
Swimming	12%	16%	13%
Personal Watercraft use	2%	12%	6%
Camping	10%	0%	2%
Windsurfing	0%	0%	0%
Waterskiing	1%	6%	4%
Picnicking	9%	2%	3%
Hiking	4%	1%	2%
Sunbathing	8%	12%	8%
Sailing	0%	0%	1%
Other	5%	3%	0%
Total	**100%**	**100%**	**100%**

Several of the public access recreation areas and private campgrounds at Narrows Reservoir provide facilities for camping. Some survey respondents from recreation areas besides those that provide camping facilities also indicated that they were camping on the reservoir. The total number of overnight users at Narrows Reservoir was estimated at 95,072 recreation days (nights) or approximately 10 percent of total recreational use (ERM, 2005b Appendix E-19).

E.5.5.1.4 Falls Reservoir

One-hundred percent of recreation use at Falls Reservoir was conducted through public access use and totals over 4,000 recreation days. The highest use levels were April through August and these months accounted for approximately 68 percent of the total recreation use. June received the highest recreation use of any month (ERM, 2005b Appendix E-19).

Table E.5-21: Estimated Annual Falls Reservoir Recreation Use (in recreation days)

Month	Public Access Recreation Areas	Canoe Portage Use	Grand Total	Percent of Total Use
May	606	2	608	15
June	669	2	671	16
July	612	2	614	15
August	532	2	534	13
September	342	2	344	8
October	214	2	216	5
November	350	2	352	8
December	93	2	95	2
January	17	0	17	<1
February	76	0	76	2
March	240	2	242	6
April	408	2	410	10
Total	**4,159**	**20**	**4,179**	**100**

Fishing (by boat and along the shoreline) and camping were the primary recreational activities at Falls Reservoir with over 40 percent of respondents indicating participation. Other popular activities included hiking, picnicking, and swimming (ERM, 2005b Appendix E-19).

Eighty-four percent of the recreation users at Deep Water Trail Access indicated that they were camping for at least one night. The total number of overnight users at Falls Reservoir was estimated at 1,284 recreation days (nights) or approximately 31 percent of total recreational use (ERM, 2005b Appendix E-19).

E.5.6 Capacity Issues and Future Trends

Recreational facilities at the Yadkin Project public access recreation areas were evaluated in terms of their capacity to meet recreational demand; physical, social, and total carrying capacity; and future use trends.

Overall recreation use has increased 69 percent since 1991 with High Rock and Narrows use increasing by 118 percent and 56 percent respectively. Both Tuckertown and Falls reservoirs have experienced a decrease in recreational use since 1991 (ERM, 2005b Appendix E-19).

Table E.5-22: Summary of Historical Annual Recreational Use at the Yadkin Project (in recreation days)

Reservoir	1991	1997	2003	2004
High Rock	708,500	815,166	410,230	1,543,891
Tuckertown	178,000	110,856	117,476	54,352
Narrows	614,000	365,596	289,521	959,153
Falls	12,000	9,036	10,209	4,179
Total	1,512,500	1,300,654	827,436	2,561,575

The number of boat launch lanes and amount of parking were found to be generally adequate. Several relatively heavily used recreation areas lacked trash receptacles and toilets. Given the number of survey respondents who identified lack of sanitary facilities and improper disposal of litter and trash as big or moderate problems, additional trash receptacles and toilets are warranted (ERM, 2005b Appendix E-19).

The estimated physical carrying capacities (PCC) of High Rock, Tuckertown, Narrows, and Falls reservoirs are 1,355, 283, 507, and 25 respectively (ERM, 2005b Appendix E-19).

Table E.5-23: Project Physical Carrying Capacity by Reservoir

Reservoir	Motor Boats and PWC	Water skiers or Tubers	Sailboats	Canoes/ Kayaks/ Windsurfers	Estimated Physical Carrying Capacity (# of boats)
High Rock	1191	82	27	55	1355
Tuckertown	235	17	0	31	283
Narrows	446	41	0	20	507
Falls	18	2	0	5	25

Table E.5-24 summarizes the results of social carrying capacity surveys for the Project reservoirs. Generally, very few users rated Tuckertown and Falls reservoirs as "very" or "quite" crowded on summer weekends. A higher percentage of users, but less than 40 percent, rated High Rock and Narrows reservoirs as "very" or "quite" crowded on summer weekends (ERM, 2005b Appendix E-19).

Table E.5-24: Project Social Carrying Capacity by Reservoir

Reservoir	Percentage of Users Rating Project Reservoirs as "Quite" or "Very Crowded" on Summer Weekends
High Rock	21-36%
Tuckertown	5%
Narrows	8-38%
Falls	6%

Based on spot counts, aerial photographs on peak holiday weekends, and peak day recreational use from prior studies, the maximum number of boats at one time (BAOT) was estimated for each Project reservoir as follows:

High Rock Reservoir - 641 watercraft
Tuckertown Reservoir - 92 watercraft
Narrows Reservoir - 411 watercraft
Falls Reservoir - 8 watercraft

The estimates of future maximum BAOT approaches but does not exceed the physical carrying capacity at Tuckertown and Falls reservoirs. At High Rock and Narrows current boating use is approaching the reservoirs' carrying capacities, and significant increases in both waterfront and non-waterfront residences, combined with regional trends for increased boating could result in use levels that may exceed carrying capacities. At the current pace, Environmental Resources Maangement (ERM) estimated that High Rock will be at 119 percent of its PCC and Narrows will be at 150 percent of its PCC by the year 2030 (ERM, 2005b Appendix E-19).

Table E.5-25: Comparison of Estimated Future BAOT with Reservoir Carrying Capacity

Reservoir	Current Max BAOT	Population Growth	Participation Rate Trends	Frequency Rate Trends	2030 Max BAOT	Physical Carrying Capacity (PCC)	2030 BAOT as Percent of PCC
High Rock							
Residents	367	1.20	1.33	1.05	615		
Visitors	274	1.44	1.33	1.05	551		
Total	641				1,166	981	119%
Tuckertown							
Total	92	1.44	1.33	1.05	185	264	70%
Narrows							
Residents	212	1.15	1.33	1.05	340		
Visitors	199	1.44	1.33	1.05	400		
Total	411				740	494	150%
Falls							
Total	8	1.44	1.33	1.05	16	18	89%

E.5.7 Recreation Economic Impact Study

During the initial consultation phase of the relicensing process, APGI was requested to evaluate the effects of the Project on the effects of recreational spending on the regional economy. In response to this request, APGI undertook a Recreation Economic Impact Study which was carried out in accordance with a study plan that was developed in close consultation with the RASM IAG. The purpose of the study was to quantify the economic contribution of recreational use at the Yadkin Project to the five counties surrounding the Project, Davidson, Davie, Montgomery, Rowan and Stanly counties (ERM and Global Insight, 2005 Appendix E-20). The study used the U.S. Forest Service's (USFS) IMpact analysis for PLANning (IMPLAN) model to estimate the economic effects of recreational use at the Yadkin Project. IMPLAN uses the latest national input-output tables from the Bureau of Economic Analysis, secondary economic data at the county level from a variety of public sources, and proprietary procedures to develop an economic input-output model for the study area.

The study quantified the regional economic effects of current facility operations and recreational use, as well as evaluated the economic effects of various water level management alternatives at High Rock Reservoir (ERM and Global Insight, 2005 Appendix E-20). To evaluate the effect of alternative Project operations on recreational spending, and ultimately the regional economy, the study examined three different water level alternatives for High Rock Reservoir. Water levels at or near full pool usually encourage recreational use, whereas lower water levels discourage it. Figure E-9 in Exhibit E.3.13 presents the three High Rock water level alternatives compared to "existing conditions" and normal full pool. These alternatives were selected to represent a range of potential operating options considered in the relicensing process. As Figure E-9 shows, High Rock Alternative 1 (HR1) would maintain relatively high water levels year-round at approximately 3 ft below normal full pool. High Rock Alternative 2 (HR2) would result in higher water levels in March, April, October, and November than existing conditions. Conversely, High Rock Alternative 3 (HR3) would result in lower water levels all year in comparison with existing conditions, and the winter drawdown would be approximately 10-ft lower than existing conditions.

The effects of the three water level alternatives were estimated by comparing existing recreational use at High Rock Reservoir by month with recreational use at other reservoirs in the southeast that have similar operations to the three alternatives. Recreational spending per recreation day was estimated based on user responses to the Visitor Use Survey, Resident Use Survey, and Private Community Use Survey. These data were entered into the IMPLAN model, which estimated the overall economic effect of the Project of the three water level alternatives on the five-county regional economy.

A three-step process was used to evaluate the overall economic effects of recreational spending at the Yadkin Project:

1. Evaluate the effect of the three water level alternatives on recreational use, as measured in annual recreation days.
2. Estimate recreational spending per recreation day.
3. Input recreational spending into the IMPLAN model to estimate the effects of Project-related recreational expenditures on the regional economy for each alternative.

The IMPLAN model was used to estimate the amount of economic activity in the five-county study area that is generated by the existing mix of recreational activity at the High Rock, Tuckertown, Narrows, and Falls reservoirs. A total of 2,561,575 activity days of recreational use occurs at the four reservoirs, with High Rock accounting for 1,543,891 (60.3 percent) of these days. A total direct recreation spending of $11,419,147 results in employment of 174.9 jobs in the study area, consisting of 146.6 direct jobs, 12.6 indirect jobs, and 15.7 induced jobs (ERM and Global Insight, 2005 Appendix E-20). The employment impacts account for 0.12 percent of the study area's employment in 2005. Recreational activities at the four reservoirs contribute $3.55 million in earnings to the local economy and $514,262 in state and local taxes. Output attributed to the recreational activity occurring on the four reservoirs under existing conditions totals $9.65 million or 0.04 percent of the five-county region's economic output.

A summary of the IMPLAN model results for the three High Rock water level alternatives, as compared to existing conditions is provided in Table E.5-26. In terms of the economic effects of the three water level alternatives for High Rock Reservoir, the IMPLAN model results showed that Alternative HR1 (maintain near full pool water elevation year-round) would generate the most economic benefits, resulting in increases in spending, employment, taxes, and total economic output. Alternative HR2 would generate more modest economic benefits. Alternative HR3 would result in a reduction in spending, employment, taxes, and total economic output relative to existing conditions (ERM and Global Insight, 2005 Appendix E-20).

Table E.5-26: Comparison of High Rock Water Level Alternatives to Existing Conditions (in terms of percent change from Existing Conditions)

	Existing Conditions	Alternative HR1	Alternative HR2	Alternative HR3
Spending	$5.3 million	+23%	+10%	-39%
Employment	82 jobs	+17%	+5%	-40%
State Taxes	$230,000	+17%	+5%	-40%
Total Economic Output	$4.6 million	+18%	+5%	-40%

E.5.8 Regional Recreation Resources

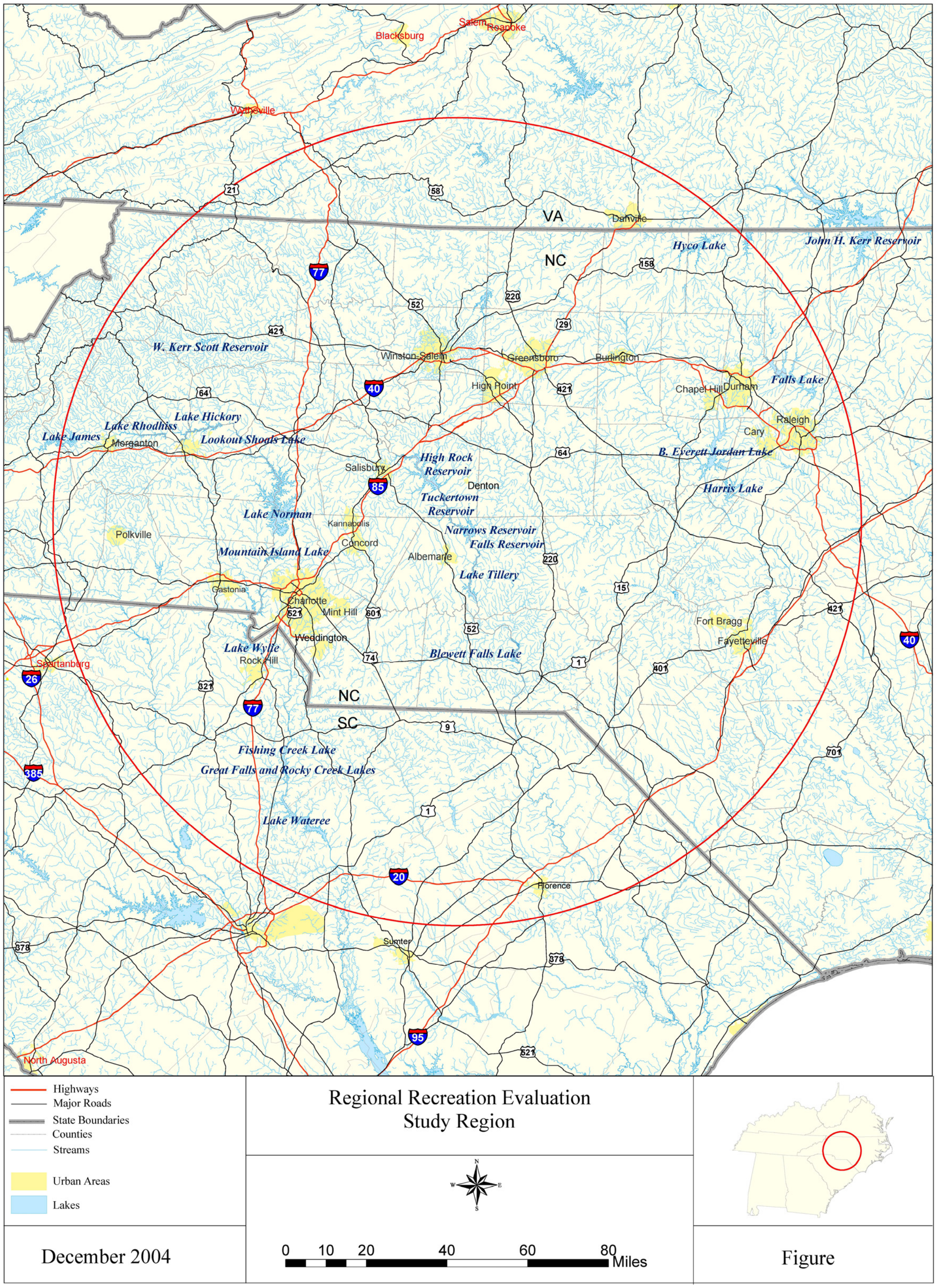
Through the relicensing study process, APGI was asked to examine recreational facilities and opportunities at the Yadkin Project in a regional context. Accordingly, in response to comments on the Yadkin Project Relicensing Initial Consultation Document (ICD) filed with FERC in 2002, APGI developed a study plan for a Regional Recreation Evaluation with input from the RASM IAG. The objectives of the study were to:

- Identify and inventory the publicly available (governmental and private) recreation sites/facilities at other reservoirs in the study region.
- Provide a general characterization of the recreational opportunities and experiences available at these reservoirs and sites.
- Evaluate how recreation opportunities available at the Yadkin Project compare with those available elsewhere within the study region.

For the study, existing recreation information was reviewed and compiled to create a general inventory of major regional recreation sites found at the Yadkin Project and at other locations within the “study region”. The evaluation defined the “study region” as the area within a 100-mile radius of the Yadkin Project (Figure E-18). The inventory focused on the major outdoor water-based recreational opportunities afforded by other reservoirs and lakes within the study region.

Within the study region, there are 182 recreation sites along 23 different reservoirs, which provide ample opportunities for reservoir and water-based recreation. Generally, reservoir recreation sites provide shoreline fishing access and boat launching facilities. A majority of these sites also provide picnicking opportunities. A few offer fishing piers, swimming beaches, and campgrounds. Beyond these five major activities, reservoir access sites not associated with large state or regional parks provide few other recreational opportunities. Generally, activities such as rock climbing, hiking, mountain biking, and whitewater boating are available within the study region, but opportunities for these activities in conjunction specifically with reservoir-based recreation are limited (LVA, 2005b Appendix E-21).

Figure E-18: Regional Recreation Evaluation Study Region



Compared to other hydroelectric or power-related projects, the Yadkin Project provides similar recreational opportunities. Specifically, the predominant type of recreation provided is boating access. The four Yadkin Project reservoirs provide a total of 40 recreation sites and 30 boat ramps. To a lesser extent, fishing piers, campgrounds, and swimming beaches are also available. A similar distribution of recreation facilities can be found among all power-related reservoirs.

Of the 23 reservoirs within the study region, nine reservoirs have been classified as “Natural,” seven as “Limited Development,” and seven as “Developed” (Table E.5-27). Generally, there is an even distribution of all three types of reservoir experiences within the study region (LVA, 2005b Appendix E-21).

Table E.5-27: Summary of Experience Classifications for Reservoirs within the Study Region

Reservoir	Shoreline Miles	Percentage of Undeveloped Shoreline	Experience Classification
High Rock Reservoir	360	57%	Developed
Tuckertown Reservoir	75	81%	Limited Development
Narrows Reservoir	115	48%	Developed
Falls Reservoir	6	94%	Natural
Tillery Reservoir	118	38%	Developed
Blewett Falls Reservoir	46.9	NA	Natural
Harris Lake	40	90-95%	Natural
Hyco Lake	160	NA	Developed
Lake James	151.1	83%	Limited Development
Lake Rhodhiss	103.9	96.5%	Natural
Lake Hickory	110.6	45.1	Developed
Lookout Shoals Lake	36.3	71%	Limited Development
Lake Norman	591.6	62%	Developed
Mountain Island Lake	86.5	74%	Limited Development
Lake Wylie	327.51	48%	Developed
Fishing Creek Lake	67.1	91.4%	Natural
Great Falls and Rocky Creek Lakes	37	77%	Natural
Lake Wateree	213.1	58%	Limited Development
W. Kerr Scott	55	NA	Limited Development
John H. Kerr Reservoir	800	31%	Limited Development
Falls Lake	175	NA	Natural
B. Everett Jordan Lake	200	NA	Natural

Notes: NA – denotes information that was not available.

Two of the Yadkin Project reservoirs, Narrows and Falls, are adjacent to a national forest, a feature that most other reservoirs (with the exception of Tillery Reservoir classified as “Developed” and Lake James, classified as a “Limited Development”) do not have. The location of the Uwharrie National Forest adjacent to Narrows and Falls reservoirs and the natural character of the shoreline in these areas are unique within central North Carolina. Recreation users seeking a "Natural" reservoir experience, especially in central North Carolina, have far fewer opportunities than recreation users who are unconcerned with a reservoir's overall setting.

Large reservoirs within the study region, including the Yadkin Project reservoirs, were also evaluated in terms of tourism through interviews with local tourism departments and boards. Generally, tourism at the reservoirs is promoted by localities (counties, cities, and towns) directly adjacent to the reservoir through websites, advertisements, and visitor brochures. The reservoirs in the study region receive the most use from local areas, with the exception of some of the larger reservoirs. Some of the larger reservoirs within the region attract significant numbers of tourists from outside the local area by hosting large events (fishing tournaments, holiday celebrations, etc.). Conversely, many of the smaller reservoirs within the study region are not promoted as tourist destinations at all, but receive light use predominantly by locals (LVA, 2005b Appendix E-21).

E.5.9 Area Plans and Future Opportunities

Of the five counties surrounding the Project (Davidson, Davie, Montgomery, Rowan, and Stanly), three do not have any future plans for the addition of recreational facilities: Davie, Montgomery, and Stanly. Rowan County, although it currently has no specific plans, has stated its desire to expand the Eagle Point Nature Preserve on High Rock Reservoir and possibly add a new park/recreation area directly adjacent to the reservoir (LVA, 2005b Appendix E-21).

In June 2005, Davidson County completed a recreation and tourism "Master Plan" (Piedmont Triad Council of Governments, 2005), which made recommendations for future recreation opportunities, some of which are applicable to the Yadkin Project. Davidson County passed a resolution supporting the recommendations of the Master Plan. Applicable to the Yadkin Project, the Master Plan identified three top-priority park development projects that would require a partnership with APGI to develop public parks on its current land holdings: 1) Boone's Cave State Park Expansion and Greenway along the Yadkin River, 2) Linwood Community Center Park Expansion and Greenway along High Rock Reservoir, and 3) Proposed Alcoa Park and Greenway along Tuckertown Reservoir (approximately 2,683 acres). The Master Plan also recommended that Davidson County ask APGI to preserve in perpetuity all of its land holdings with Davidson County along the Yadkin River and both reservoirs (13,050 acres). The Master Plan suggested that the following preservation options be explored: permanent conservation easements (sale or donation), long-term/minimum cost lease arrangements, fee-simple donation or sale, and preservation partnerships.

E.5.10 Agency Recommended Measures or Facilities to Create, Preserve, or Enhance Recreational Opportunities at the Project and in its Vicinity

E.5.10.1 Public Recreation Access and Facilities

During initial consultation, agencies made no specific formal recommendations for improving recreational facilities at the Yadkin Project. However, through the initial consultation process and in subsequent RASM IAG meetings to review study findings, agencies and other stakeholders raised several issues regarding recreation resources at the Yadkin Project.

Both the NCWRC and USFS indicated a concern with the lack of adequate fishing access for bank fishing. As noted previously (Exhibit E.5.3), several of the most heavily used, traditional bank fishing areas have been effectively "closed" recently by the posting of "No Parking" signs on the busy roadways along which anglers using these areas have traditionally parked. APGI is discouraging use of these areas because of the potentially unsafe pedestrian and vehicular interactions along roadways. This has reduced the number of bank fishing areas easily available to fishermen. In addition, the NCWRC has noted that there are currently no public fishing piers located on High Rock Reservoir, which further reduces opportunities for non-boating anglers. Finally, the USFS and NCWRC have both noted that informal access created by bank fishing at many locations around the reservoir (often in the vicinity of other public recreation areas such as boat launches) can lead to problems with shoreline erosion and trash.

In a letter dated 7/31/03 (Appendix E-25), Rowan County specifically indicated its concern with the fact that there are no public swim beaches located along the Rowan County side of High Rock Reservoir. According to the County, this creates a situation where Rowan residents have to travel long distances to access designated swim beaches on the Davidson County side of High Rock or in Stanly County on Narrows Reservoir.

The City of Salisbury has asked that the Rowan County Pump Station Access Area (see H3 on Figure E-14), which includes a boat ramp and parking area, be closed and relocated because of its proximity to sensitive infrastructure critical to the municipal water supply. While APGI has posted FERC Part 8 and other signs at the access area, APGI does not own or manage the recreational facilities at the Rowan County Pump Station. The City of Salisbury provides the driveway to the access area and private citizens provide the land for the access area through an informal agreement with Rowan County. It is APGI's understanding that Rowan County supports this closing.

Several agencies and non-governmental organizations (NGOs) voiced concern with the condition and facilities available at some of the existing public recreation sites. In particular, the lack of restroom/toilet facilities at several of the major access areas has been noted as an issue that should be addressed by APGI.

Finally, agencies indicated their interest in assuring that appropriate handicapped access is considered and made available at additional public recreation sites at the Yadkin Project.

APGI received additional comments and recommendations from agencies and other interested parties in response to the Draft License Application (DLA). In a letter dated 1/4/06 (Appendix E-25), the NCWRC made several recommendations regarding recreational resources at the Project. NCWRC recommended that APGI construct two (2) Americans with Disabilities Act (ADA) compliant fishing piers, one to be located on the Rowan County side of High Rock Reservoir and the other on Tuckertown Reservoir. NCWRC also recommended that APGI make modifications to all of the APGI maintained boat access areas to make them ADA compliant. Finally NCWRC recommended that in the likely event that Highway 49 boating access is lost due to road widening, APGI should construct a new boat access area on the southern end of Tuckertown Reservoir.

In its comments on the DLA, the USFS (letter dated 12/20/05, Appendix E-25) made some specific recommendations regarding Uwharrie National Forest public recreation facilities that also provide access to the Yadkin Project. First, the USFS recommended that APGI reevaluate [UNF] facilities to determine their condition and compliance with USFS standards when facilities reach 20 years of age. Upon determining that a facility does not meet USFS standards, the USFS proposed that APGI fund 50 percent of all construction costs including design, environmental reviews, and compliance and construction costs on a cost-share basis with the USFS.

The USFS also recommended that APGI evaluate the Deep Water Camp (a.k.a., Deep Water Trail) Access Area and fund 50 percent of all construction costs on a cost-share basis with the USFS; the total estimated cost would be $171,000.

Regarding future recreation needs, the USFS recommended that APGI continue to use established mechanisms for monitoring growth in recreation facility demand, such as the FERC Form 80, North Carolina Statewide Comprehensive Outdoor Recreation Plan (NCSCORP), and USFS recreation use monitoring data, to monitor recreation facility use and determine future needs. Should future facility needs be identified, the USFS recommended that APGI fund 50 percent of these needs on a cost-share basis with the USFS.

The USFS also recommended that APGI provide 50 percent funding for direct operation and maintenance (O&M) costs of the Uwharrie National Forest recreation areas providing direct access to the Project (Holts Cabin, Badin Lake Group Campground, Kings Mountain Point, Badin Lake Campground, Cove Boat Ramp, Arrowhead Campground, Deep Creek Access, and Badin Lake Trail System. The USFS estimated the cost of O&M for these sites to be $107,936 annually.

Finally, the USFS indicated a concern regarding the potential impact to UNF recreation areas and facilities resulting from shoreline erosion. To mitigate these impacts, the USFS recommended that APGI fund 100 percent of a shoreline stabilization program within the first five years of license issuance.

The U.S. Fish and Wildlife Service (USFWS) also provided comments and recommendations (letter dated 1/27/06, Appendix E-25) regarding recreation facilities at the Yadkin Project. Specifically, the USFWS indicated a concern that bank fishing access to tailwater areas is becoming unnecessarily restricted. They noted that areas have traditionally provided access to prime recreational fishing of the tailwaters, particularly during the spring when striped bass and white bass congregate below the dams. The USFWS went on to say that while it understands the need to provide security at the dams, it believes that both a high level of security and recreational fishing can be achieved in the new license for the Project. Accordingly, the USFWS recommended that APGI maintain fishing access to the tailwater areas, especially, the High Rock Dam and Tuckertown Dam tailwaters. The USFWS also recommended enhancements that would allow more access for tailwater fishing and create facilities that are in compliance with the ADA.

In response to the DLA (letter dated 1/27/06, Appendix E-25), the North Carolina Division of Water Resources (NCDWR) also made comments regarding public recreation at the Yadkin Project. Generally, the NCDWR encouraged APGI to consider additional recreational enhancements in the Final License Application. It noted that providing additional opportunities for non-motorized boating, swimming, picnicking, primitive camping, and reservoir-related trails would strengthen the application. NCDWR also commented that certain APGI non-Project lands located along the west side of Falls Reservoir, in the vicinity of Morrow Mountain State Park, could be used to expand the park and provide many of these types of recreational opportunities for a wide range of users.

E.5.10.2 Recreation Safety

Regarding recreation safety at the Project, in their comments on the DLA, the NCWRC recommended that APGI construct a boathouse/boat ramp for use by emergency and law enforcement personnel on High Rock and Narrows reservoirs. NCWRC noted that such facilities would allow for rapid response on these high-use reservoirs.

No other comments were received from agencies regarding recreational safety. However, one other party, SaveHighRockLake.org (SHRLO) commented that APGI's proposal for the continued operation of High Rock Reservoir demonstrated an apparent disregard for recreational safety concerns associated with excessive water level fluctuations.

E.5.11 Existing Measures or Facilities to be Continued and New Measures or Facilities Proposed by the Applicant

E.5.11.1 Proposed Facilities and Facility Operations

Based on the results of the recreation use assessments, facility inventories and comments received, APGI is proposing a comprehensive package of measures and facilities to enhance recreational use of the Yadkin Project.

Facility Closures

APGI is proposing to continue to maintain and operate the existing public recreation facilities at the Project with a few exceptions. As noted previously, due to safety concerns associated with roadside parking, NCDOT has posted no parking signs along roadways that have traditionally served as parking areas for several informal shoreline fishing areas including the bridge on Highway 8 at Abbotts Creek (High Rock), the Crane Creek Fishing Access Pull-off (High Rock), and Lick Creek Fishing Pull-off (Tuckertown). In conjunction with the "no parking" signs, APGI has been discouraging use of these areas and considers them "closed."

In response to comments received from the City of Salisbury (letter dated 1/4/06, Appendix E-25), APGI is proposing to close the Pump Station Boat Access located in Rowan County on the upper end of High Rock Reservoir. According to Salisbury, recreational use at that site, which is immediately adjacent to the City's water withdrawal plant, puts the plant at risk from trespassing or vandalism. In making this recommendation, Salisbury further noted that the site receives relatively little use, and that given the secluded nature of the site, the site has been a source of continuing problems with drinking and vagrancy. Since the site is located on private property, at the end of a County road, APGI's role in closing the site will be limited to removing its Part 8 and safety signage. The property owners, Rowan County, or the City of Salisbury will be responsible for taking any additional measures deemed necessary to "close" the site (e.g., gate installation, "no trespassing signs," etc.).

The Pump Station Boat Access is a small, relatively unimproved boat launch site. Facilities at the site include a single boat launch lane, a small gravel parking area, trash receptacles and signage. APGI's recreation surveys indicate that the Pump Station Boat Access receives very little use, with an estimated annual recreational use of 874 recreation days (ERM, 2005b Appendix E-19). Therefore, APGI does not believe relocation or replacement of these facilities is required.

Facility Upgrades and Improvements

APGI expects the remaining public recreation sites to be maintained. Many of these sites are maintained and operated by the NCWRC and a few by the USFS. In some cases, APGI has an existing agreement with NCWRC to jointly manage and maintain the sites. APGI plans to continue to work with NCWRC, as it has in the past, to jointly manage several of the major recreation sites.

APGI is proposing to make access improvements to several of the existing public recreation sites. Based on information collected during the Facility Inventory, APGI worked with NCWRC to develop a preliminary list of recreation sites that can most readily be made to comply with ADA standards and that would benefit recreational users the most (Table E.5-28). A final list of sites, and the improvements necessary to make the sites ADA compatible, will be determined in consultation with NCWRC, USFS, the surrounding Counties, and other appropriate agencies and will be included in a Recreation Plan for the Project. Sites will be improved in accordance with ADA specifications and other appropriate "accessibility" standards.

Table E.5-28: Preliminary List of Recreation Sites That Can Most Readily Be Made to Comply with ADA Standards

Site Name (Priority Number)	Reservoir	Improvements Needed to Achieve Barrier-Free Accessibility
Flat Creek Boat Access Area (1)	Tuckertown	Transition plates on dock; accessible bathroom; accessible pathway
Circle Drive Boat Access Area (2)	Narrows	Accessible bathroom; accessible pathway
Buddle Creek Boat Access Area (3)	High Rock	ADA parking signage; accessible bathroom; accessible pathway; accessible picnic table
Dutch Second Creek Boat Access (3)	High Rock	ADA parking spaces; ADA parking signage; accessible bathroom; accessible pathways
Badin Boat Access (3)	Narrows	ADA parking spaces; ADA parking signage; transition plates; accessible bathroom; accessible picnic table; accessible pathways
Old Whitney NCWRC Fishing Pier (4)	Narrows	Removal of barriers to pier
Old Whitney Boat Access Area (4)	Narrows	ADA parking spaces; ADA parking signage; accessible bathroom; accessible picnic table; accessible pathways
Riles Creek Recreation Area (5)	Tuckertown	ADA parking space; ADA parking signage; accessible bathroom; accessible pathways
Falls Boat Access (6)	Falls	ADA parking space; ADA parking signage; dock abutment; courtesy floating dock
Highway 601 Access Area (7)	High Rock	ADA parking space; ADA parking signage; dock abutment; courtesy floating dock; accessible pathways
Bringle Ferry Boat Access (7)	Tuckertown	ADA parking space; ADA parking signage; dock abutment; courtesy floating dock; accessible pathways; accessible bathroom
Badin Lake Swim/Picnic Area (8)	Narrows	ADA parking spaces; ADA parking signage; accessible bathroom; accessible picnic tables; accessible pathways
Flat Swamp Boat Access (9)	High Rock	ADA parking space; ADA parking signage; accessible bathroom; accessible picnic table; accessible pathways
Southmont Boat Access Area (9)	High Rock	ADA parking spaces; ADA parking signage; accessible bathroom; accessible picnic table; accessible pathways

In response to concerns by stakeholders regarding the lack of toilet facilities at some of the sites, APGI is proposing to provide and maintain new portable toilet facilities at several existing recreation sites, where such facilities are not currently available. APGI's Recreational Use Assessment identified the sites that would benefit the most from the addition of portable toilets. Table E.5-29 is a preliminary list of recreation sites where portable toilets will be added, but the final list of sites where toilets are to be added will be determined in consultation with the

NCWRC, USFS, surrounding counties, and other appropriate agencies and included in a Recreation Plan for the Project.

Table E.5-29: Preliminary List of Recreation Sites where New Portable Toilets Will be Added

Site Name	Reservoir	Number of Toilets to be Added
York Hill Boat Access	High Rock	1
Dutch Second Creek Boat Access	High Rock	1 - 2
Bringle Ferry Boat Access	Tuckertown	1
Flat Creek Boat Access	Tuckertown	1
Flat Creek Fishing Access	Tuckertown	1
Riles Creek Recreation Area	Tuckertown	1
Old Whitney Boat Access	Narrows	1
Lakemont Access Area	Narrows	1

In response to comments from the NCWRC and USFWS, APGI is proposing to make site improvements designed to enhance public fishing at the Project. Specifically, APGI is proposing to install two (2) ADA compliant public fishing piers at existing public access areas. In keeping with the recommendations of the NCWRC, APGI proposes that one of the fishing piers be installed on the Rowan County side of High Rock Reservoir and the other on Tuckertown Reservoir. The exact location of the proposed fishing piers will be determined in consultation with the NCWRC and other agencies. APGI is also proposing to make modifications to the existing tailwater fishing areas located at the High Rock and Tuckertown tailwaters. The exact nature of these modifications is yet to be determined, but the concept would be to provide facilities that allow improved access to the tailwater areas for fishing, with special consideration given to public safety and facility Critical Energy Infrastructure Information (CEII) security issues. Conceptual plans for these proposed facility modifications will be developed in consultation with the USFWS and other resource agencies, with guidance from FERC staff.

To address the concern expressed by Rowan County early in the relicensing process regarding the lack of public swimming areas on the Rowan side of High Rock Reservoir, APGI is proposing to donate a parcel of non-Project land located immediately adjacent to the reservoir, that will be suitable for the development of a new public recreation site with a swimming facility. The land donation will be made to the County or other appropriate entity, on condition that the County or other party assumes responsibility for the construction, maintenance and operation of any public recreation facilities developed at the site.

New Facilities

Based on the results of the Recreational Use Assessment, dispersed camping was identified as a need at the Yadkin Project. Currently, unauthorized dispersed camping occurs throughout the Project on islands and other lands (private and Project). APGI acknowledges the need for the development of designated camping sites, and accordingly is proposing installation of up to ten (10) “hardened” campsites. Specific locations for the proposed campsites will be determined by APGI in consultation with resource agencies. Preferred locations would be those that meet the following minimum criteria: 1) located on APGI-owned Project or non-Project land, 2) located in areas not prone to flooding, 3) located away from existing public recreation areas, 4) accessible by water or trail, 5) sites conducive for use primarily by non-motorized watercraft, 6) sites distributed throughout the Project so as to support use of the Project reservoirs as part of the Yadkin-Pee Dee River Trail, and 7) sites conducive with safety and security of the Project.

Replacement Facilities

Boating access to the lower part of Tuckertown Reservoir is currently provided at an access area located immediately off of Highway 49, in the vicinity of the Highway 49 Bridge. While the facility is located primarily on property owned by APGI, parking for the site is located in the NCDOT Highway 49 right-of-way APGI is aware that NCDOT has plans to widen Highway 49 in this area sometime within the next 10-15 years. It is likely that when that widening occurs that the existing site would have to be closed due to lack of parking. APGI proposes that at the time of the Highway 49 widening, it will replace the existing boat launch with a similar facility located elsewhere on the lower portion of Tuckertown Reservoir. A final determination on the site of the new facility will be made by APGI, and the design of the new facility will be carried out in consultation with NCWRC and other resource agencies.

Recreation Plan

Details of all of the facility improvements proposed to be undertaken by APGI at the Yadkin Project will be outlined in a Recreation Plan for the Yadkin Project. The Recreation Plan will outline new facilities or facility improvements to be undertaken by APGI during the term of its new FERC license. The Recreation Plan will include a schedule for the improvements and will also provide information on maintenance activities to be undertaken by APGI at the public recreation sites. The Recreation Plan will be developed in consultation with resource agencies and the surrounding Counties. The final plan will be submitted to FERC for review and approval within two years of the effective date of a new license.

E.5.11.2 Proposed Project Operations

As outlined in Exhibits B and E.2.7, APGI is proposing to operate the Yadkin Project with certain changes in Project operations including changes in reservoir operations. The potential effects of proposed changes in reservoir operations on recreational resources are discussed in the following section.

E.5.11.2.1 Effects of Proposed Reservoir Operations on Recreation Resources

APGI is proposing to operate High Rock Reservoir in accordance with a revised guide curve as outlined in Exhibit B. Under this proposal, the reservoir will not be drawn below the proposed "Hard Guide" except as needed to meet required downstream minimum flows or as outlined in the Low Inflow Protocol (LIP) or Hydro Project Maintenance and Emergency Protocol (HPMEP). Moreover, during most of the year, the reservoir will be operated in accordance with a "Soft Guide". During the period April 15 through September 15, APGI will operate High Rock in accordance with a new "Recreation Season Guide Curve" which would maintain water levels within 3 ft of full during the prime recreation season.

Operation of High Rock Reservoir under the proposed guide curve will provide significant enhancement of recreational use of the reservoir. First and foremost, the revised guide curve will significantly extend the period of near-full reservoir levels over what currently occurs. In total, three additional months (six weeks in spring and six weeks in fall) of near full reservoir conditions will be provided at High Rock. This will significantly enhance the quality of the recreation experience at High Rock during both the spring and fall, and is expected to increase recreational use on the reservoir during those periods, particularly by shoreline residents.

Also, as APGI is proposing both a “soft guide” and a “hard guide” under this proposal, recreational users at High Rock will have a greater assurance of higher reservoir levels during the late summer and fall than they have in the past. No longer will APGI reduce the reservoir below the 617.9’ elevation in the summer in order to meet its generation needs. Instead, APGI will maintain the reservoir within 6 ft of full throughout the period, except as needed to maintain the minimum flow requirement at Falls, or as specified in the LIP or HPMEP.

As discussed earlier in Exhibit E.5.5, because the period of greatest recreational use of all the Yadkin Project reservoirs is April through September, APGI’s proposed guide curve for High Rock will enhance recreational use of the reservoir over existing conditions, particularly during the spring and fall recreation seasons. High Rock will continue to experience a seasonal drawdown on average of about 10 ft, in the winter, but recreational use data collected at the Yadkin Reservoirs and comparisons to other reservoirs in the region clearly demonstrate that recreational use declines significantly during the winter months, even on reservoirs that do not experience a seasonal reduction in water levels. Moreover, while High Rock will still continue to have a seasonal drawdown, the magnitude of the drawdown will be reduced over the existing average of 12 ft. Maintaining the reservoir water level within 12 ft of full in the winter will also allow most of the public recreation facilities (particularly the boat launches) located on High Rock Reservoir to remain useable on a year round basis.

E.5.12 Identification of the Entities Responsible for Managing and Maintaining any Existing or Proposed Recreation Measures or Facilities

Public recreation facilities at the Yadkin Project are owned, operated and maintained by various entities. As outlined in Exhibit E.5.1.3, there are a number of recreation facilities that are operated as private commercial establishments, but which are open to the general public for use. However, most public use at the Project is through one of the public access areas owned, operated, and maintained by APGI, NCWRC, the USFS, or some combination thereof. Table E.5-30 summarizes the entities that are currently responsible for operating and maintaining the non-commercial public recreation facilities at the Yadkin Project.

APGI is proposing to continue to maintain and operate its public recreation facilities. The facilities for which APGI currently undertakes full responsibility for maintenance and operation are listed in Table E.5-30 and shaded in gray. Currently, APGI spends approximately $500,000 annually to maintain these facilities. These costs cover routine maintenance of the facilities including trash removal, mowing, portable toilet services, and minor repairs. A portion of these annual costs also goes toward more significant maintenance activities which APGI undertakes periodically on an as needed basis. Such maintenance may include, but is not limited to, parking lot and road repairs, repairs to boat launches and boat docks, accessibility upgrades, replacement and/or repair of signs, and replacement or repair of other facilities (swimming buoys, safety equipment, trash cans, picnic tables, etc.)

APGI also provides funding to the surrounding counties to help support safety patrols in and around the reservoirs during the recreation season. Currently, APGI provides the counties with approximately $90,000 annually for safety patrols. APGI proposes to continue its safety patrol assistance to the counties.

Table E.5-30: Major Public Recreation Sites at the Yadkin Project and Entity Currently Responsible for Managing and Maintaining the Site

Site No.	Site Name	Site Manager	Notes
High Rock			
H1	Highway 601 Access Area	Davie County Parks and Recreation Department	Site maintained with permission from APGI (site owner); agreement expires in 2008
H3	Rowan County Pump Station	Rowan County Parks and Recreation Department	Access area is privately owned and provided through an informal agreement with Rowan County
H8	York Hill Boat Access	APGI	APGI is the site owner
H16	Crane Creek Fishing Access Pull-off	APGI and NCDOT	NCDOT is the site owner; APGI discourages use of this area because of the potentially unsafe pedestrian/vehicular interactions
H19	Little Crane Creek Fishing Access	APGI	APGI is the site owner
H28	Southmont Boat Access Area	APGI	APGI is the site owner
H36	Highway 47 Fishing Pull-off	APGI	APGI is the site owner
H39	Buddle Creek Boat Access Area	APGI	APGI is the site owner
H44	Abbotts Creek/NC 8 Bridge Pull-off		APGI discourages use of this area because of the potentially unsafe pedestrian/vehicular interactions
H48	Dutch Second Creek Boat Access	NCWRC	APGI is the site owner; NCWRC manages the site under agreement with APGI
H64	Flat Swamp Boat Access	APGI	APGI is the site owner
H67	High Rock Dam Canoe Portage	APGI	APGI is the site owner
Tuckertown			
T1	High Rock Dam Tailrace Access (Rowan)	APGI	APGI is the site owner
T2	High Rock Dam Tailrace Access (Davidson)	APGI	APGI is the site owner
T3	Bringle Ferry Boat Access	NCWRC	APGI is the site owner
T4	Cedar Creek Fishing Pull-off	APGI	APGI is the site owner
T6	Lick Creek Fishing Pull-off		APGI discourages use of this area because of the potentially unsafe pedestrian/vehicular interactions
T8	Flat Creek Boat Access Area	NCWRC and APGI	APGI is the site owner; site is maintained jointly by NCWRC and APGI

Table E.5-30: Major Public Recreation Sites at the Yadkin Project and Entity Currently Responsible for Managing and Maintaining the Site (continued)

Site No.	Site Name	Site Manager	Notes
T9	Flat Creek Fishing Access Area	NCWRC and APGI	APGI is the site owner; site is maintained jointly by NCWRC and APGI
T10	Newsome Road Access	APGI	APGI is the site owner
T12	Riles Creek Recreation Area	APGI	APGI is the site owner
T14	Highway 49 Boat Access Area	APGI	APGI is the site owner
T15	Tuckertown Pull-off Fishing Access		This area consists of four separate areas. APGI discourages use of one of these areas (parking area is on the opposite side of road from access area) because of the potentially unsafe pedestrian/vehicular interactions
T16	Tuckertown Dam Canoe Portage	APGI	APGI is the site owner
Narrows			
N1	Tuckertown Dam Tailrace Access	APGI	APGI is the site owner
N2	Garr Creek Access Area	APGI	APGI is the site owner
N5	Old Whitney NCWRC Fishing Pier	NCWRC	NCWRC is the property owner (under agreement with APGI)
N6	Old Whitney Boat Access Area	APGI	APGI is the site owner
N13	Circle Drive Boat Access Area	NCWRC	APGI owns up to the 545' contour, NCWRC is the property owner above the 545' contour
N16	Lakemont Boat Access Area	NCWRC	NCWRC is the site owner
N24	UNF Holt's Cabin Picnic Area	USFS	USFS is the site owner
N25	UNF Kings Mountain Point Day Use Area	USFS manages the recreation area; NCWRC maintains the piers	APGI and USFS are the site owners
N26	UNF Badin Lake Campground	USFS	USFS is the site owner
N27	UNF Cove Boat Landing	USFS	USFS is the site owner
N28	Palmerville Access Area	APGI	APGI is the site owner
N29	Badin Lake Swim/Picnic Area	APGI	APGI is the site owner
N30	Badin Boat Access	APGI	APGI is the site owner
N31	Narrows Dam Canoe Portage	APGI	APGI is the site owner
N36	Badin Lake Group Camp	USFS	USFS is the site owner
N38	UNF Arrowhead Campground	USFS	USFS is the site owner
Falls			
F1	UNF Deep Water Trail Access	USFS	USFS is the site owner
F2	Falls Boat Access	APGI	APGI is the site owner
F3	Falls Dam Canoe Portage	APGI	APGI is the site owner

All measures being proposed by APGI for improving existing recreation facilities and sites at the Project will be funded by APGI. In some cases, if the improvement involves a site that is managed by the NCWRC or USFS, APGI may provide the funding to those agencies so that they can make the actual improvement to the site in accordance with their own plans and specifications.

E.5.13 Schedule of Implementation of the Measures or Construction of the Facilities

To assist APGI and the other agencies with an interest in recreation use and facilities at the Yadkin Project in planning for future improvements to Project recreational facilities, APGI is proposing to develop a Recreation Plan for the Yadkin Project (see Exhibit E.5.11.1). The Recreation Plan will be developed in consultation with resource agencies and the surrounding counties, and will include a detailed schedule for the implementation of all recreation site measures or facilities being proposed by APGI at the Yadkin Project.

E.5.14 Estimate of Costs of Construction, Operation, and Maintenance of Proposed Facilities

APGI is making several significant proposals for the enhancement of public recreational use at the Yadkin Project. The estimated capital costs associated with proposed recreational facility improvements and additions are outlined in Table E.5-31.

Table E.5-31: Estimated Capital Costs Associated with Proposed Recreational Facility Improvements and Additions

Proposals for Public Recreation Facilities	Estimated Added Annual O&M Cost	Estimated One-Time Capital Cost
Prepare a Recreation Plan for the Project.		$50,000
Undertake certain measures (below) to enhance public recreation at the Project (to be outlined in the Recreation Plan) • Donate land to Rowan County suitable for new public recreation site with a swim beach. ($10,000) • ADA improvements at public recreation sites ($90,000) • Addition of ADA compliant fishing piers to existing sites on High Rock and Tuckertown Reservoirs ($50,000) • Improvements to tailrace fishing access at High Rock and Tuckertown ($235,000) • Addition of 10 hardened, dispersed camp sites ($12,000) • Replace Highway 49 Boat Access Area (when needed) ($125,000) • Addition of portable toilets at several existing recreation areas ($10,000 annually) • Additional O&M associated with proposed new facilities/upgrades ($40,000 annually) • Closure of the Rowan County Pump Station (for safety reasons), at the request of the City of Salisbury (negligible cost)	$50,000	$522,000

Currently, APGI spends approximately $500,000 annually to maintain APGI's owned and operated facilities. These costs cover routine maintenance of the facilities including trash removal, mowing, portable toilet services, and minor repairs. A portion of these annual costs also goes toward more significant maintenance activities that APGI undertakes periodically on an as needed basis. As a result of the proposed improvements and additions to recreation facilities and sites, APGI anticipates annual O&M costs to increase by approximately $50,000, annually, bringing the total estimated annual O&M cost to $550,000 (2005 dollars).

E.5.15 Map of Recreation Measures or Facilities

Maps showing the location of existing public recreation facilities at the Yadkin Project were provided earlier in Figures E-14 through E-17. Conceptual drawings of recreation sites and facilities to be upgraded and improved by APGI during a new license term will be prepared and provided in the proposed Recreation Plan for the Yadkin Project.

E.5.16 Explanation of why the Applicant has Rejected any Measures or Facilities Recommended by an Agency

In response to recommendations by agencies, APGI is proposing significant improvement to recreation facilities at the Yadkin Project (see Exhibit E.5.11). However, APGI does not agree that all of the recreation facilities or facility improvements recommended by agencies are needed.

In its comments on the DLA, NCWRC (letter dated 1/4/06, Appendix E-25) recommended that APGI make improvements at all the existing boating access areas at the Project to make them ADA compliant. Subsequent to consultation with NCWRC, APGI is proposing to upgrade several public recreation access areas located throughout the Yadkin Project to make them ADA compliant. However, due to specific site conditions, APGI believes that not all facilities can reasonably be made ADA compliant. In consultation with NCWRC, APGI has prepared a preliminary list of recreation areas that could be made ADA compliant. As part of its proposed Recreation Plan, APGI will work with NCWRC and other resource agencies to prepare a final list of sites that will be made ADA compliant.

In its comments on the DLA, the USFS (letter dated 12/20/05, Appendix E-25) made several recommendations for APGI to undertake improvements or be responsible for O&M costs at USFS recreation sites located adjacent to the Project reservoirs. APGI does not agree that it has responsibility for improving or maintaining USFS sites. APGI acknowledges that some of the USFS recreation areas provide access to the Project reservoirs (Narrows and Falls), but of the recreation facilities located in the Uwharrie National Forest that provide direct access to the Yadkin Project (Badin Lake Campground, Cove Boat Ramp, Kings Mountain Point and Deep Water Trail), nearly all have been significantly upgraded and improved by the USFS within the last few years. APGI will monitor these facilities and their use throughout the term of the new license through the FERC Form 80 process. At such time that periodic use monitoring indicates that recreational use needs at facilities in Uwharrie National Forest are not being met, APGI will work with the USFS to determine what facility improvements or upgrades are necessary.

Regarding the Deep Water Camp Access Area (aka, Deep Water Trail), APGI does not agree that all of the improvements recommended by USFS are needed, nor does APGI feel that it is responsible for these improvements. APGI already provides boat access to Falls Reservoir and is committed to maintaining access in the future. Throughout the relicensing consultation process, numerous stakeholders have suggested that the remote and natural recreation experience currently being provided at Falls Reservoir be further enhanced by banning motorized watercraft from the reservoir. Although APGI has no authority to regulate the type of watercraft that can be used on the reservoir, APGI recognizes that power boat use of the reservoir can be limited by limiting access to the impoundment. Boating access to Falls Reservoir is provided at APGI's boat access site on the Stanly County side of the reservoir, and it is not clear to APGI that additional boat access is needed on the UNF side of Falls Reservoir.

The USFS also made several recommendations for APGI to contribute to the operation and maintenance of some of the UNF recreation facilities. APGI does not agree that it has any responsibility for the operation and maintenance of USFS sites.

Finally, the USFS recommended that APGI fund 100 percent of a shoreline stabilization program to protect UNF recreation sites from the ongoing effects of shoreline erosion. APGI does not agree that it is responsible for stabilization of eroding reservoir shoreline. Shoreline erosion is a naturally occurring phenomenon that varies significantly depending on shoreline features such as orientation, fetch, slope and substrate/soil type. Prevention of severe erosion is the responsibility of the owner of the property adjoining the reservoir. The Yadkin SMP contains provisions that allow adjoining property owners, at their own expense, to undertake appropriate shoreline stabilization measures, if needed.

E.5.17 Specially Designated Areas

E.5.17.1 National Wild and Scenic Rivers System

No Project waters are included in the National Wild and Scenic Rivers System. No portion of the Yadkin-Pee Dee River upstream or downstream of the Project has been designated as Wild and Scenic River.

E.5.17.2 Wilderness Areas

There are no areas within the Project or in close proximity to the Yadkin Project that have been designated as Wilderness Area.

E.5.18 Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. The following table summarizes the consultation record related to recreation resources at the Yadkin Project. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.5-32: Summary of Consultation Record Related to Recreation Resources

Agency/Party	Date	To	Description
North Carolina Division of Water Resources, John Morris	January 9, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
High Rock Lake Association, Larry Jones	January 9, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
North Carolina Watershed Coalition, Scott Jackson	January 9, 2003	APGI	Initial relicensing comments
Yadkin-Pee-Dee Lakes Project, Ann Liebenstein Bass	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
U.S. Forest Service, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
North Carolina Wildlife Resources Commission, Chris Goudreau	January 12, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments and "Hydropower Relicensing Issues, Standards, and Mitigation"
South Carolina Coastal Conservation League and American Rivers, Gerrit Jobsis	January 12, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
APGI, Jody Cason	March 25, 2003	All IAGS	Agenda for April 10, 2003 RASM IAG meeting (email)
APGI, Jody Cason	April 4, 2003	RASM IAG	Distribution of Recreation Use Assessment Draft Study Plan (email)
APGI	April 10, 2003	RASM IAG	Recreation Economic Impact Draft Study Plan distributed at April 10, 2003 RASM IAG meeting
APGI, Jody Cason	May 2, 2003	RASM IAG	Distribution of Recreation Use Assessment Revised Study Plan (email)
NC Wildlife Resources Commission, Chris Goudreau	May 5, 2003	RASM IAG	Comments on revised Recreation Use Assessment Draft Study Plan and survey instruments (email)
APGI, Jody Cason	May 26, 2003	RASM IAG	Distribution of revised study plan for the Recreation Economic Impact Study (email)
Yadkin-Pee Dee Lakes Project, Bill Medlin	May 27, 2003	APGI, Jody Cason; RASM IAG	Comments on revised study plan for the Recreation Economic Impact Study (email)
APGI, Jody Cason	June 5, 2003	RASM IAG	Final summary of March 13, 2003 RASM IAG meeting (email)

Table E.5-32: Summary of Consultation Record Related to Recreation Resources (continued)

Agency/Party	Date	To	Description
Environmental Resources Management, David Blaha	June 6, 2003	CPOHRL, Lee Hinson and Terry Bargy; HRLA, Larry Jones; SHRLO, Robert Petree; Uwharrie Point Assn., Chip Conner; Badin Lake Assn., Harry Saunders	Email requesting comments on the Recreation Resident Use Survey and requesting assistance
APGI, Jody Cason	June 9, 2003	CPOHRL, Lee Hinson and Terry Bargy; SHRLO, Robert Petree; HRLA, Larry Jones, Uwharrie Point Assn. , Chip Conner; Badin Lake Assn., Harry Saunders	Email to schedule a conference call about the Recreation Resident Use Survey
APGI, Jody Cason	June 17, 2003	CPOHRL, Lee Hinson and Terry Bargy; SHRLO, Robert Petree; HRLA, Larry Jones, Uwharrie Point Assn. , Chip Conner; Badin Lake Assn., Harry Saunders	Email follow-up to June 13, 2003 call regarding the Recreation Resident Use Survey
APGI, Jody Cason	June 24, 2003	RASM IAG	Agenda for July 9, 2003 RASM IAG meeting (email)
APGI, Jody Cason	July 2, 2003	RASM IAG	Final summary of April 10, 2003 RASM IAG meeting (email)
APGI, Jody Cason	July 23, 2003	RASM IAG	Final study plans for Recreation Use Assessment and Recreation Economic Impact Study (email)
Rowan County, Tim Russell	July 31, 2003	APGI, Gene Ellis	Letter requesting consideration of the number and quality of public access areas on Rowan County side of High Rock Reservoir
APGI, Jody Cason	August 15, 2003	RASM IAG	Final summary of July 9, 2003 RASM IAG meeting (email)
APGI, Jody Cason	August 28, 2003	RASM IAG	Recreation Facilities Inventory and Condition Assessment Draft Study Plan (email)
U.S. Forest Service, David Wright	September 2, 2003	APGI, Jody Cason	Comments on Recreation Facilities Inventory and Condition Assessment Draft Study Plan (email)
APGI, Jody Cason	September 23, 2003	RASM IAG	Agenda for October 8, 2003 RASM IAG meeting (email)
APGI, Jody Cason	October 2003	RASM IAG	Final study plan for Recreation Facility Inventory and Condition Assessment (email)

Table E.5-32: Summary of Consultation Record Related to Recreation Resources (continued)

Agency/Party	Date	To	Description
APGI, Jody Cason	December 2, 2003	RASM IAG	Final summary of October 8, 2003 RASM IAG meeting (email)
APGI, Jody Cason	April 19, 2004	RASM IAG	Final summary of February 4, 2004 RASM IAG meeting (email)
APGI, Jody Cason	April 22, 2004	RASM IAG	Agenda for the May 5, 2004 RASM IAG meeting and distribution of Draft Regional Recreation Evaluation Study Plan (email)
APGI, Jody Cason	May 7, 2004	RASM IAG	Request for additional comments on Regional Recreation Evaluation Draft Study Plan (email)
Environmental Resources Management, David Blaha	May 17, 2004	USFS, David Wright; NCWRC, Chris Goudreau; Dean Barbee	Email requesting recreation use data at state-managed recreation facilities at the Yadkin Project
APGI, Jody Cason	July 14, 2004	RASM IAG	Final Regional Recreation Evaluation Study Plan (email)
APGI, Jody Cason	September 2, 2004	RASM IAG	Final summary for RASM IAG meeting on May 5, 2004 (email)
APGI, Gene Ellis	October 15, 2004	RASM IAG	Distribution of Recreation Facilities Inventory and Condition Assessment Draft Study Report (letter)
APGI, Jody Cason	October 18, 2004	RASM IAG	Email informing IAG of the distribution of the Recreation Facilities Inventory and Condition Assessment Draft Study Report
APGI, Jody Cason	October 20, 2004	RASM IAG	Draft agenda for the November 3, 2004 RASM IAG meeting (email)
U.S. Forest Service	November 23, 2004	APGI	Comments on Recreation Facility Inventory Draft Report (letter)
High Rock Lake Association, Larry Jones	December 5, 2004	APGI, Jody Cason	Comments on the Recreation Facilities Inventory Draft Report (email)
Concerned Property Owners High Rock Lake, Don Seitz	December 6, 2004	APGI, Jody Cason	Comments on Recreation Facility Inventory Draft Report (email)
APGI, Gene Ellis	December 22, 2004	RASM IAG	Distribution of the Recreation Use Assessment Draft Study Report (letter)
APGI, Jody Cason	December 23, 2004	RASM IAG	Email informing IAG of the distribution of the Recreation Use Assessment Draft Study Report
APGI, Jody Cason	January 11, 2005	RASM IAG	Final summary for the November 3, 2004 RASM IAG meeting (email)
APGI, Jody Cason	January 13, 2005	RASM IAG	Email informing IAG of the distribution of the Regional Recreation Evaluation Draft Report

Table E.5-32: Summary of Consultation Record Related to Recreation Resources (continued)

Agency/Party	Date	To	Description
APGI, Gene Ellis	January 13, 2005	RASM IAG	Distribution of the Regional Recreation Evaluation Draft Report (letter)
APGI, Jody Cason	January 14, 2005	RASM IAG	Draft agenda for the February 2, 2005 RASM IAG meeting (email)
APGI, Gene Ellis	February 28, 2005	RASM IAG	Distribution of Recreation Facilities Inventory and Condition Assessment Final Study Report (letter)
NC Wildlife Resources Commission, Todd Ewing	March 1, 2005	APGI, Jody Cason	Comments on Recreation Use Assessment Draft Report (email)
U.S. Forest Service, Ray Jones	March 4, 2005	APGI, Gene Ellis and Jody Cason	Comments on Recreation Use Assessment Draft Report (emailed letter)
APGI, Jody Cason	April 20, 2005	RASM IAG	Draft agenda for May 3, 2005 RASM IAG Meeting (email)
APGI, Gene Ellis	April 20, 2005	RASM IAG	Distribution of Regional Recreation Evaluation Final Study Report (letter)
APGI, Jody Cason	June 16, 2005	RASM IAG and CE IAG	Draft agenda for June 30, 2005 RASM IAG and County Economic Impacts IAG joint meeting and distribution of Recreation Economic Impacts Draft Study Report (email)
APGI, Jody Cason	June 28, 2005	RASM IAG and CE IAG	Distribution of County Economic Impacts of APGI's Yadkin Project Draft Report (email)
Salisbury-Rowan Utilities, City of Salisbury, Matt Bernhardt	August 4, 2005	APGI, Gene Ellis	Comments on County Economic Impacts Draft Report (memo)
City of Salisbury, Randy Tinsley	August 24, 2005	APGI, Jody Cason	Comments on County Economic Impacts Draft Report (email)
APGI, Jody Cason	August 24, 2005	RASM IAG	Final summary of February 2, 2005 RASM IAG Meeting
APGI, Jody Cason	August 24, 2005	RASM IAG	Final meeting summary for May 3, 2005 RASM IAG meeting (email)
APGI, Jody Cason	August 24, 2005	RASM IAG and CE IAG	Final meeting summary for June 30, 2005 joint IAG meeting (email)
APGI, Jody Cason	October 18, 2005	RASM IAG	Distribution of Recreation Economic Impacts and Recreation Use Assessment Final Study Reports (letter)
APGI, Jody Cason	October 18, 2005	RASM IAG	Email informing IAG of distribution of Recreation Economic Impacts and Recreation Use Assessment Final Study Reports

Table E.5-32: Summary of Consultation Record Related to Recreation Resources (continued)

Agency/Party	Date	To	Description
U.S. Forest Service, Dave Wright	December 16, 2005	APGI, Gene Ellis and Jody Cason	Email correction to the Recreation Use Assessment Final Study Report
APGI, Gene Ellis	January 3, 2006	USFS, Dave Wright and Ray Johns	Email response to December 16, 2005 email re: corrections to the Recreation Use Assessment Final Study Report

Notes: APGI – Alcoa Power Generating Inc.
CE IAG – County Economics Issue Advisory Group
CPOHRL – Concerned Property Owners of High Rock Lake
IAG – Issue Advisory Group
HRLA – High Rock Lake Association
NCWRC – North Carolina Wildlife Resources Commission
RASM IAG – Recreation, Aesthetics, and Shoreline Management Issue Advisory Group
SHRLO – SaveHighRockLake.org
USFS – U.S. Forest Service

Exhibit E.6

Land Management and Aesthetics

E.6 Land Management and Aesthetics

E.6.1 Existing Development and Land Use

The Yadkin Project (Project) reservoirs vary greatly in terms of the level of surrounding development, general land use, and aesthetic character. The following section provides a description of land use around each Project reservoir. Table E.6-1 provides a breakdown of the four Project reservoir shorelines by major land use type and maps showing cover types around each of the Project reservoirs are provided in Figures E-19 through E-23. These maps provide an overview of the portions of the reservoir shorelines that are developed and those which are not. Other prominent land uses/cover types shown on the maps include agricultural land and various forest cover types.

Table E.6-1: Reservoir Shoreline Miles in Each Land Use Category

	High Rock		Tuckertown		Narrows		Falls		Project Total	
Land Use	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**
Forest	219.2	60.9	68.3	91.1	69.8	60.7	5.7	95	363	65.3
Developed	114.8	31.9	1.3	1.7	42.2	36.7	0.1	1.7	158.4	28.5
Agricultural	26.0	7.2	5.4	7.2	3.0	2.6	0.2	3.3	34.6	6.2
Total Shoreline Miles	**360**	**100**	**75**	**100**	**115**	**100**	**6**	**100**	**556**	**100**

E.6.1.1 High Rock Development

High Rock Reservoir is the largest of the four Yadkin Project reservoirs with 360 miles of shoreline. It is generally shallow and subject to sedimentation from upstream sources. The upper end of the reservoir (above I-85) is very narrow and shallow and retains much of the character of a slow flowing river. Below I-85, the reservoir widens to an area of broad shallow waters, with sediment deposits and sand bars that have created a large wetland complex that provides premier habitat for waterfowl, wading birds, fish, and other wildlife. This area is used extensively for hunting and fishing, but boat access to the area is limited by water depth. Although there are some large towns and cities nearby, the upper reaches of High Rock Reservoir are generally undeveloped.

The middle and lower portions of High Rock Reservoir are more developed. Beginning at Swearing Creek, the reservoir shoreline is heavily developed with seasonal and permanent residences. In most instances these shore-front homes have private piers, and some of the older homes have on-pier structures, boat houses, and other recreation facilities associated with them. Many homes have lawns extending to the shoreline, where they end at a retaining wall or shoreline riprap. Boating use and other recreational uses of the middle and lower parts of High Rock Reservoir are very high. These parts of the reservoir are wider and can accommodate sizable watercraft; it is not uncommon to see motorboats and sailboats of up to 20 ft in length. There are few remaining natural areas on the middle and lower portions of High Rock Reservoir.

The larger tributary embayments on High Rock Reservoir, including Abbotts Creek, Crane Creek, Swearing Creek, Flat Swamp Creek, and Dutch Second Creek, are also heavily developed. In some areas of older development, houses and private piers are set very close together along the shoreline, while in other areas, houses and private piers are more widely spaced, and in some instances, areas of natural shoreline have been preserved. Many of the newer homes are very large and designed to maximize the water view. Boating use on these large tributary embayments is also very high.

As shown in Figures E-19 through E-21, the predominant land use/cover type along the High Rock shoreline is forest (Forested Upland), which accounts for approximately 61 percent of the shoreline. Approximately 32 percent of the High Rock shoreline is developed land, primarily in the form of residential development. Agricultural land uses (crop land, grassland, pasture, and mineral) are also common along the reservoir shoreline (7.2 percent). Residential development is greatest in the lower portion of the reservoir and is the predominant cover type along many of the lower reservoir tributary arms such as the Abbotts Creek, Flat Swamp Creek, Panther Creek, Dutch Second Creek, Crane Creek and Swearing Creek arms. As a result of this development, the lower portion of High Rock Reservoir (Swearing Creek southward) is a moderately developed reservoir. The upper end of High Rock Reservoir, however, is largely undeveloped. From Swearing Creek upstream, undeveloped cover types including forest, and floodplain and forest wetlands predominate the shoreline.

There are several public access recreation sites located on High Rock Reservoir. The reservoir also supports approximately 2,700 private individual piers as well as numerous multi-use recreation facilities associated with private development and commercial establishments.

Figure E-19: Cover Types within 200-foot Project Area on Upper High Rock Reservoir

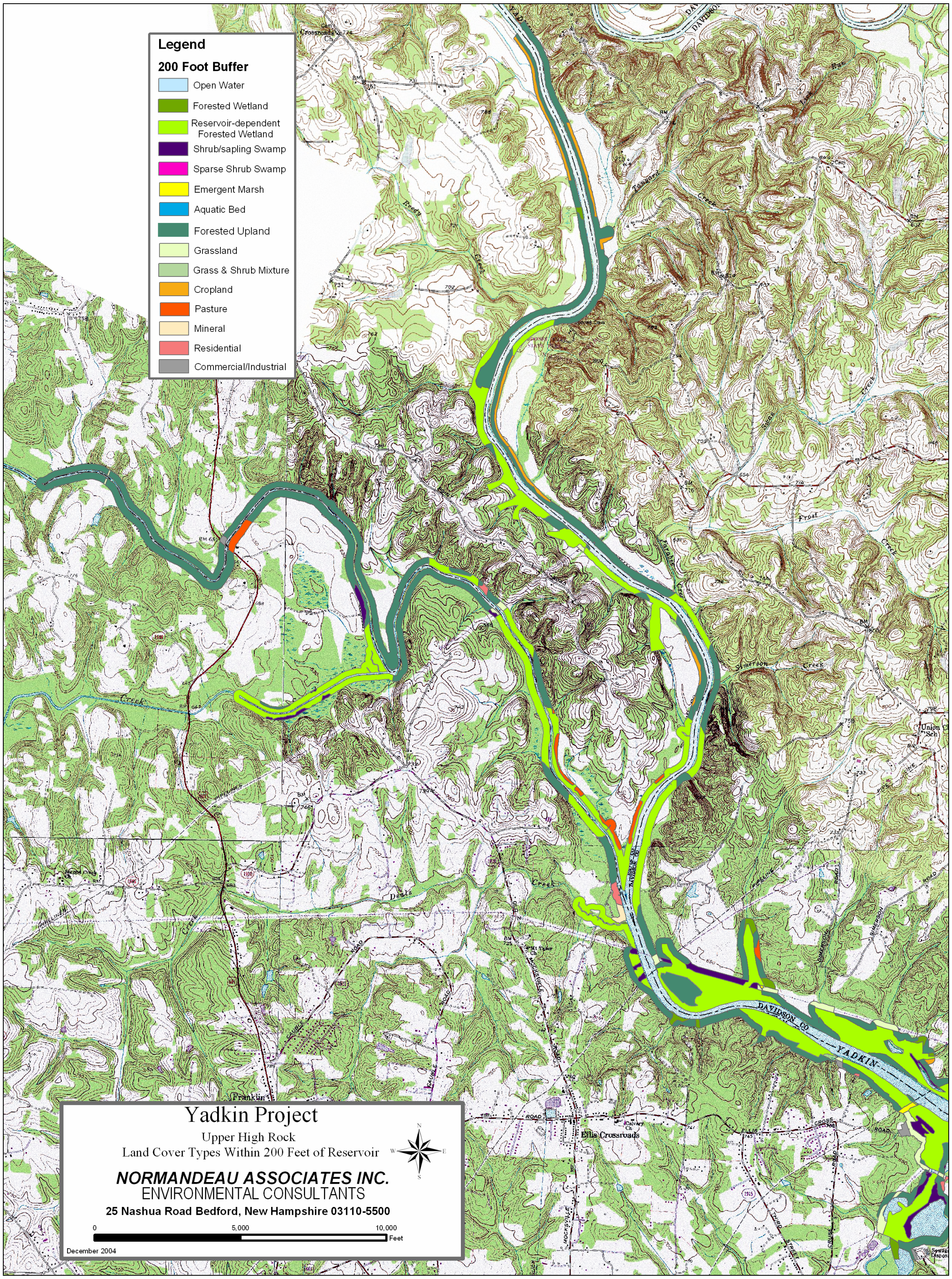


Figure E-20: Cover Types within 200-foot Project Area on the Central Section of High Rock Reservoir

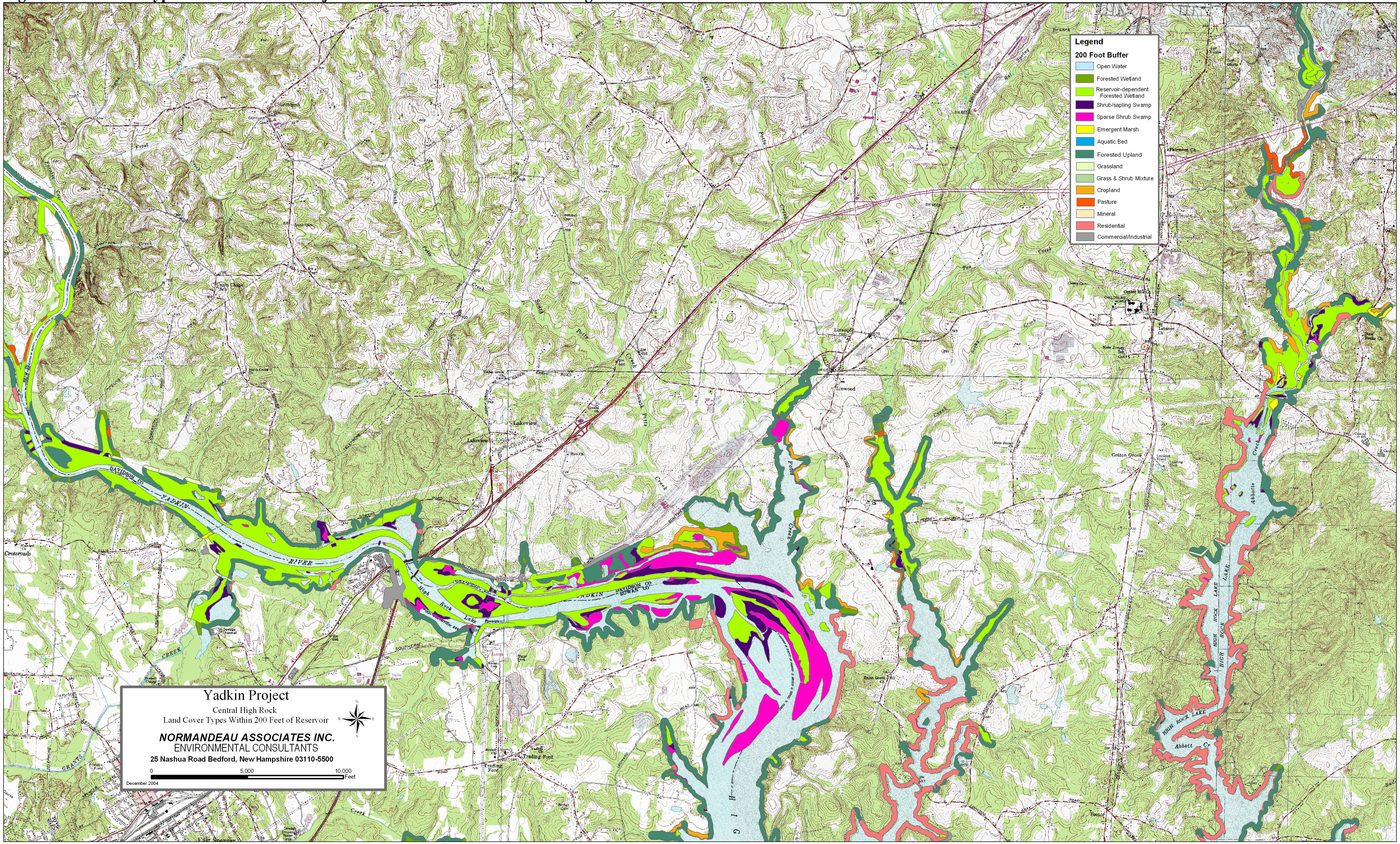
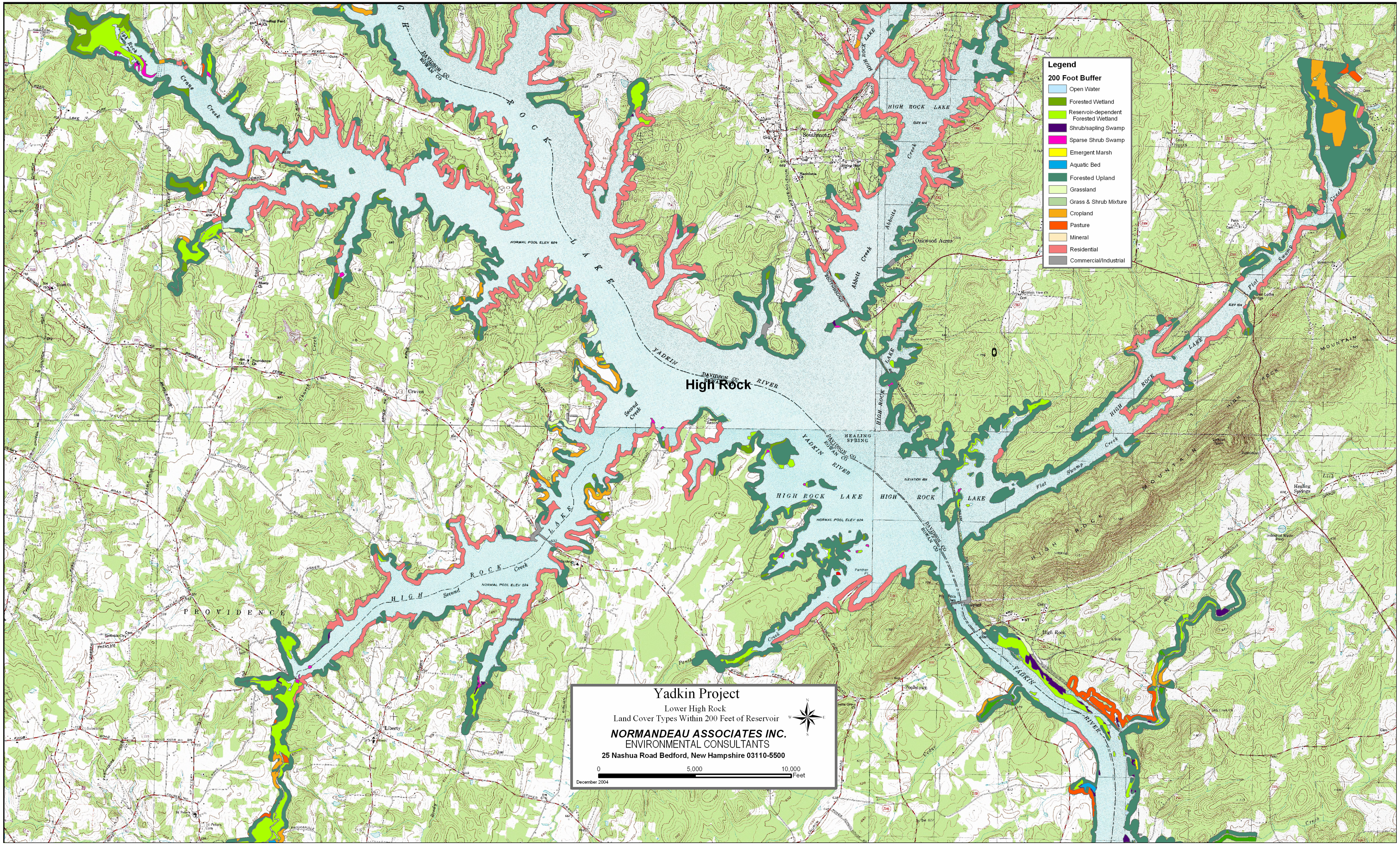


Figure E-21: Cover Types within 200-foot Project Area on Lower High Rock Reservoir



E.6.1.2 Tuckertown Development

Tuckertown Reservoir (Figure E-22) has 75 miles of shoreline and is largely undeveloped. The shoreline around Tuckertown Reservoir is predominately forest (approximately 91 percent), and development accounts for only about 1.7 percent of the shoreline. Because of the limited development, the reservoir provides a relatively natural experience for those using the reservoir for recreation. There are several public access recreation sites located on Tuckertown Reservoir and a couple of multi-use facilities (piers) associated with commercial businesses.

Alcoa Power Generating Inc. (APGI) does not allow private piers or other private access facilities along Tuckertown Reservoir and, therefore, the few existing shoreline residences do not infringe upon the natural character of the reservoir. Tuckertown Reservoir is long and narrow and is generally considered a fishing reservoir. While boating use of the reservoir by non-residents can be relatively high during peak-use weekends, most of the boating use is for angling rather than water skiing or cruising.

Tuckertown Reservoir has several unique habitat areas. There are extensive areas of complex wetlands located throughout the reservoir, particularly in the shallow coves and embayments (see Exhibit E.3.3.1). The majority of the shoreline around Tuckertown Reservoir is non-Project land owned by APGI. Generally, the first 100 ft of these non-Project lands is managed by APGI as buffer[1]. Much of the APGI owned, non-Project lands surrounding Tuckertown Reservoir have been designated as North Carolina Game Lands and are open for public recreation use, as allowed under State Game Land regulations. The railroad parallels nearly the entire eastern shore of the reservoir, which further serves to limit the opportunity for future development.

E.6.1.3 Narrows Development

Narrows Reservoir is comprised of two major basins, the east arm and west arm, which are divided down the middle by the Uwharrie Point peninsula. Narrows Reservoir is moderately developed, and much of the existing development at the reservoir is older, high-density development. Thus, while there are still many areas of Narrows Reservoir that are undeveloped, recreational use by both residents and non-residents is very high, and boating and boat fishing are the principal recreation interests.

Narrows Reservoir supports large quantities of submergent and emergent aquatic vegetation. These aquatic vegetation beds provide excellent habitat for fish and wildlife and contribute to maintaining good water quality in the reservoir by filtering sediment and removing nutrients (see Exhibit E.3.3.1).

Although there is a moderate level of development, Narrows Reservoir still supports some large areas of natural shoreline. Narrows Reservoir has 115 miles of shoreline with about 61 percent of the shoreline forested (see Figure E-23). A unique feature of the Narrows shoreline is the Uwharrie National Forest (UNF), which accounts for approximately 10 miles of undeveloped forested shoreline on the eastern side of the reservoir. In this area, the shoreline is generally

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[1] The first 100 ft of APGI or Alcoa-owned land from the normal full pool elevation of the reservoir is managed by APGI as buffer and is referred to in the Yadkin Shoreline Management Plan as the Yadkin-Managed Buffer.

characterized by large stands of mature second-growth forest, interspersed with some small, vegetated wetlands in coves. There are also several undeveloped islands located in the eastern arm of the reservoir adjacent to the National Forest. Another area, Palmer Island on the western shore, north of Badin, also provides a large area of undeveloped natural shoreline. In addition, the railroad paralleling the western shoreline above and below Palmer Island has created a moderate vegetated wetland complex that is generally inaccessible, and therefore cannot be developed.

Development accounts for approximately 36.7 percent of the reservoir shoreline. Like High Rock, most of the development at Narrows is residential development. There are several public recreation facilities scattered around the reservoir along with numerous multi-use recreation facilities and about 1,084[2] private individual piers.

E.6.1.4 Falls Development

Falls Reservoir occupies a forested, gorge-like setting. The reservoir is narrow and deep with a steep shoreline. Other than the land immediately around the dam and powerhouse and two small public access areas, there is no development along the shoreline of Falls Reservoir. It is bordered on the east by the Uwharrie National Forest and on the west by non-Project lands owned by APGI. Recreational use of the reservoir is low, most of which is by anglers in the spring and early summer.

The natural and remote character of Falls Reservoir supports areas of very distinctive habitat. Both the Falls Dam Slope and Yadkin River Scour Banks support populations of federal and state listed Rare and Endangered plant species (see Exhibit E.3.4). Forest land accounts for approximately 95 percent of the shoreline (Figure E-23). The shoreline is generally rugged and steep and does not lend itself to either development or agricultural uses.

[2] This number is as of September 6, 2005.

Figure E-22: Cover Types within 200-foot Project Area on Tuckertown Reservoir

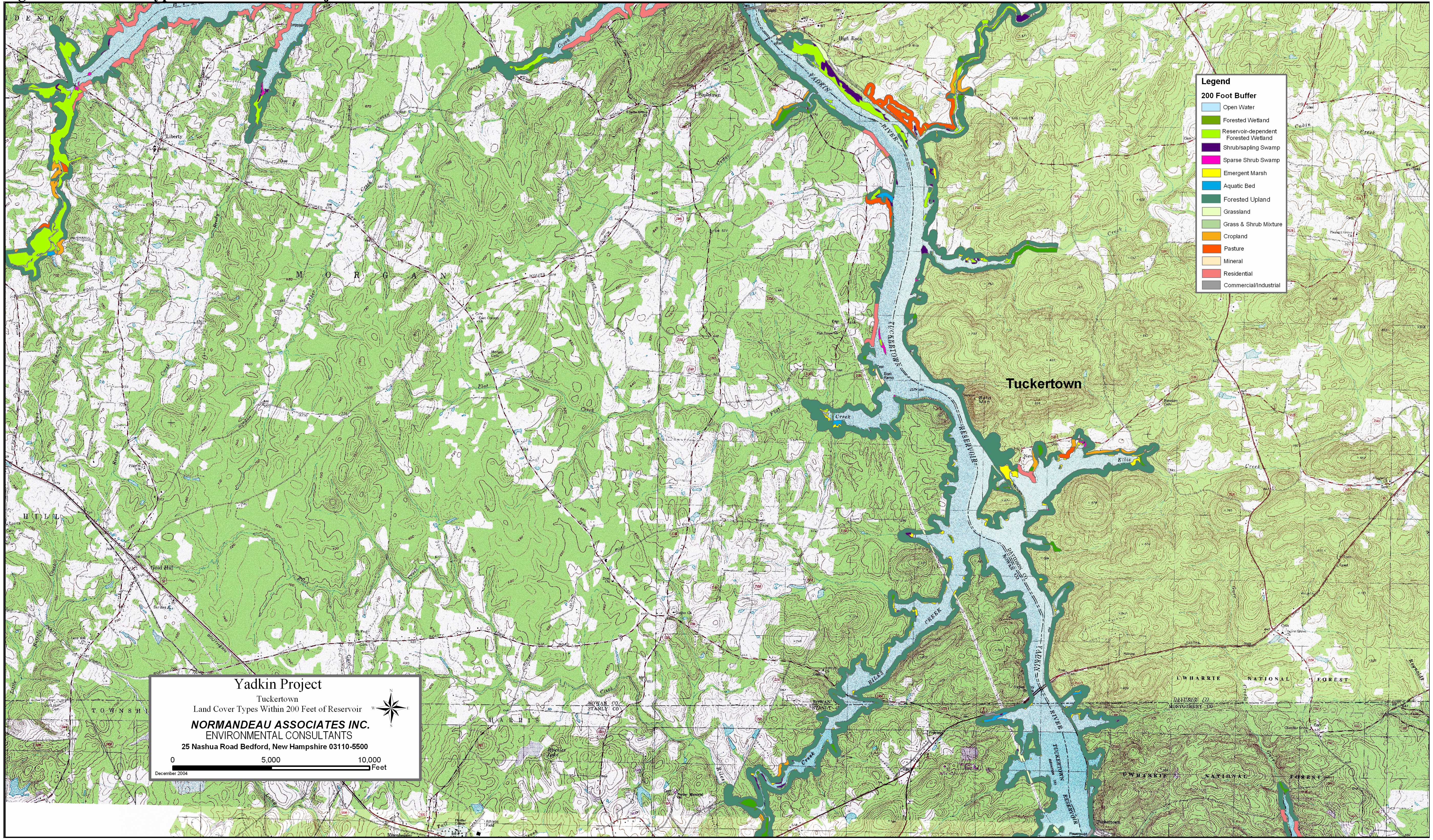
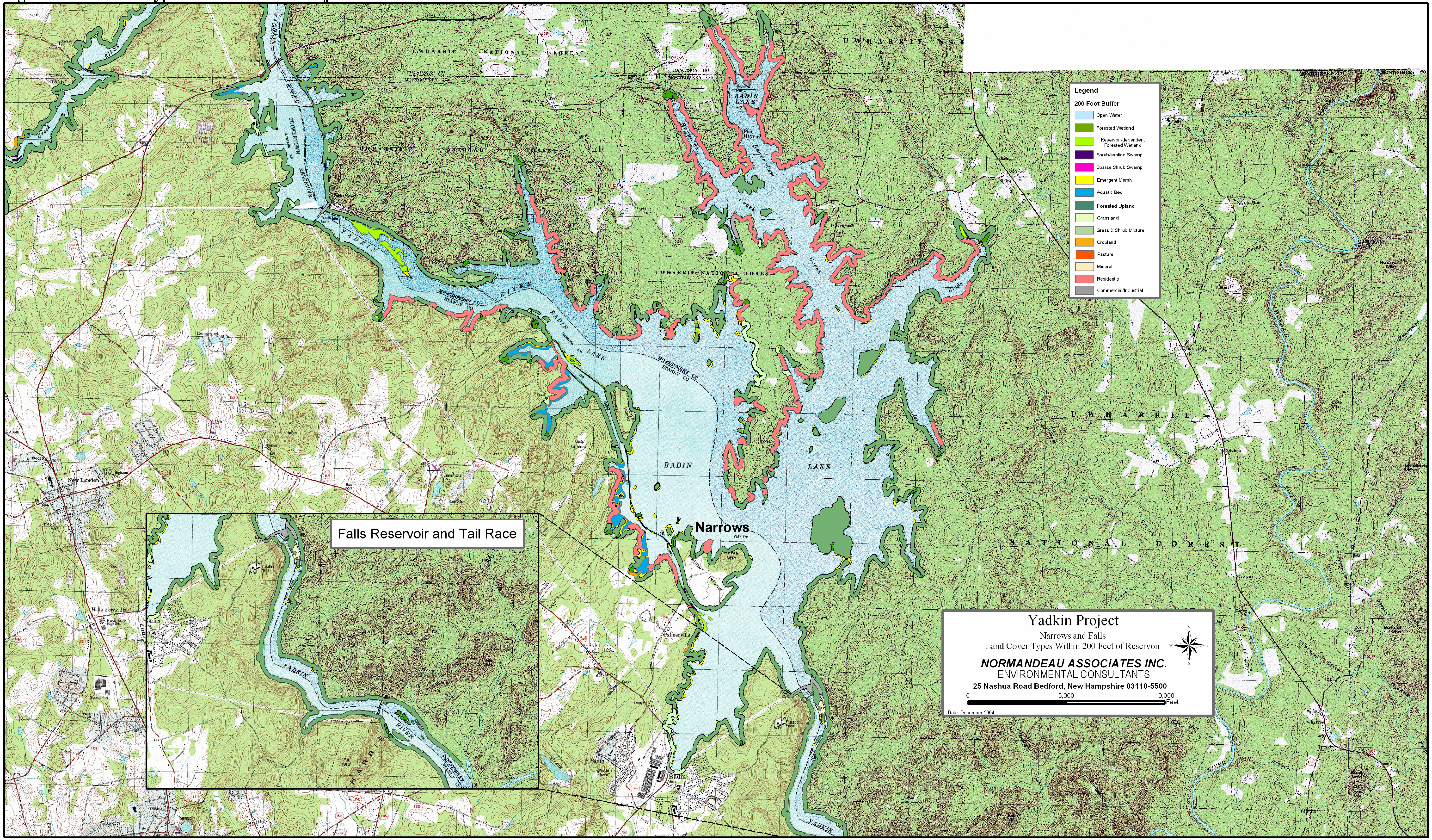


Figure E-23: Cover Types within 200-foot Project Area on Narrows and Falls Reservoirs



E.6.2 Yadkin Shoreline Management Plan

In response to increasing shoreline development pressure in the late 1990s, APGI developed a Shoreline Management Plan (SMP) for the Yadkin Project. The Yadkin SMP was developed by APGI with considerable input from the public, local municipalities and state and federal agencies, and was submitted to the Federal Energy Regulatory Commission (FERC) on July 1, 1999. FERC approved the SMP on November 9, 2000. Subsequent minor revisions were submitted to FERC on June 3, 2002, and the SMP became effective on July 1, 2002. The revisions were formally approved by FERC on February 9, 2004.

The Yadkin SMP established reservoir management priorities for each of the four Project reservoirs. The priorities were designed to reflect both the natural character of each of the reservoirs, the historical use of the reservoirs, and the level of shoreline development. The management priorities established for each of the reservoirs through the SMP were as follows:

High Rock Reservoir Management

- protect the High Rock Reservoir wetland complex as habitat for fish and wildlife and manage the wetland complex in cooperation with the North Carolina Wildlife Resources Commission (NCWRC);
- protect bald eagle habitat on the peninsulas and islands found along the mainstem of the reservoir;
- protect the fishery resource of High Rock Reservoir by preserving wetlands and areas of aquatic vegetation and cooperating with NCWRC fishery management efforts;
- allow additional development on the reservoir only in areas that can best accommodate increased use and associated environmental impacts;
- protect remaining areas of natural shoreline in the middle and lower portions of High Rock Reservoir; and
- monitor recreational use of the reservoir.

Tuckertown Reservoir Management

- protect the natural character of Tuckertown Reservoir;
- protect the fishery resource of Tuckertown Reservoir by preserving wetlands and areas of aquatic vegetation and cooperating with NCWRC fishery management efforts;
- protect other significant natural areas along the Tuckertown Reservoir shoreline, including bald eagle habitat;
- encourage low impact recreational use of the reservoir, such as bank fishing; and
- provide adequate public access and recreation facilities, and monitor recreation use.

Narrows Reservoir Management

- protect the natural undeveloped shoreline located adjacent to the UNF;
- protect submergent and emergent aquatic vegetation to retain good reservoir water quality;

- protect the fishery resource of Narrows Reservoir by preserving wetlands and areas of aquatic vegetation and cooperating with NCWRC fishery management efforts;
- allow additional reservoir development only in areas that can best accommodate increased use and associated environmental impacts;
- monitor recreation use of the reservoir; and
- protect bald eagle habitat on islands and peninsulas overlooking the main body of the reservoir.

Falls Reservoir Management

- protect the natural character of the Falls Reservoir; do not allow the installation of private access/recreation facilities on the reservoir;
- protect shoreline areas inhabited by rare, threatened and endangered (RTE) species;
- protect the fishery resource of Falls Reservoir by preserving areas of aquatic vegetation and cooperating with NCWRC fishery management efforts; and
- encourage low impact recreational use of the reservoir such as bank fishing in suitable areas.

The SMP identifies important natural resource areas along the Project reservoir shorelines. These areas are worthy of special consideration and protection and have been designated as Conservation Zone. The SMP designation of shoreline areas as Conservation Zone is used as a planning tool to identify areas that may require special consideration or protection. If potential impacts to that resource cannot be adequately avoided or mitigated, development will not be allowed. The remainder of the Project shoreline has not been designated as Conservation Zone. This does not mean that the resources in these areas do not need to be protected or mitigated, but it does suggest that impacts to those areas may be more readily avoided or mitigated. Regardless of an area's designation, the SMP requires that developmental impacts to identified resources be avoided or mitigated according to state and federal resource agency requirements.

Of the 556 Project shoreline miles, approximately 227 miles (41 percent) are designated as Conservation Zone, as shown in Table E.6-2. The largest areas of shoreline Conservation Zone are found on Tuckertown Reservoir, the upper reaches of High Rock Reservoir above Swearing Creek, along the Uwharrie National Forest boundary on Narrows Reservoir, and on Falls Reservoir.

Table E.6-2: Percentage of Shoreline as Conservation Zone

Reservoir	Shoreline (miles)	Conservation Zone (miles)	Conservation Zone (percent)
High Rock	360	119	33%
Tuckertown	75	49	65%
Narrows	115	54	47%
Falls	6	5	91%
Project Total	**556**	**227**	**41%**

The SMP established processes for reviewing and permitting private individual and multi-use recreational facilities and uses. The SMP also established procedures for approving subdivision access and industrial uses/facilities. These processes, combined with the designation of Conservation Zones, are the means by which shoreline recreation development and other uses of Project lands and waters are managed by APGI at the Yadkin Project.

The SMP also established a Shoreline Stewardship Policy (Policy). The Policy details APGI's policies, procedures, and requirements for use of the reservoirs, shorelines, and Yadkin-Managed Buffer by adjoining property owners and others. It includes APGI's goals for protecting and enhancing the shoreline, as well as guidance on how adjoining property owners can voluntarily help to protect the reservoirs. Issues addressed in the Shoreline Stewardship Policy include vegetation management, activity permits, aquatic vegetation protection, and volutary shoreline stewardship practices.

E.6.2.1 SMP Comparison Study

During the initial consultation phase of the relicensing process, APGI was asked to conduct a study comparing elements of the Yadkin SMP with SMPs for other hydropower reservoirs in the southeastern United States. As part of the study, a wide variety of issues was compared among 12 SMPs, including:

- Shoreline Classification
- Private Pier Requirements
- Private Pier Dimensions
- Private Pier Configuration
- Pier Materials
- Private Boathouses
- Private Boat Launches
- Private Boat Lifts
- Multi-Use Facilities
- Excavation and Dredging
- Shoreline Stabilization
- Shoreline Buffers
- Vegetation Management
- Other Vegetation Guidelines
- Permitting Procedures
- Fees
- Cultural Resource Issues
- Aesthetic Considerations
- Facility Classifications
- Miscellaneous
- Environmental Considerations
- Shoreline Cleanup

The 12 SMPs reviewed for the study were:

- APGI's Yadkin Project
- American Electric Power's Smith Mountain Project
- Duke Power Nantahala Area
- Duke Power Catawba-Wateree
- Dominion's Lake Gaston and Roanoke Rapids Hydroelectric Project
- Georgia Power's North Georgia Project
- Progress Energy's Tillery Reservoir Project
- Santee Cooper Lakes Project
- South Carolina Electric & Gas' Lake Murray Project
- The Tennessee Valley Authority System
- U.S. Army Corps of Engineers' (USACE) Hartwell Lake
- USACE's Lake Lanier

The SMP Comparison Study showed that all of the SMPs reviewed for the study were generally similar in content (LVA, 2004 Appendix E-22). Of the shoreline development issues outlined above, most were found to be addressed by almost all of the SMPs, including facility construction procedures and specifications, vegetation management guidelines, and application processes to carry out shoreline activities. In addition, all 12 SMPs reviewed were found to share similar objectives in attempting to maintain a balance between shoreline development and preserving environmental, cultural, and aesthetic resources and recreational opportunities. The report also showed that the specific requirements and guidelines for different shoreline activities outlined in each SMP were highly variable.

Overall, the study demonstrated that the Yadkin SMP was similar to most of the other regional SMPs in terms of the issues addressed and the specifications and requirements for shoreline facilities. In the case of issues that have numeric standards associated with them, the comparison report showed that the Yadkin SMP was solely at one end of the range [the protective end] of the standards given for three issues: minimum lot width requirement (200 ft at the Yadkin Project), minimum water depth requirement (8 ft at the Yadkin Project), and designated shoreline buffer (100 ft at the Yadkin Project). For the remaining SMP issues examined in the study, the Yadkin SMP is similar to, or falls within the range of, requirements at the other projects. In no case was the Yadkin SMP found to be the only one of the 12 SMPs to address a particular issue or set criteria or requirements for the permitting of facilities or uses.

E.6.3 Project Aesthetics

E.6.3.1 Project-Wide Aesthetic Study

In response to comments from stakeholders during the initial consultation phase of the relicensing process, APGI conducted two visual resource studies at the Yadkin Project. Both studies were done in accordance with study plans developed with input from the Recreation, Aesthetics, and Shoreline Management Issue Advisory Group (RASM IAG): a Project-Wide Aesthetic Study and an Uwharrie National Forest Aesthetic Study. For the first study, the Project-Wide Aesthetic Study, APGI collected, analyzed, and provided information regarding aesthetics at the Yadkin Project (ERM, 2005a, Appendix E-23).

The objectives of the study were to:

- Generally characterize the aesthetic character of the Project area,
- Characterize the aesthetic character of Project facilities, and
- Evaluate the effect of existing and alternative Project facilities and operations on aesthetics in the Project area.

The Project-Wide Aesthetic Study included two integral analyses of Project aesthetics: a technical analysis, based on evaluating the views from 42 Key Observation Points (KOPs) during different seasons and varying water levels and a user analysis, based on the responses from surveys of visitors, waterfront residents, and non-waterfront residents of private communities regarding Project aesthetics.

For each reservoir, KOPs were identified as representative views of the Project reservoirs and facilities to evaluate the aesthetic character of each reservoir respectively (Table E.6-3).

Table E.6-3: Total Number of KOPs and Views for Each Reservoir

Reservoir	Number of KOPs	Number of Views
High Rock	12	18
Tuckertown	8	11
Narrows	16	16
Falls	6	6
Total	**42**	**51**

Additionally, each reservoir was characterized according to its "scenic integrity" or a measure of the degree to which the landscape is visually perceived to be whole, intact, and complete. Scenic integrity ratings were given to each of the developments and surrounding areas. The ratings are a continuum ranging over five levels of integrity: very high (unaltered), high (appears unaltered), moderate (slightly altered), low (moderately altered), and very low (heavily altered). The aesthetic analyses for each reservoir are discussed below. The study also surveyed reservoir users to evaluate how users perceive the scenic quality of each of the reservoirs. Results of the user survey are summarized in Table E.6-4.

Table E.6-4: Summary of User Responses on Project Reservoir Aesthetics

Reservoir	# of Respondents	Average Score	Ratings/Scores				
			1	2	3	4	5
			Very Un-attractive	Somewhat Unattractive	Average	Somewhat Attractive	Very Attractive
High Rock	1,559	3.7	4%	5%	36%	29%	26%
Tuckertown	215	4.1	1%	2%	29%	18%	49%
Narrows	915	4.3	5%	2%	15%	20%	58%
Falls	17	3.8	0%	12%	29%	29%	29%

High Rock Development

High Rock is the most developed of the four Project reservoirs with approximately 32 percent of the shoreline developed. The majority of the development is concentrated along the middle and lower portions of the reservoir. There are approximately 2,700 private piers and docks along the shoreline. Overall the area surrounding High Rock Reservoir is slightly to moderately altered and therefore received a Low-Moderate Scenic Integrity rating. In response to a survey of reservoir users (residents and visitors), over half of the respondents rated High Rock Reservoir as "very attractive" or "somewhat attractive," with only nine percent of respondents rating it as "very unattractive" or "unattractive" (ERM, 2005a Appendix E-23).

Floating debris, muddy water, exposed lake bottom, and eroding shoreline were identified by recreational users as primary detractors from scenic quality. The exposed lake bottom is at least partially attributable to Project operations. Project facilities such as High Rock Dam, electric transmission lines, and High Rock Reservoir were identified as detractors by less than 10 percent of respondents.

Overall, existing Project facilities were found to be consistent with the slightly to moderately altered Scenic Integrity rating of the area. However, Project operations that result in significant water level drawdown adversely affect the visual quality of the Project area (ERM, 2005a Appendix E-23). The large number of viewers and the magnitude and duration of the drawdown collectively increase the severity of this aesthetic impact.

Tuckertown Development

The Tuckertown Development is relatively undeveloped with about 98 percent of the shoreline in forest or agricultural uses. There are a few waterfront homes along Tuckertown Reservoir, but there are no private piers or docks that intrude into the reservoir. Tuckertown Reservoir is operated as a run-of-river facility with relatively little water level fluctuation. The presence of overhead transmission lines alters the otherwise natural landscape and, therefore, Tuckertown Reservoir received a Moderate (slightly altered) Scenic Integrity rating (ERM, 2005a Appendix E-23).

Two-thirds of the respondents to the user survey rated Tuckertown Reservoir as “very attractive” or “somewhat attractive,” with only three percent of respondents rating it as “very unattractive” or “unattractive.”

Floating debris, muddy water, and eroding shorelines were identified by recreational users as primary detractors from scenic quality. Project facilities and operations were identified as detractors by less than 15 percent of respondents. Overhead, electric transmission lines cross the Yadkin River immediately downstream of Tuckertown Dam and a regional transmission line runs along the west side of Tuckertown Reservoir and crosses Flat Creek and Riles Creek. Approximately 13 percent of respondents identified electric transmission lines as aesthetic detractors. Overall, Project facilities and operations at Tuckertown Reservoir were found to be consistent with the slightly altered Scenic Integrity rating of the area (ERM, 2005a Appendix E-23).

Narrows Development

The Narrows Development is moderately developed with about 37 percent of the shoreline classified as developed. Overhead transmission lines and a railroad trestle cross the reservoir. However, much of the eastern shoreline is within the Uwharrie National Forest and is undeveloped. Overall, the area surrounding the Narrows Development is slightly to moderately altered and therefore received a Low-Moderate Scenic Integrity rating (ERM, 2005a Appendix E-23).

Despite the effects of shoreline development, overhead transmission lines, and the railroad trestle, 78 percent of the constituents rated Narrows Reservoir as “very attractive” or “somewhat attractive.” Nearly 60 percent of respondents rated Narrows Reservoir as “very attractive”, while only seven percent of respondents rated the reservoir as “very unattractive” or “somewhat unattractive.”

Floating debris, muddy water, timber harvesting, and eroding shoreline were identified by recreational users as primary detractors from scenic quality. Project facilities were identified as detractors by less than 15 percent of respondents. The technical analysis identified the view of Narrows Dam from the tailwaters as being only somewhat compatible with the Low-Moderate Scenic Integrity rating of the surrounding area. The scale of the dam dominates the view from downstream. This impact is offset to some extent by the relatively small number of recreation users who view the dam from this perspective (ERM, 2005a Appendix E-23).

Under existing Project operations, water levels within Narrows Reservoir generally fluctuate about 3 ft annually. Nevertheless, exposed lake bottom was identified by 14 percent of survey respondents as a detractor from scenic quality. This result may be at least partially attributable to the significant drawdown (approximately 16 ft) that occurred between Thanksgiving and Christmas 2003 to allow a relicensing study to be performed. The magnitude of this drawdown resulted in significant dewatering of several coves and exposed large expanses of muddy lake bottom. A drawdown of this magnitude is not compatible with the Low-Moderate Scenic Integrity rating of this area (ERM, 2005a Appendix E-23).

Overall, Project facilities and operations at Narrows Reservoir were found to be consistent with the slightly to moderately altered Scenic Integrity rating of the area.

Falls Development

The Falls Development is the least developed of the four Yadkin developments with no waterfront residences and the Uwharrie National Forest encompassing the eastern half of the Falls Reservoir shoreline. Falls Reservoir is operated as a run-of-river facility with relatively little water level fluctuation. Although Falls Dam and Reservoir represent man-made deviations from a natural landscape, the overall effect is still quite natural and the setting appears unaltered. Therefore, the Falls Reservoir area received a High Scenic Integrity rating (ERM, 2005a Appendix E-23).

The technical analysis of the KOPs identified views of Falls Dam (from both upstream and the tailwaters) and the overhead electric transmission lines as Project features that are only somewhat compatible with the High Scenic Integrity rating of the surroundings. Approximately 60 percent of the user survey respondents rated Falls Reservoir as “very attractive” or “somewhat attractive”, although there were not sufficient responses to ensure a statistically valid response.

Floating debris, eroding shorelines, and muddy water were identified by recreational users as the primary detractors from scenic quality. Project facilities and operations were identified as detractors by less than 15 percent of respondents (ERM, 2005a Appendix E-23).

Overall, Project facilities and operations at Falls Dam are generally compatible with the High Scenic Integrity rating of the area.

E.6.3.2 Uwharrie National Forest Aesthetic Study

The objectives of the second aesthetics study, the Uwharrie National Forest (UNF) Aesthetic Study (ERM, 2005c Appendix E-24) were to:

- Evaluate the consistency of existing and proposed Project facilities and operations that are visible from the UNF with the Visual Quality Objectives (VQOs) of the UNF Management Plan and
- Consider the potential auditory effects of Project use on the UNF.

The UNF Aesthetic Study included two integral analyses of project aesthetics: 1) a technical analysis, based on evaluating the views from 14 KOPs during different seasons and varying water levels; and 2) a visitor preference survey to assess user opinions regarding the scenic quality of the Project area and those elements that detracted from scenic quality. Based on the KOP analysis, only two aspects of the Project or its operation that are visible or potentially visible from Uwharrie National Forest received a “Low” or “Very Low” scenic integrity ratings: 1) Narrows Dam viewed from downstream, and 2) Narrows Reservoir with an extreme drawdown (approximately 12 ft).

Narrows Dam (when viewed from downstream) is a large imposing structure with a maximum height of approximately 200 ft. The visual effect of the dam is complicated with alterations (e.g. a non-integral powerhouse and transmission lines, an access road, and a bridge all crossing the tailwaters downstream of the dam) tending to dominate the landscape. Therefore, Narrows Dam received a Low Scenic Integrity rating (ERM, 2005c Appendix E-24).

Narrows Reservoir was evaluated over a range of drawdowns. At full pool, Narrows Reservoir appears “intact” and is consistent with a High Scenic Integrity rating. At the normal maximum annual drawdown of approximately 3 ft, the reservoir “appears slightly altered” and is consistent with a Moderate Scenic Integrity rating. At an extreme drawdown of approximately 16 ft, like that which occurred during the winter of 2003 for purposes of relicensing studies, the reservoir “appears heavily altered” and is consistent with a Very Low Scenic Integrity rating. Falls Reservoir is operated as a run-of- river facility with little daily fluctuation (approximately one foot). Under current operations, Falls Reservoir appears “intact” and is consistent with a High Scenic Integrity rating (ERM, 2005c Appendix E-24).

The study also included a survey of UNF users. The primary findings of the user survey were as follows:

- 85 percent of respondents indicated that scenic quality was either a minor consideration or not a consideration in the user's decision to go to the UNF.
- 67 percent of respondents considered the scenic quality of the UNF to be better than alternative recreation areas in the region.
- 89 percent of respondents rated the scenic quality of the Project in the vicinity of UNF "somewhat attractive" or "very attractive".
- Most respondents considered the Project reservoirs (Narrows and Falls), forest, and trails as the most attractive features of the UNF.
- Campgrounds/picnic areas and the reservoirs were frequently noticed and generated primarily positive reactions.
- Most respondents considered the dirt roads and trash as the least attractive features of the UNF.
- Forest roads and timber harvests were frequently noticed and generated primarily negative reactions.
- The lowest rating of the Visual Preference photographs was given to the Narrows Dam tailrace and Falls Dam (viewed from upstream), which reflects a slightly positive visual impression. No photographs received an overall negative rating.
- Floating debris/trash, eroding shorelines, and muddy water were identified as the most common detractors of scenic quality in the UNF Project area.
- Relatively few respondents indicated that they had "special ties" to the Project area (e.g., family traditionally visited the area).

In terms of Project facilities, none were identified as a significant detractor of visual quality. In fact, the reservoirs were considered to be one of the principal amenities of the UNF. Narrows Dam, as viewed from downstream, and Falls Dam, as viewed from upstream, received the lowest Visual Preference ratings, but these ratings were still slightly positive (ERM, 2005c Appendix E-24).

Most existing views of the Project reservoir and facilities were found to be compatible with the VQO of the UNF Management Plan. However, Narrows Dam as viewed from downstream received a low scenic integrity rating in the technical analysis but constituents rated the view as slightly positive. From a Project operations perspective, current operations (normal maximum drawdown of approximately 3 ft at Narrows and 1 foot at Falls reservoirs) were found to be consistent with the VQO of the UNF Management Plan. More extreme drawdowns, such as the approximately 16 foot drawdown that occurred in December 2003 at Narrows Reservoir for purposes of relicensing studies, would not be compatible with the VQO of the UNF Management Plan (ERM, 2005c Appendix E-24).

The constituent surveys also questioned users about the magnitude and source of noise encountered at the UNF. About 81 percent of respondents indicated that noise was not a problem, with only 1 percent indicating that noise was a big problem and 4 percent indicating that noise was a moderate problem. RV generators, rather than watercraft (boats and jet skis) were cited as the major source of noise problems (ERM, 2005c Appendix E-24).

E.6.4 Measures Proposed by the Applicant to Ensure that any Proposed Project Works and Topographic Alterations Blend with the Surrounding Environment

APGI is proposing no structural additions or changes to the existing Project or Project works that would have any impact on the current visual quality of the reservoirs or Project facilities.

E.6.5 Wetlands and Floodplains Within or Adjacent to the Project Boundary

As discussed previously in Exhibit E.3.3.1, APGI mapped all wetlands located in and around the Project reservoirs. Table E.3-20 summarizes the wetland acres at the Project reservoirs.

Floodplains at the Yadkin Project are found primarily along the mainstem Yadkin and South Yadkin rivers in the upper-most, riverine portion of High Rock Reservoir (upstream of the I-85 Bridge). Floodplains and the effects of Project operation on flooding were discussed earlier in Exhibit E.1.8.

E.6.6 Project Buffer Zone

At the Yadkin Project, the FERC Project boundary generally follows the normal full pool elevation of each of the four Project reservoirs. Project lands are limited, and most Project land occurs in the immediate vicinity of the dams and powerhouses. Therefore, strictly speaking, there is no Project buffer zone.

However, through the provisions of the Yadkin SMP, APGI has created an effective buffer around the Project reservoirs through its shoreline management policies. Under the SMP, Project shoreline buffers are managed by APGI under two separate headings: the Yadkin-Managed Buffer and the 100-foot Forested Setback. The Yadkin-Managed Buffer is defined as property adjoining the FERC Project boundary at the normal full pool elevation of the reservoir that is owned by APGI (or its parent company Alcoa), to a width of 100 ft. More specifically, in some areas around the Project reservoirs, APGI owns a narrow strip of shoreline property immediately adjacent to the FERC Project boundary. At Narrows Reservoir, APGI owns a narrow strip of shoreline property around nearly the entire reservoir, generally to an elevation of 545.0 ft (Yadkin datum), approximately 4 vertical ft above normal full pool elevation. APGI also owns some narrow strips of shoreline property around portions of High Rock Reservoir. Most of the High Rock shoreline strips are owned to a specified elevation. Collectively, these strips of shoreline property, to the extent they extend no more than 100 ft from the FERC Project boundary, are considered “Yadkin-Managed Buffer.” In other areas, including along large portions of Tuckertown and Falls reservoirs, APGI may own shoreline property that extends back from the water a considerable distance. In these areas, the first 100 ft of shoreline from the Project boundary is also considered “Yadkin-Managed Buffer”.

Under the Yadkin SMP, APGI strictly limits use of the Yadkin-Managed Buffer. For example, the Yadkin SMP prohibits private and industrial uses and facilities within the Yadkin-Managed

Buffer without APGI's written permission. Likewise, the SMP prohibits any unauthorized uses within the Yadkin-Managed Buffer such as:

- change in the features or vegetation
- construction, installation, or placement of structures, including retaining walls
- construction of roads, sidewalks or pathways
- clearing or disturbance of land
- logging or removal of trees and vegetation
- dumping

In addition, the Yadkin SMP requires a "100-Foot Forested Setback" be maintained by adjoining property owners in new subdivisions recorded after July 1, 1999 in order to qualify for private pier construction. The SMP sets forth specific vegetation management guidelines for maintaining the 100-Foot Forested Setback:

- A 20-foot construction zone is allowed to intrude on the 100' setback but must be revegetated
- The 100-foot setback must be maintained as it existed prior to development
- To improve water views: 50 percent of vegetation less than 5 ft may be removed (but no tree greater than 2 inches in diameter as measured 1 foot above ground may be removed
- Nothing may be removed within 30 ft of tributaries, ditches, swales, or reservoir drainages
- Dead limbs may be removed
- Living limbs up to 8 ft above ground may be removed
- Fallen limbs and trees may be removed but leaf litter must remain
- No trees overhanging or within the reservoir may be removed without permission
- Any vegetation removal requires a written permit from APGI

Together, the Yadkin-Managed Buffer and the 100-Foot Forested Setback combine to create an effective buffer zone of 100 ft along significant portions of the reservoirs' shorelines.

E.6.6.1 Costs and Other Constraints of Applicant's Ability to Provide a Buffer Zone

The management of a 100-foot strip non-Project shoreline property by APGI as buffer results in a loss of potential timbering revenue by APGI.

E.6.7 Applicant's Policies Regarding Permitting Shoreline Facilities on Project Lands and Waters

Shoreline facilities development (including piers, docks, boat landings, and bulkheads) along Project lands and waters are strictly regulated under the FERC-approved Yadkin SMP. The specific policies and regulations pertaining to all types of shoreline development are detailed in four sections of the SMP:

- Section 7.0: Shoreline Management

- Appendix E: Specifications for Private Recreation Facilities at High Rock and Narrows Reservoirs
- Appendix F: Subdivision Access Approval, Multi-Use Facility Permitting, and Industrial Approval Procedures
- Appendix G: Shoreline Stewardship Policy

Combined, these sections of the Project's SMP contain a comprehensive policy for the permitting of shoreline facilities on Project lands and waters (Yadkin, 1999).

E.6.8 Existing Shoreline Management Measures to be Continued and New Measures Proposed

APGI is proposing to continue to manage the reservoir shorelines through the policies and procedures in the Yadkin SMP. At the time that the original Project SMP was filed with FERC, APGI recognized that the SMP would need to undergo periodic review, revision and updating to remain current and effective. An initial revision involving some minor changes to the original SMP was filed with FERC in 2002. The relicensing process for the Yadkin Project provides APGI with another excellent opportunity to review and potentially revise the current Yadkin SMP.

Specifically, APGI is proposing to make some modifications to the Yadkin SMP. Modifications to the SMP will be identified through a collaborative process that includes state and federal agencies, public recreation users, non-governmental organizations (NGOs) and shoreline property owners. At this time, it is anticipated that modifications will focus on some changes to private pier specifications and minor changes to vegetation management specifications. All of the changes to the SMP that will be undertaken will be designed to continue the current level of protection to the shoreline and reservoirs, while providing adjoining property owners and APGI more flexibility in considering and approving specific shoreline development proposals and requests. Modifications to the SMP will be undertaken within one year of the effective date of a new FERC license and the revised SMP will be filed with FERC for final approval within two years of the effective date of a new license. The process of revising the SMP is estimated to cost $100,000.

The Yadkin SMP has been in effect for six years. Over that time, the SMP has proved to be highly protective of the reservoir shoreline and related environments, while at the same time allowing new private facilities to be permitted. However, such protections impose certain restrictions on shoreline property development and activities that could be modified while still maintaining the same level of resource protection. A proposal by APGI to undertake modifications to the SMP in consultation and collaboration with agencies and other stakeholders provides the opportunity for continued protection of reservoir resources while allowing some changes in certain shoreline specifications that are of interest to adjacent property owners.

E.6.9 Agency Recommendations Regarding Land Management and Aesthetics

At the outset of the consultation process, agencies, NGOs and other stakeholders raised a number of issues with respect to land management and Project aesthetics. No specific recommendations were made at that time, but there were requests for certain studies to be done by APGI. Ultimately, APGI conducted three different studies regarding land management and aesthetics:

- Shoreline Management Plan Comparison Study – Appendix E-22
- Overall Project Aesthetics Study – Appendix E-23
- Uwharrie National Forest Aesthetics Study– Appendix E-24

Information gained from these studies was used earlier in this section to describe existing shoreline management and aesthetics at the Project.

In response to APGI's Draft License Application (DLA), several resource agencies provided additional comments and recommendations regarding land management, shoreline management, and aesthetics at the Yadkin Project.

In a letter dated 12/20/05 (Appendix E-25), the U.S. Forest Service (USFS) suggested that should there be a need to include a tract of land as mitigation for direct Project impacts, the USFS would be interested in acquiring by donation the small island located directly west of USFS recreation areas on Narrows Reservoir. The USFS further recommended that APGI either petition FERC to modify the Project boundary to include a non-Project strip of land that lies between the Project and USFS lands or that APGI donate in fee-simple to the USFS this strip of non-Project lands.

In a letter dated 1/4/06 (Appendix E-25), the North Carolina Division of Water Resources (NCDWR) noted that lands owned by APGI in the vicinity of Morrow Mountain State Park could be used for the expansion of the park along the west side of Falls Reservoir. The NCDWR further noted that the conservation of those lands is a high priority for the North Carolina Department of Environment and Natural Resources (NCDENR) and would provide significant public benefits.

In addition to agencies, APGI did receive a few comments regarding land management from non-agency participants in the Yadkin relicensing process. In a letter dated 1/3/06 (Appendix E-25), the Land Trust for Central North Carolina noted that APGI owns several thousand acres of non-Project land in the vicinity of the Yadkin Project and that possible conservation of these lands be discussed in the Project License Application.

APGI has reviewed these comments and considered them as it prepared this License Application for the Yadkin Project. Overall, APGI believes that land and shoreline management at the Yadkin Project has been comprehensively and vigorously addressed in the Yadkin SMP, which was approved by FERC in November 2000. As noted time and again by FERC, and as demonstrated in the SMP Comparison Study discussed earlier in Exhibit E.6.2, the Yadkin SMP is one of the most environmentally protective SMPs governing shoreline development along southeastern United States reservoirs. Moreover, as part of this License Application, APGI is proposing a comprehensive package of mitigation and enhancement measures that are designed to directly and indirectly address ongoing Project impacts to natural, recreational, and cultural resources. For these reasons, APGI does not agree that additional protection of non-Project lands is necessary for the purposes of operating the Project or as additional protection, mitigation and enhancement measures.

E.6.10 Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. The following table summarizes the consultation record related to land management and aesthetics at the Yadkin Project. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.6-5: Summary of Consultation Record Related to Land Management and Aesthetics

Agency/Party	Date	To	Description
North Carolina Division of Water Resources, John Morris	January 9, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
High Rock Lake Association, Larry Jones	January 9, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
North Carolina Watershed Coalition, Scott Jackson	January 9, 2003	APGI	Initial relicensing comments
Yadkin-Pee-Dee Lakes Project, Ann Liebenstein Bass	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
U.S. Forest Service, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
North Carolina Wildlife Resources Commission, Chris Goudreau	January 12, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments and “Hydropower Relicensing Issues, Standards, and Mitigation”
The Trust for Public Land, Dave Brown	January 12, 2003	APGI, Gene Ellis	Email re: initial relicensing comments
South Carolina Coastal Conservation League and American Rivers, Gerrit Jobsis and David Sligh	January 12, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
Land Trust for Central North Carolina, Jason Walser	January 12, 2003	APGI	Email re: initial relicensing comments
Land Trust for Central NC, Andy Abramson	March 18, 2003	APGI, Norm Pierson	Email request for timbering information and possibility of studying forested riparian buffers
APGI, Jody Cason	March 25, 2003	All IAGs	Agenda for April 10, 2003 RASM IAG meeting (email)
APGI, Jody Cason	April 4, 2003	RASM IAG	Distribution of draft study plans for the Overall Project Aesthetic and Uwharrie National Forest Aesthetic studies (email)
High Rock Lake Association, Larry Jones	April 8, 2003	APGI, Gene Ellis	Letter recommending that the relicensing process include a study of SMP issues
APGI, Jody Cason	May 26, 2003	RASM IAG	Distribution of revised study plans for the Overall Project Aesthetic Study and Uwharrie National Forest Aesthetic Study (email)
Yadkin-Pee Dee Lakes Project, Bill Medlin	May 27, 2003	RASM IAG	Comment on revised study plans for aesthetic studies (email)
APGI, Jody Cason	June 5, 2003	RASM IAG	Final summary of March 13, 2003 RASM IAG meeting (email)
APGI, Jody Cason	June 24, 2003	RASM IAG	Distribution of agenda for July 9, 2003 RASM IAG meeting, SMP Comparison Draft Study Plan, and comment from SHRLO on SMP Comparison Study (email)

Table E.6-5: Summary of Consultation Record Related to Land Management and Aesthetics (continued)

Agency/Party	Date	To	Description
North Carolina Wildlife Resources Commission, Chris Goudreau	June 25, 2003	APGI, Jody Cason and Wendy Bley	Comments on SMP Comparison Draft Study Plan (email)
APGI, Jody Cason	July 2, 2003	RASM IAG	Final summary of April 10, 2003 RASM IAG meeting (email)
APGI, Jody Cason	July 23, 2003	RASM IAG	Final Study Plans for Uwharrie National Forest Aesthetic and Overall Project Aesthetic studies (email)
APGI, Jody Cason	August 15, 2003	RASM IAG	Final summary of July 9, 2003 RASM IAG meeting
APGI, Jody Cason	August 28, 2003	RASM IAG	Distribution of SMP Comparison Revised Draft Study Plan (email)
High Rock Lake Association, Larry Jones	September 4, 2003	APGI, Jody Cason; RASM IAG	Comments on SMP Comparison Revised Draft Study Plan (email)
APGI, Jody Cason	September 23, 2003	RASM IAG	Agenda for October 8, 2003 RASM IAG meeting (email)
APGI, Jody Cason	October 2003	RASM IAG	Final study plan for SMP Comparison Study (email)
APGI, Jody Cason	December 2, 2003	RASM IAG	Final summary of October 8, 2003 RASM IAG meeting (email)
APGI	March 30, 2004	RASM IAG	Distribution of SMP Comparison Draft Study Report (email)
APGI, Jody Cason	April 19, 2004	RASM IAG	Final summary of February 4, 2004 RASM IAG meeting (email)
APGI, Jody Cason	April 22, 2004	RASM IAG	Agenda for the May 5, 2004 RASM IAG meeting (email)
APGI, Jody Cason	May 7, 2004	HRLA, Larry Jones	Email request for SMP comparison tables
High Rock Lake Association, Larry Jones	May 8, 2004	APGI, Jody Cason	Provided SMP comparison tables (email)
APGI, Jody Cason	May 8, 2004	RASM IAG	Email request for additional comments on SMP Comparison Draft Study Report
High Rock Lake Association, Larry Jones	May 27, 2004	APGI	Comments on the SMP Comparison Study Draft Report (letter)
APGI, Jody Cason	June 10, 2004	RASM IAG	Update on changes to the SMP Comparison Draft Study Report (email)
High Rock Lake Association, Larry Jones	June 11, 2004	APGI and RASM IAG	Request of reconsideration of revisions to the SMP Comparison Draft Study Report (email)
APGI, Jody Cason	September 2, 2004	RASM IAG	Final summary for May 5, 2004 RASM IAG meeting (email)
APGI, Jody Cason	September 27, 2004	RASM IAG	Distribution of Final SMP Comparison Study Report (email)

Table E.6-5: Summary of Consultation Record Related to Land Management and Aesthetics (continued)

Agency/Party	Date	To	Description
Concerned Property Owners of High Rock Lake, Dean Vick	September 27, 2004	APGI, Jody Cason	Comments on the Final SMP Comparison Study Report (email)
APGI, Gene Ellis	September 28, 2004	CPOHRL, Dean Vick	Response to Mr. Vick's comments on Final SMP Comparison Study Report (email)
APGI, Jody Cason	October 20, 2004	RASM IAG	Draft agenda for the November 3, 2004 RASM IAG meeting (email)
APGI, Jody Cason	January 11, 2005	RASM IAG	Final summary for the November 3, 2004 RASM IAG meeting (email)
APGI, Jody Cason	January 14, 2005	RASM IAG	Draft agenda for the February 2, 2005 RASM IAG meeting (email)
APGI, Jody Cason	April 20, 2005	RASM IAG	Draft agenda for May 3, 2005 RASM IAG Meeting (email)
APGI, Gene Ellis	April 20, 2005	RASM IAG	Distribution of draft study reports: Project-wide Aesthetics Study Draft Report and Uwharrie National Forest Aesthetics Study Draft Report (letter)
High Rock Lake Association, Larry Jones	May 3, 2005	APGI, Jody Cason	Comments on Project Wide Aesthetic Draft Study Report (email)
APGI, Jody Cason	June 16, 2005	RASM IAG and CE IAG	Distribution of agenda for June 30, 2005 RASM IAG and County Economic Impacts IAG joint meeting (email)
APGI, Jody Cason	June 28, 2005	RASM IAG and CE IAG	Distribution of County Economic Impacts of Yadkin Project Draft Study Report (email)
Salisbury-Rowan Utilities, City of Salisbury, Matt Bernhardt	August 4, 2005	APGI, Gene Ellis	Comments on County Economic Impacts Draft Study Report (memo)
City of Salisbury, Randy Tinsley	August 24, 2005	APGI, Jody Cason	Comments on County Economic Impacts Draft Study Report (email)
APGI, Jody Cason	August 24, 2005	RASM IAG	Final summary of February 2, 2005 RASM IAG Meeting (email)
APGI, Jody Cason	August 24, 2005	RASM IAG	Final meeting summary for May 3, 2005 RASM IAG meeting (email)
APGI, Jody Cason	August 24, 2005	RASM IAG and CE IAG	Final meeting summary for June 30, 2005 joint IAG meeting (email)
APGI, Jody Cason	October 18, 2005	RASM IAG	Distribution of Project-wide Aesthetics Study Final Report and Uwharrie National Forest Aesthetics Study Final Reports (letter)

Table E.6-5: Summary of Consultation Record Related to Land Management and Aesthetics (continued)

APGI, Jody Cason	October 18, 2005	RASM IAG	Email informing IAG of distribution of Project-wide Aesthetics Study Final Report and Uwharrie National Forest Aesthetics Study Final Report

Notes: APGI – Alcoa Power Generating Inc.
CE IAG – County Economics Issue Advisory Group
CPOHRL - Concerned Property Owners of High Rock Lake
HRLA - High Rock Lake Association
IAG – Issue Advisory Group
ICD – Initial Consultation Document
RASM IAG – Recreation, Aesthetics, and Shoreline Management Issue Advisory Group
SMP – Shoreline Management Plan

Exhibit E.7

Consistency with Comprehensive Plans

E.7 Consistency with Comprehensive Plans

Alcoa Power Generating Inc.'s (APGI) proposal for the continued operation of the Yadkin Project (Project) for the term of a new license is consistent with all applicable comprehensive plans and resource management plans, of which APGI is aware.

The following sections summarize the following comprehensive plans that have been filed with the Federal Energy Regulatory Commission (FERC) that are applicable to the Yadkin Project. The summaries also discuss how APGI's proposal for the continued operation of the Project is consistent with those plans:

- Yadkin-Pee Dee River Basinwide Water Quality Plan
- "Redbook" Surface Waters and Wetlands Standards NC Administrative Code 15A NCAC 02B .0100, .0200 & .0300
- Basinwide Assessment Report: Yadkin River
- North Carolina Water Quality Assessment and Impaired Waters List (2006 Public Review Draft Integrated 305(b) and 303(d) Report)
- Statewide Comprehensive Outdoor Recreation Plan: North Carolina Outdoor Recreation Plan 2003-2008
- North Carolina Wildlife Action Plan
- Fisheries and Wildlife Management Plan for the Yadkin-Pee Dee River Basin

In addition to the comprehensive plans filed with FERC, APGI has identified the following comprehensive plans that are summarized in Exhibit E.7.8:

- Basinwide Wetlands and Riparian Restoration Plan for the Yadkin-Pee Dee River Basin
- North Carolina State Water Supply Plan
- Restoration Plan for the Diadromous Fishes of the Yadkin-Pee Dee River Basin: North Carolina and South Carolina
- Croatan and Uwharrie National Forests - Land and Resource Management Plan: 1985-2000
- Habitat Management Guidelines for the Bald Eagle in the Southeast Region
- Schweinitz's Sunflower Recovery Plan

E.7.1 Yadkin-Pee Dee River Basinwide Water Quality Plan

The Yadkin Pee-Dee River Basinwide Water Quality Plan (Basinwide Water Quality Plan), prepared by the North Carolina Department of Environment and Natural Resources' (NCDENR) Division of Water Quality (NCDWQ) in March 2003, provides an overview of the Yadkin-Pee Dee River basin, with emphasis on identifying causes and sources of pollution to facilitate local restoration efforts. The Basinwide Water Quality Plan describes the assessment of water quality in North Carolina and discusses the goals of basinwide planning, including:

- identifying water quality problems and restoring full use to impaired waters;
- identifying and protecting high-value resource waters;
- protecting unimpaired waters while allowing for reasonable economic growth;

- developing appropriate management strategies to protect and restore water quality;
- assuring equitable distribution of waste assimilative capacity for dischargers; and
- improving public awareness and involvement in the management of the state's surface waters.

The Basinwide Water Quality Plan presents management strategies and recommendations for those waters considered to be impaired or that exhibit some notable water quality problem. Of interest to the relicensing of the Yadkin Project, the plan presents NCDWQ's management strategy for High Rock Reservoir. Increased monitoring of High Rock Reservoir over recent years (1999, 2000, and 2001) has shown high levels of nutrients, combined with chlorophyll *a*, turbidity and percent dissolved oxygen saturation in violation of the state standards. Low dissolved oxygen and high turbidity in the Abbotts Creek and Crane Creek Arms are also contributing to aquatic life impairment. The Basinwide Water Quality Plan discusses the low dissolved oxygen concentrations below High Rock Dam, which likely result from hypolimnetic (deep water) releases.

According to the Basinwide Water Quality Plan, no new National Pollutant Discharge Elimination System (NPDES) regulated discharges will be permitted into the Abbotts, Swearing, Grants and Crane Creek arms of High Rock Reservoir until water quality issues are addressed and standards are met. No increase in loading will be permitted for existing NPDES discharges into these same arms. Due to adverse dissolved oxygen concentrations in High Rock Reservoir, further investigation is warranted. The plan suggests the development of both a nutrient response model and a watershed loading model to assist in assessing water quality in High Rock Reservoir. NCDWQ also plans to work closely with other agencies that set priorities for nonpoint source pollution reduction in the Yadkin-Pee Dee River basin.

Nutrient enrichment, particularly in the reservoir arms, has also been an ongoing concern at Narrows Reservoir. Potential sources of nutrient loading to Narrows Reservoir include development in the immediate watershed and inflow of nutrient-rich water from High Rock Reservoir. NCDWQ conducted an intensive water quality survey of Narrows Reservoir in 2002 to better document water quality conditions. Data indicate that the productivity of Narrows Reservoir was similar in 2002 to previous years. The plan suggests that a nutrient reduction strategy for the immediate watershed is needed to protect the aquatic life communities of Narrows Reservoir from becoming impaired.

According to the plan, NCDWQ plans to work with APGI to improve water quality in Narrows Reservoir and the High Rock tailwater during the hydropower relicensing process. NCDWQ will ensure, through the 401 Water Quality Certification review, that Project operations will not result in violations of water quality standards.

APGI's proposal for the continued operation of the Yadkin Project is fully consistent with NCDWQ's Basinwide Water Quality Plan. APGI has worked closely with NCDWQ throughout the Project relicensing process, and as a result has developed a proposed plan for improving Project water quality that is consistent with the objectives outlined in the Basinwide Water Quality Plan. As discussed in Exhibit E.2.7, APGI proposes to undertake a series of extensive

Project modifications designed to increase dissolved oxygen concentrations and enhance water quality in the four Project tailwaters.

APGI's proposal for the operation of High Rock Reservoir under a revised guide curve is also expected to provide some water quality enhancement in that reservoir. As proposed, the new guide curve for High Rock will reduce the magnitude of the winter drawdown and, overall, result in a narrower water level operating range for the reservoir. The corresponding reduction in the magnitude of water level fluctuations may help to stabilize some pollutants that become trapped in the reservoir sediments, and therefore reduce the likelihood that these pollutants will become resuspended as a result of changing reservoir water levels.

Additionally, provisions of the Yadkin Shoreline Management Plan (SMP), which was approved by FERC in 2000, help to ensure responsible development and activities along the shorelines of the Project reservoirs, In particular, provisions of the SMP, including rigorous buffer and setback requirements, limitations on vegetation removal, as well as specifications for private recreation facilities, and multi-use facility permitting and industrial approval procedures, are designed to minimize the impacts of shoreline development on reservoir water quality.

E.7.2 "Redbook" Surface Waters and Wetlands Standards NC Administrative Code 15A NCAC 02B .0100, .0200 & .0300

Water quality in North Carolina is regulated by NCDWQ under the North Carolina Administrative Code Subchapter 2B (15A NAC 02B.0100, .0200, and .0300). The "Redbook", dated August 1, 2004, contains the statutes used by NCDWQ for stream classifications and water quality standards. All surface waters are assigned classifications that determine protected uses and set standards for water quality constituents to support the designated uses.

The continued operation of the Yadkin Project as proposed is consistent with the State's classification of the Yadkin River and its tributaries.

E.7.3 Basinwide Assessment Report: Yadkin River

The Yadkin River Basinwide Assessment Report (Basinwide Assessment Report), prepared by NCDWQ in June 2002, presents the 2001 evaluation of water quality and biological communities of the Yadkin River basin. The assessment included 106 monitoring locations for benthic macroinvertebrates, 56 fish community assessments, 46 ambient chemistry locations, 26 reservoirs, and 2 fish tissue evaluations. These monitoring efforts were supplemented with effluent toxicity testing at 80 NPDES facilities and the investigation of 19 fish-kill incidents. The Yadkin-Pee Dee River Basin Association also conducted ambient chemistry monitoring at an additional 71 locations.

The Basinwide Assessment Report notes that observed water quality concerns in the basin include increasing nutrient enrichment, increasing urbanization and suburbanization of once rural landscapes, instream sedimentation from nonpoint sources, and instream impacts from permitted municipal and industrial dischargers. In addition, the Basinwide Assessment Report states that most of the monitored reservoirs, including High Rock, Tuckertown and Narrows, were observed to have excessive algal growth and associated concerns with dissolved oxygen and pH, sedimentation, nutrients, and toxicants.

Specific to the Yadkin Project, the report indicates that eutrophication affecting the Project reservoirs is caused by nutrients coming from developed areas upstream, agriculture and shoreline development. Further, the Basinwide Assessment Report notes that low dissolved oxygen levels (in non-compliance with the water quality standards) below High Rock Reservoir are the result of the release of hypolimnetic water from High Rock Dam and recommends addressing this issue during the relicensing process.

According to the report, to address the nutrient-enrichment in High Rock Reservoir, the NCDWQ has initiated several actions, including relocating discharges for wastewater facilities and improving their nutrient controls, and investigation of nonpoint sources. Since the turbidity and eutrophication problems currently being experienced in High Rock Reservoir are a direct result of pollutant loadings from upstream sources, NCDWQ is initiating a Total Maximum Daily Load (TMDL) process to address this issue.

As with NCDWQ's Basinwide Water Quality Plan, the continued operation of the Yadkin Project as proposed is fully consistent with NCDWQ's water quality management objectives for the Project. As noted earlier, APGI is proposing to undertake a series of Project modifications designed to increase dissolved oxygen concentrations and enhance water quality in the four Project tailwaters. As part of this effort, APGI also proposes to continue dissolved oxygen and temperature monitoring in each of the four Project tailwaters in order to evaluate water quality improvements that are achieved as a result of the water quality improvement plan.

E.7.4 North Carolina Water Quality Assessment and Impaired Waters List (2006 Integrated 305(b) and 303(d) Report) - Public Review Draft

The North Carolina Water Quality Assessment and Impaired Waters List (draft dated February 2006), prepared by NCDENR, is an integrated report that includes both the 305(b) and 303(d) reports of previous years. The 305(b) Report is compiled biennially to update the assessment of water quality in North Carolina and to meet the Section 305(b) reporting requirement of the Clean Water Act. In general, the 305(b) Report describes the quality of surface waters, groundwaters, and wetlands, and existing programs to protect water quality. The 305(b) Report presents how well waters support designated uses (e.g., swimming, aquatic life support, water supply), as well as likely causes (e.g., sediment, nutrients) and potential sources of impairment.

The 303(d) List is a comprehensive list of all impaired waterbodies that is derived from the 305(b) Report/Use Support. An impaired waterbody is one that does not meet water quality uses, such as water supply, fishing or propagation of aquatic life. For each water quality limited segment impaired by a pollutant and identified in the 303(d) List, a TMDL must be developed.

Of the Project waters, portions of High Rock Reservoir are on the 2006 North Carolina draft list of impaired waters (the 303(d) List)[1] and will require the development of TMDLs. The upper

[1] These same waters appeared on the NCDENR 2004 303(d) List.

portion of the reservoir is listed as impaired due to violation of water quality standards for chlorophyll *a* and turbidity, the Abbotts Creek Arm due to violations for turbidity, and the lower portion of the reservoir for turbidity. Additionally, the Swearing Creek Arm of High Rock Reservoir is listed as impaired for biological integrity requiring a TMDL stressor study to identify stressors to aquatic life. The tailwater below High Rock Dam to the mouth of Cabin Creek (the upper portion of Tuckertown Reservoir) is also impaired due to violations for dissolved oxygen. The section of Lick Creek draining into Tuckertown Reservoir is also impaired due to dissolved oxygen violations.

As part of its proposed operation of the Yadkin Project, APGI will be participating in the State's TMDL process for High Rock Reservoir. Accordingly, the continued operation of the Yadkin Project, as proposed, is consistent with NCDENR's water quality management objectives for the Project.

E.7.5 Statewide Comprehensive Outdoor Recreation Plan: North Carolina Outdoor Recreation Plan 2003-2008

The North Carolina Division of Parks and Recreation has developed the Statewide Comprehensive Outdoor Recreation Plan: North Carolina Outdoor Recreation Plan 2003-2008 (NCSCORP). The NCSCORP provides a framework for "addressing the problems, needs, and opportunities related to the need for improved public outdoor recreation." The planning guidelines used to develop the NCSCORP require that it contain: (1) comprehensiveness; (2) an evaluation of the demand for and supply of outdoor recreation resources and facilities in the state; (3) a wetlands priority component; (4) a program for implementation of the plan; (5) ample public participation in the planning process; and, (6) a description of process and methodology. The NCSCORP was prepared to both meet requirements for continuing Land and Water Conservation Fund (LWCF) eligibility (federal funding) and to meet the need for meaningful evaluation of state and local government public outdoor recreation projects.

The first chapter of the NCSCORP presents the issues currently identified for 2003-2008:

- Improved Outdoor Recreational Services — The need to provide improved outdoor recreational services to meet the needs of a growing and changing population.
- Conservation of Natural Resources — The need to conserve and protect important natural resources and open spaces in a rapidly developing state.
- Funding — The need to ensure a stable and adequate source of funding to provide for the outdoor recreation needs of current and future generations.
- Partnerships — The need to create effective partnerships between all parties interested in outdoor recreation so they may pursue common interests more effectively.
- The State Parks System — The need to improve the North Carolina state parks system.

Chapter II details the supply, demand, and need for public recreation within the state including: the supply of outdoor recreation opportunities; a comparison of counties based on existing recreational opportunities and county population; recreation participation rates; and priorities for publicly funded outdoor recreation.

Chapter III describes the roles and responsibilities of federal, state, local, private, and commercial outdoor recreation providers in the state. Among the identified agencies that have roles are the North Carolina Wildlife Resources Commission (NCWRC) and the U.S. Department of the Interior. Although the NCSCORP identifies numerous providers as having roles and responsibilities, the focus of its efforts is on the actions that can be taken by state agencies and not by private or commercial providers

Chapter IV identifies trends affecting outdoor recreation. Specifically, the chapter includes population growth, increased development, increased participation, population shifts, quality of life issues, and activities trends as those important when considering statewide outdoor recreation. Chapter V contains an overview of the steps the state has taken to preserve and protect natural diversity and Chapter VI contains a federally mandated wetlands component, which was developed in coordination with the NCWRC. The final chapter includes actions the state and state agencies will be undertaking over the next five years to address the issues and needs identified in this plan. Such actions include: (1) improving outdoor recreational resources and services; (2) conserving natural resources; (3) funding issues; (4) effective partnerships; and (5) the state parks system.

The continued operation of the Yadkin Project, as proposed, is fully consistent with the state's recreation initiatives, as outlined in the NCSCORP. Although the NCSCORP includes no specific goals or recommendations for the Yadkin Project, the public recreation opportunities that the Project will continue to provide to residents and visitors contribute significantly to the state of North Carolina. There are approximately 40 significant public recreation sites at the Yadkin Project, many of which are directly managed by APGI. These facilities are provided free to the public, and make the Project reservoirs available for a wide array of recreational pursuits including boating, fishing, swimming, and picnicking. Moreover, APGI is proposing certain enhancements to these facilities to improve the recreational experience and to make recreational opportunities more accessible to the handicapped.

E.7.6 North Carolina Wildlife Action Plan

The North Carolina Wildlife Action Plan (Plan) was developed by the North Carolina Wildlife Resources Commission (NCWRC) to obtain annual funding allocations from the federal government to supplement existing state fish and wildlife conservation programs. In the process, the Plan aims to provide a conservation blueprint for agencies, organizations, industries, and academics across the state to advance the sound management of fish and wildlife resources into the future. Within the document, critical fish and wildlife resources and priority conservation needs associated with those resources are identified. The Plan is strengthened by all of the local, state, and regional conservation planning efforts that have preceded it and those efforts provide the foundation upon which the Plan is built. The Plan promotes proactive conservation measures to ensure cost-effective solutions instead of reactive measures enacted in the face of imminent losses.

Five goals form the core of the Plan: 1) to improve understanding of the species diversity in North Carolina and enhance the ability to make conservation or management decisions for all species, 2) to conserve and enhance habitats and the communities they support, 3) to foster partnerships and cooperative efforts among natural resource agencies, organizations, academia and private industry, 4) to support educational efforts to improve understanding of wildlife resources among the general public and conservation stakeholders, and 5) to support and improve existing regulations and programs aimed at conserving habitats and communities.

To meet these goals, the NCWRC engaged hundreds of people across a broad spectrum of agencies and organizations. Key themes that are perpetuated through the document include:

- The need to strengthen partnerships among natural resource agencies, organizations, academics, and individuals to meet shared goals and visions,
- The need to impact the landscape in a large-scale fashion, and to consider all components of a sustainable community of plants and animals,
- The need to gather additional information and fill knowledge gaps to advance our understanding of species and their habitats,
- The need to work cooperatively with private landowners to influence the conservation of natural resources across the majority of the state, and
- The need to educate and engage local governments, planning commissions, and urban publics about the importance of fish and wildlife conservation as a key component of successful land use planning.

The sections of the Plan build on one another in similar fashion to its development. Within the Approach section are summaries of key processes and exercises that were carried out in order to develop the Plan, including organizational frameworks, partnerships and stakeholder involvement, and the species prioritization process. Next, in The State of the State section provides an overview of the condition of the state's natural resources, threats affecting species and habitats in the state, key conservation partners, and challenges faced in program administration and efficacy are provided. In Statewide Conservation Strategies four broad-scale conservation issues, including strategies on urban wildlife issues, private lands wildlife management, land conservation priorities, and education and outreach are addressed. Following is the most detailed chapter of the report, entitled Species and Habitat Assessments & Conservation Strategies. This chapter, features the conservation needs of terrestrial resources within habitats across the three ecoregions of the state (the Southern Blue Ridge, Piedmont, and Mid-Atlantic Coastal Plain), aquatic resources within the 17 river basins in the state, and marine resources at the coast. Next, cross-cutting conservation needs among habitats and basins is addressed within Synthesis of Conservation Priorities. In Status and Trends Monitoring species and habitat monitoring needs are discussed. Ways to monitor the implementation of conservation activities, adapt to new information, and revise future iterations of the Plan are outlined in the final chapter, Implementation Monitoring, Adaptive Management, & Review and Revision Procedures.

The Plan was developed at the strategic level, meaning that the implementation of activities identified in the Plan should go one step further to consider the operational details of involving partners, setting explicit objectives and targets, detailing monitoring protocols, etc. The NCWRC has organized the format and content of the Plan to provide maximum utility as a resource to set conservation priorities. The Plan is designed to flow from beginning to end, but individual chapters and sections can also be used independently, as stand-alone documents. For example, users may turn to a particular habitat or basin section to review priority needs and recommendations pertaining specifically to their region or expertise area (e.g., the Yadkin-Pee Dee River basin, lakes and reservoir habitat). It is intended that the information provided within each chapter and section translates into clear and objective conservation planning at that level.

The Plan does not stipulate explicit guidelines and monitoring protocols for the management of fish and wildlife in the state. Rather, it is meant as a tool for setting management priorities. As such, APGI will use the Plan as a guide for setting conservation priorities. APGI has consistently worked cooperatively with resource agencies and the public to develop and institute sound conservation practices. One such example includes the Yadkin SMP, which was approved by FERC in 2000. The SMP identifies important natural resources and designates portions of the shoreline where these important resources are found as "Conservation Zones." The SMP contains a Shoreline Stewardship Policy, specifications for private recreation facilities, and subdivision access approval, multi-use facility permitting and industrial approval procedures as processes for ensuring sound conservation. Overall, the continued operation of the Yadkin Project, as proposed, is fully consistent with this Plan.

E.7.7 Fisheries and Wildlife Management Plan for the Yadkin-Pee Dee River Basin

The Fisheries and Wildlife Management Plan for the Yadkin-Pee Dee River Basin (Plan), prepared by the NCWRC in 2004, presents NCWRC's goals for the management of fish and wildlife resources in the Yadkin-Pee Dee River basin. The geographic area covered by the plan includes all lands and waters in the basin from the headwaters to the South Carolina state line. The plan describes the fish and wildlife resources in the basin as well as past and present management activities conducted by the state such as fish stocking, wildlife restoration, and habitat management.

The plan also describes additional resource information needs including:

- factors limiting the crappie populations of W. Kerr Scott and Narrows reservoirs and Lake Tillery,
- the assessment of stocks of striped bass and their hybrids in the Yadkin-Pee Dee reservoirs to determine optimum stocking rates and regulations,
- the effects of dams on aquatic habitat fragmentation
- the impacts of reservoir water level fluctuations on sportfish recruitment, and
- the status of nongame fish and wildlife species within the river basin.

In accordance with the Plan, NCWRC's goals for aquatic habitats include: (1) attaining the highest possible water quality classifications for all water; (2) encouraging buffers and other measures that will serve to protect aquatic habitats; (3) ensuring that stream restoration projects are undertaken where they are most needed to provide significant improvements to fish habitat; (4) protection of trees and vegetation along the shorelines of reservoirs experiencing development; (5) improved angling access; (6) protecting brook trout as a special resource; (7) reducing the spread of exotic aquatic species throughout the basin; and (8) providing passage around dams for aquatic fauna when feasible.

NCWRC's goals for terrestrial habitats include: (1) determining habitat needs and characteristics for game and non-game species of interest throughout the basin; (2) monitoring black bear, wild turkey, deer, and other wildlife populations; (3) maintaining and expanding (where feasible) bald eagle habitat protection; (4) protecting floodplain forests and their associated wetlands; (5) enhancing early successional habitat on farmlands; and (6) using land acquisition and conservation easements to mitigate loss of wildlife habitats.

The continued operation of the Project as proposed by APGI is consistent with the NCWRC's Yadkin-Pee Dee River Basin Management Plan. Moreover, many of the enhancements being proposed by APGI will further the goals of the NCWRC.

Water quality at the Project will be specifically addressed through the North Carolina 401 Certification process. As outlined in Exhibit E.2.7, APGI is proposing significant modifications to Project facilities to improve tailwater dissolved oxygen conditions. Once completed, the modifications to the Project will significantly enhance dissolved oxygen conditions in the tailwaters. Water quality in the Project reservoirs will continue to benefit from the rigorous shoreline buffer and building setback provisions of the Yadkin SMP. The required buffers serve to reduce pollutant contributions to the reservoirs from the immediate shoreline, and to protect and preserve natural aquatic and riparian habitats around the reservoirs.

Regarding reservoir fisheries, the continued operation of the Yadkin Project, as proposed, will maintain and enhance the high quality fisheries in all four Project reservoirs. APGI's proposal for the operation of High Rock under a revised guide curve, will decrease the overall impact of storage operations and the necessary annual cycle of reservoir drawdown, on fish and aquatic habitats. Further, the extension of the "near full" water level season for an additional six weeks in the spring and fall, is also expected to benefit reservoir fish. In addition, APGI is proposing to continue its voluntary efforts to enhance spring spawning conditions in the reservoirs by maintaining more stable water levels during the prime fish spawning season. This operation helps to maximize spawning success in the shallow water portions of the reservoirs, which provide the prime habitat for spawning.

Trees, wetlands and other forms of naturally occurring shoreline vegetation will continue to be protected under the provisions of the SMP. Provisions of the SMP provide a high level of protection for shoreline vegetation of all types, ensuring, to the fullest extent possible, that the impacts to reservoirs from development outside the Project boundary are minimized. In addition, APGI is proposing to work in cooperation with North Carolina Division of Water Resources (NCDWR) and NCWRC to monitor invasive, exotic aquatic species of concern and to periodically undertake control activities as needed. The primary focus of the monitoring program will be on species that may become established in the reservoirs.

Angler access to the Project reservoirs will continue to be provided in many areas. APGI is proposing to ensure the continued operation and maintenance of approximately 40 public recreation areas scattered throughout the Project, most of which provide angler access to the Project in the form of boat launches, fishing piers and bank fishing access. In addition, APGI is proposing to upgrade several of these facilities to provide access for the disabled, which should help to ensure that angler access is available to all.

APGI's proposal for the continued operation of the Yadkin Project also includes provisions designed to enhance terrestrial and wildlife resources. Since 2001, APGI has been conducting bald eagle and great blue heron nesting surveys at the Yadkin Project. These surveys have allowed resource agencies to closely track the status of breeding populations of these two species over time. APGI is proposing to continue to monitor bald eagle and great blue heron nesting at the Project by conducting annual nesting surveys in the spring of each year.

APGI is proposing to maintain two Project transmission line corridors with a cleared width of approximately 200 ft as outlined in Exhibit E.3.6.1. In the long-term, the widening of the transmission line corridor is expected to add additional mixed grass and shrub habitat for wildlife use and is expected to benefit game species such as white-tailed deer, turkey, and bobwhite, as well as some non-game species.

E.7.8 Additional Comprehensive Plans

In addition to the comprehensive plans that have been filed with FERC, APGI identified several other comprehensive plans that are applicable to the Yadkin Project which are also discussed below.

E.7.8.1 Basinwide Wetlands and Riparian Restoration Plan for the Yadkin-Pee Dee River Basin

The Basinwide Wetlands and Riparian Restoration Plan for the Yadkin-Pee Dee River Basin, prepared by NCDENR's Wetlands Restoration Program is a basinwide plan for targeting restoration sites in the Yadkin-Pee Dee River basin. The North Carolina Wetlands Restoration Program (NCWRP) was established by the North Carolina General Assembly in 1996 to restore, enhance, preserve, and create wetlands, streams and riparian areas to compensate for past, present, and future wetland losses. Basinwide Wetlands and Riparian Restoration Plans allow the NCWRP to achieve its goals.

The NCWRP has established the following basinwide restoration goals for the Yadkin-Pee Dee River basin: (1) protect and improve water quality to address measurable water quality problems; (2) increase floodwater retention capabilities; (3) protect and improve aquatic habitat to support and maintain aquatic species; (4) protect and improve wildlife and plant habitat to support and maintain the diversity of plants and animals; and (5) improve recreational opportunities by enhancing water quality, flood storage capacity, and aquatic and wildlife habitat.

To attain these goals, the NCWRP has developed a prioritization process for searching for restoration sites. The first step of the prioritization process involves identifying priority subbasins based on the need for restoration, based on water quality and the condition and scarcity of other valuable natural resources, and the restoration potential, based on land cover, land use, and the likely sources and types of water pollution. Within this first step, component hydrologic units within each priority subbasin were identified. The second step of the prioritization process involves evaluating sites in priority watersheds based on their ability to meet the goals established for the river basin.

The Yadkin-Pee Dee River basin priority watersheds in the vicinity of the Yadkin Project include: subbasins 04 (6 hydrologic units), 06 (5 hydrologic units), and 07 (3 hydrologic units). Subbasin 04 includes the watersheds of High Rock Reservoir, Muddy Creek, and South Fork Muddy Creek near Winston-Salem, Salisbury, and Spencer. Subbasin 06 includes the South Yadkin River and its tributaries located in Davie, Iredell, and Rowan counties. Subbasin 07 includes Abbott's Creek and is contained entirely in Davidson County.

The Basinwide Wetlands and Riparian Restoration Plan encourages other public or private resource management and protection groups to use the information contained within the Plan for their own planning purposes. The NCWRP operates the Wetlands Restoration Fund providing a voluntary opportunity for individuals to satisfy compensatory mitigation requirements of wetland regulatory programs. The NCWRP utilizes all payments to the fund in accordance with the goals and site selection criteria in the Basinwide Wetlands and Riparian Restoration Plan. Additionally, the NCWRP encourages private mitigation banks to use priority sites and priority watersheds identified in the Basinwide Wetlands and Riparian Restoration Plan.

Although the Basinwide Wetlands and Riparian Restoration Plan does not contain any specific management plans or objectives for the Yadkin Project reservoirs, the continued operation of the Yadkin Project as proposed, is consistent with the Plan's overarching goals for the basin. APGI's proposal for the Project includes many provisions designed to address existing water quality issues at the Project, and to enhance Project water quality including both direct improvements to water quality (e.g., increase tailwater dissolved oxygen conditions) and indirect measures designed to enhance reservoir water quality (e.g., buffer and set-back provisions of the SMP). APGI is also proposing measures designed to enhance aquatic habitats at the Project, particularly at High Rock Reservoir where under the proposed revised guide curve for the reservoir, wetlands and other important aquatic habitats are expected to benefit considerably from a reduced winter drawdown and an extension of the "near full" reservoir water level season in both the spring and fall.

Several other measures for the protection, mitigation and enhancement of Project aquatic and terrestrial resources being proposed by APGI, also support the goals of Basinwide Wetlands and Riparian Restoration Plan, including APGI's proposals to monitor invasive, exotic aquatic plans, monitor tailwater dissolved oxygen and temperature conditions, conduct bald eagle nesting surveys, and develop a rare, threatened and endangered (RTE) species management plan. In addition, APGI's proposals for enhancing public recreation opportunities at the Project support the Plan's goals for improving recreational opportunities in the river basin.

E.7.8.2 North Carolina State Water Supply Plan

The North Carolina State Water Supply Plan (Plan) is a compilation of over 500 Local Water Supply Plans developed by local government water systems to assess their water supply needs over the next 20 years. The most recent version of the State Water Supply Plan, dated January 2001, is based on the most recent Local Water Supply Plans, most of which were developed during 1998 and 1999. The NCDWR carefully reviewed the local plans and worked with local governments to assure that they were as complete and accurate as possible. In addition, the Plan incorporates the 1999 water withdrawal registration data that other water users submitted during

2000. The Plan is to be updated at five year intervals, with each update reflecting the most recent Local Water Supply Plans and water withdrawal registration data.

The Plan describes the major water supply issues facing state and local governments now and over the next 5-10 year period. Such issues include how to address the serious decline in ground water levels in portions of the central coastal plain. The Plan presents relevant information for local communities and their consultants to use when planning for their future water supply needs, such as water conservation, additional water supply alternatives, and the various state regulations and programs affecting water supply planning.

A draft State Water Supply Plan was released in January 2000, based on 1992 Local Water Supply Plan data. In addition to incorporating more recent data, the final version also reflects public and agency comments received during 14 public meetings that were held across the state during June and July 2000 and other written comments received throughout the year.

The Plan states that North Carolina is fortunate in having a generous natural supply of water but it concedes that the state is beginning to experience some problems in areas where somewhat limited natural availability of water is coupled with high demand or competition among water users. Some of these emerging pressure points are the Central Coastal Plain, where the Cretaceous aquifers have a relatively slow recharge rate; the headwater areas of the Piedmont river basins, where streamflows are greatly reduced during dry weather; and some areas near the coast and on the Outer Banks, where the natural availability of fresh water is limited. In cases such as these, the Plan recommends that residents, community leaders, and the economic development community need to recognize that water demands have to be managed and matched to available supplies to prevent water from becoming the limiting factor on economic growth. Doing so will require a determined effort by local governments, water users, and state government working together to orchestrate the right combination of monitoring, planning, and regulation.

The Plan also highlights the importance of monitoring the availability of ground and surface water supplies and good data on all types of water use. These data on water availability and water use can then be used as a foundation for planning for future water needs and that such planning is necessary to work out the specific solutions to future water supply needs. The Plan also states that regulation is needed to avoid depletion of water supplies or to create a fair allocation of water among competing needs in some cases. It asserts that state statutes should also regulate the transfer of surface water from one river basin to another to assure that resources in both basins are adequately protected.

Ultimately, the Plan makes several recommendations. These recommendations are as follows:

- In areas of the Coastal Plain, overpumping of ground water is resulting in serious water level declines and encroachment of salt water into fresh water portions of the Black Creek and Upper Cape Fear aquifers. It is essential that water withdrawals be reduced in those areas to protect the aquifers and ensure that they remain a long-term, regional water supply. To address this issue, the Environmental Management Commission has enacted a Central Coastal Plain Capacity Use Area for a 15-county area in eastern North Carolina.

The rule, effective as of August 2002, requires water use permits for groundwater withdrawals above 100,000 gallons per day, along with phased-in pumping reductions in specific problem areas. Parallel to this regulatory response, water systems in the Central Coastal Plain need to begin planning for new sustainable water supplies and expanding their water conservation efforts to assure that water is available to support the region's economy.

- Water systems whose average daily water demands already exceed 80 percent of their available water supply should be actively managing their water demand and pursuing additional water supplies. These systems are at greater risk of experiencing water shortages during periods of peak water use, especially during drought. The NCDWR can assist these systems with their water conservation and water supply development efforts to help assure that adequate water supplies are maintained.

- All water systems should develop a Water Shortage Response Plan. While drought is a common cause of water shortages, other events, such as mechanical failures, pipe breaks, or contamination of water sources, can also result in water shortages. Planning ahead for such occurrences minimizes the time needed to respond to emergencies and provides a strategy for communities to follow.

- Water is a regional resource, and some local governments will need to seek regional solutions to water supply issues. Regional water supply planning and management is critical to successful long-term protection of the quality and quantity of water available to citizens and businesses in North Carolina. The increasing costs and requirements for planning and permitting new facilities, treating water, and developing additional water sources will make it less practical for many communities to act independently to meet future water supply needs.

- A number of state programs and regulations affect water supply planning efforts by local governments, presenting challenges to, and perhaps even discouraging innovative water supply solutions, such as aggressive water reuse, aquifer storage and recovery, or regional water supply projects involving multiple river basins. The General Assembly, state agencies, local governments, and consultants should work together to ensure that a regulatory framework exists that allows innovative water supply projects such as these to be reasonably developed without compromising health and environmental standards.

The continued operation of the Yadkin Project, as proposed, is consistent with the North Carolina State Water Supply Plan. The Yadkin Project is used as water supply by several municipalities including the City of Salisbury, the City of Albemarle, Stanly County and the Town of Denton. APGI's proposal for the continued operation of the Yadkin Project will have no adverse impacts on these water supplies. Moreover, APGI is proposing to work with the states of North Carolina and South Carolina to develop a Low Inflow Protocol for the Yadkin Project which, when implemented, will help to balance water supply and economic, habitat, and recreational needs during times of low flow or drought.

E.7.8.3 Restoration Plan for the Diadromous Fishes of the Yadkin-Pee Dee River Basin: North Carolina and South Carolina

The U.S. Fish and Wildlife Service (USFWS), along with the National Marine Fisheries Service (NMFS), the NCWRC, and the South Carolina Department of Natural Resources (SCDNR) have developed a basinwide Restoration Plan for the Diadromous Fishes of the Yadkin-Pee Dee River Basin: North Carolina and South Carolina (February, 2006). As the title suggests, the purpose of the Plan is the restoration of historical diadromous fish stocks of the Yadkin and Pee Dee River Basin of North Carolina and South Carolina.

The diadromous fish species identified by the Plan as those "historically known to utilize the Yadkin and Pee Dee Rivers for spawning and, or rearing" include the American shad, hickory shad, blueback herring, striped bass, Atlantic sturgeon, shortnose sturgeon and American eel. According to the Plan, these species historically ascended the Yadkin and Pee Dee rivers to locations above the Fall Line. However, the Plan states that these fish stocks have been diminished relative to historical levels. The Plan attributes some of the factors that likely contributed to the diminished state of these fish stocks to continued harvest of some species of diadromous fishes, poor water quality conditions in critical habitats, and alterations in instream flows and access to suitable spawning and nursery areas.

As a corrective measure for the diminished diadromous fish stocks, the Plan provides a framework for rebuilding populations of these stocks. This framework includes improving instream flows, protecting and enhancing habitat, and restoring access to former spawning and rearing habitats. More specifically, the Plan aims to: (1) restore and maintain instream flows necessary for maintenance of riverine habitats that support fish migration, spawning, and maturation; (2) maintain, restore and enhance water quality as needed to support all various fish life stages; (3) identify and implement opportunities to conserve, protect, and restore riverine and associated wetland habitats, and to improve and maintain habitat quality; (4) evaluate restoration of access to historic spawning and, or rearing habitats; and (5) develop and implement safe and effective downstream passage where upstream passage is provided. It is the intent of the involved agencies to establish a "living plan" to be revised as new information becomes available and as restoration goals are achieved.

The Plan provides a sequential approach to restoring riverine habitats and for providing safe and effective fish passage. The Plan's approach includes: (1) identifying target species; (2) determining historic ranges of these fish; (3) characterizing remaining habitat; (4) determining population size potential; and, (5) setting priorities for restoration based on sub-basin characteristics, passage needs, opportunities, habitat availability, and habitat quality.

To implement the Plan, the development of partnerships is anticipated. The Plan lists the prospective partners as the NCWRC, SCDNR, NMFS, USFWS, U.S. Environmental Protection Agency (USEPA), U.S. Army Corps of Engineers (USACE), Progress Energy, APGI, non-governmental organizations, local governments, the private sector, and others who manage, use, or enjoy the public-owned water resources of the Yadkin and Pee Dee Rivers.

Continued operation of the Yadkin Project, as proposed, is fully consistent with the Plan. APGI proposes to work in consultation with the USFWS and other fishery agencies to develop a Diadromous Fish Passage Plan for the Yadkin Project that is consistent with the goals of the agencies' Diadromous Fish Restoration Plan for the Yadkin-Pee Dee River. The primary focus of the Diadromous Fish Passage Plan will be on supporting the overall restoration effort for American shad and American eel, and for providing appropriate passage, when needed.

E.7.8.4 Croatan and Uwharrie National Forests - Land and Resource Management Plan: 1985- 2000

The U.S. Forest Service (USFS) has developed a Land and Resource Management Plan: 1985-2000 (referred to as the Forest Plan). The purpose of the Forest Plan is to guide natural resource management activities and establish management priorities for the Croatan and Uwharrie National Forests. More specifically, the Forest Plan:

- Establishes the management direction and goals for the forests;
- Specifies the standards, approximate timing, and location for practices necessary to manage the forests; and
- Establishes the monitoring and evaluation required to ensure that the direction is carried out, and to evaluate the reliability of estimated outputs and effects.

The plan describes protection of the land, resource management practices, outputs of good and services, and the availability and suitability of lands for varied purposes. The Forest Plan includes prescriptions for revision on a 10-year cycle or at least every 15 years. Although the current plan has not yet been revised, the revision/update process has begun. The Forest Plan for 1985-2000 is currently being utilized until the revision process is complete.

The Forest Plan identifies eight major issues facing the forests including: transportation; lands; pocosins (forested bogs); wildlife and fish; vegetation; recreation; off-road vehicles (ORVs); and fire management.

For each of the major issues, the Forest Plan identifies the present situation and then describes the plan's response to each issue. The Forest Plan also provides general forest management directives. Approximately one-third of the Uwharrie National Forest (UNF) is to be managed as "commercial timber and hiking." This management practice involves thinning stands every 40-80 years and allowing visitor access, mainly on foot and horseback. Another one-third of the UNF is managed as "old timber and hiking." These areas allow tree harvesting for wood and wildlife habitat, often leaving old growth. These areas also have few roads (which are all closed) and allow visitor access mainly on foot and horseback. Approximately 23 percent of the UNF is managed as "commercial and car-touring areas." These areas allow harvesting every 40- 80 years and allow vehicular access and ORV use on most roads. The remaining areas in the UNF are maintained as wilderness areas (approximately 10 percent) or are used for recreation, research, or administrative areas (less than 2 percent).

Of relevance to the Yadkin Project, are UNF lands that are adjacent to portions of Narrows and Falls reservoirs. Certain public recreation areas located within the UNF provide direct access to

Yadkin Project waters. These UNF recreation access areas are managed by the USFS in accordance with the Forest Plan. Additionally, APGI owns a narrow strip of non-Project shoreline property around Narrows Reservoir that, in accordance with the Yadkin SMP, is generally managed as "Yadkin-Managed Buffer."

The continued operation of the Yadkin Project, as proposed, is fully consistent with the Forest Plan. APGI has worked in close consultation with the USFS throughout the relicensing process to ensure that any issues or concerns about Project impacts on the UNF were appropriately studied and addressed. All of the UNF recreation facilities that provide access to the Project were included in the recreation facility inventory and use assessments that were conducted as part of the relicensing study program. In addition, aesthetic and recreation issues that were solely of concern to the USFS were studied as well. None of these studies identified any ongoing impacts resulting from the Project or its operations that are impacting the UNF or are inconsistent with the current Forest Plan.

E.7.8.5 Habitat Management Guidelines for the Bald Eagle in the Southeast Region

The USFWS, Southeast Region has developed Habitat Management Guidelines for the Bald Eagle in the Southeast Region (Guidelines). The purpose of the Guidelines is to maintain and/or improve the environmental conditions that are required for the survival and well-being of bald eagles in the Southeastern United States. The Guidelines are designated essentially for application in bald eagle-human activity (principally land development) conflicts. The emphasis of the Guidelines is to avoid or minimize detrimental human-related impacts on bald eagles, particularly during nesting season.

The guidelines describe the nesting cycles of bald eagles and the importance of their nesting sites. Furthermore, the Guidelines define two management zones important for maintaining bald eagle habitat: primary zone and secondary zone. The guidelines recommend specific restrictions in each of these zones to protect known nesting areas. Recommended restrictions in the primary and secondary zones surrounding known bald eagle nesting sites include the restriction of development and logging and the use of toxic chemicals. The Guidelines also provide suggested measures to ensure the protection of feeding areas and known roosting sites. Like the recommended protections for known nesting sites, the suggested measures include restrictions on the use of toxic chemicals and development.

Continued operation of the Yadkin Project, as proposed, is fully consistent with the USFWS Habitat Management Guidelines for bald eagles. APGI is proposing several measures that will enhance bald eagles at the Project including a continuation of annual bald eagle nesting surveys. In addition, provisions of the Yadkin SMP that are designed to preserve a 100-foot building set-back and buffer in natural vegetation, are expected to continue to enhance conditions for bald eagle use of the reservoirs by maintaining critical natural vegetation, including the large trees that eagles typically use for nesting and perching, along the reservoir shorelines.

E.7.8.6 Schweinitz's Sunflower Recovery Plan

The USFWS, Southeast Region developed a Recovery Plan for Schweinitz's sunflower, *Helianthus schweinitzii* (Plan) in 1994. The Plan describes the distribution, habitat, and life history of the federally and North Carolina endangered Schweinitz's sunflower. This plant species is believed to occur only in the lower piedmont of south-central North Carolina and north-central South Carolina, with only thirty-five known populations centered around Charlotte, North Carolina, and Rock Hill, South Carolina.

According to the Plan, Schweinitz's sunflower is known to occur in four of the five counties surrounding the Yadkin Project, including Davidson, Montgomery, Rowan, and Stanly counties. The known populations of Schweinitz's sunflower are found along roadsides and in power line clearings, old pastures, and woodland openings in generally poor, clayey and/or rocky soils. Most extant populations occur in road rights-of-way, and, according to the Plan, Schweinitz's sunflower requires active management to maintain optimal habitat.

The recovery strategy for Schweinitz's sunflower involves inventorying for viable populations, particularly locating or establishing additional populations in natural habitat or in areas where natural habitat can be restored and maintained. Furthermore, the Plan describes the recovery criteria for reclassifying *Helianthus schweinitzii* from endangered to threatened and recommends actions needed for recovery of this species including: implementing emergency protective management of known remnant populations, surveying suitable habitat for additional populations and potential reintroduction sites, protecting viable populations through a range of protection tools, monitoring existing populations, conducting research on the biology of the species and on suitable management tools for maintaining the natural ecosystem in which it occurred, maintaining cultivated sources, implementing management of protected populations, enforcing laws protecting the species and/or habitat, developing materials to educate the public about species status and recovery plan objectives, and annually assessing the success of the recovery effort.

Continued operation of the Yadkin Project, as proposed, is consistent with the USFWS recovery plan for Schweinitz's Sunflower. As discussed in Exhibit E.3.13.4, APGI's RTE Species Survey found that implementation of proposed modifications to existing Project operations is not expected to have any significant impact (positive or negative) on RTE species, including Schweinitz's Sunflower which was found at Falls Reservoir. Additionally, APGI is proposing to prepare an RTE Species Management Plan for the Project, which will detail actions to be taken by APGI and others to help protect RTE species and their habitats over the term of a new license.

Exhibit E.8

Relicensing Consultation Record

E.8 Relicensing Consultation Record

In accordance with 18 CFR § 4.38, APGI consulted with the required resource agencies in addition to interested stakeholders in the development of this License Application. A complete summary of the consultation process is described in the Executive Summary to this License Application. In addition, tables provided at the conclusion of each major section of Exhibit E summarize the consultation regarding that particular resource. The following table summarizes the consultation record related to miscellaneous relicensing issues at the Yadkin Project including issues regarding socio-economic issues, operations modeling, and relicensing process and administration. A complete record of all consultation regarding the relicensing of the Yadkin Project is provided in Appendix E-25.

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues

From	Date	To	Description
APGI	September 2002	Stakeholders	Initial Consultation Document distributed to stakeholders
APGI, Gene Ellis	October 22, 2002	Stakeholders	Letter announcement of November 2002 Yadkin Project relicensing public meetings
APGI, Jody Cason	October 23, 2002	Stakeholders	Email announcing November 2002 Yadkin Project relicensing public meetings
City of Lexington, North Carolina, Richard Thomas	October 28, 2002	APGI	Resolution in support of stabilizing the water level of High Rock Lake
APGI	November 6, 7 and 13, 2002		Presentation from Yadkin Project Relicensing Public Meetings
APGI	November 6-7 and 13, 2002	Meeting Participants	Handouts distributed at relicensing public meetings
Nancy Ruppert	November 7, 2002	APGI	Initial relicensing comments
Henry Booke	November 13, 2002	APGI	Email re: initial relicensing comments
Mike	November 16, 2002	APGI, Pat Shaver	Email re: initial relicensing comments
Saveourlake.org, Karyn Musgrave	November 23, 2002	APGI, Pat Shaver	Email re: initial relicensing comments
Rainer Muth	December 9, 2002	APGI	Initial relicensing comments
APGI, Jody Cason	December 23, 2002	Marty Barfield and David Brown	Email regarding upcoming IAG organizational meeting in early 2003
City of Georgetown, SC, Lynn Wood Wilson	January 2, 2003	APGI, Pat Shaver	Letter re: initial relicensing comments and request for studies
W.R. (Randy) Dredge	January 5, 2003	APGI , Pat Shaver	Letter re: initial relicensing comments
Steve Lohr	January 6, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
Pee Dee River Coalition, Frank Willis	January 7, 2003	APGI, Pat Shaver	Letter re: initial relicensing comments and request for studies

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
Duke Power Buck Steam Station, Drew Garman	January 8, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
South Carolina Department of Natural Resources, Robert Duncan	January 9, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
North Carolina Division of Water Resources, John Morris	January 9, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments
Pee Dee River Coalition, Marty Barfield	January 9, 2003	APGI	E-mail inquiring about an Issue Advisory Group dealing with Project operations
SaveHighRockLake.org, Jean Creed	January 9, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
North Carolina Watershed Coalition, Scott Jackson	January 9, 2003	APGI	Initial relicensing comments
High Rock Lake Association, Larry Jones	January 9, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
Anchor Downs Property Owners Association, Richard Martin	January 9, 2003	APGI/ FERC	Letter re: Yadkin Project ICD comments
Linda Bell	January 9, 2003	APGI, Pat Shaver	Initial relicensing comments
Ed and Beth Solseth	January 9, 2003	APGI	Initial relicensing comments
Jack Walters	January 9, 2003	APGI, Pat Shaver	Initial relicensing comments
Roy Rowe	January 10, 2003	APGI	Initial relicensing comments
Weyerhaeuser Co., W. Martin Barfield	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
Yadkin-Pee-Dee Lakes Project, Ann Liebenstein Bass	January 10, 2003	APGI, Pat Shaver	Letter re: Yadkin Project ICD comments
U.S. Forest Service, John Ramey	January 10, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
River Rats Inc, Herb Ennis	January 10, 2003	APGI	Initial relicensing comments
City of Salisbury, North Carolina, David Treme	January 10, 2003	APGI, Gene Ellis	Letter re: initial relicensing comments and request for studies
SaveHighRockLake.org, Tom and Linda Webster	January 10, 2003	APGI	Initial relicensing comments
Denny and Cheryl Cottingham	January 11, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
John Ellington	January 11, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
Warren Godwin	January 11, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
Mark DiRienzo	January 12, 2003	APGI, Pat Shaver	Email re: initial relicensing comments

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
Rebecca DiRienzo	January 12, 2003	APGI, Pat Shaver	Email re: initial relicensing comments
North Carolina Wildlife Resources Commission, Chris Goudreau	January 12, 2003	APGI, Gene Ellis	Letter re: first stage consultation comments and "Hydropower Relicensing Issues, Standards, and Mitigation"
South Carolina Coastal Conservation League and American Rivers, Gerrit Jobsis and David Sligh	January 12, 2003	APGI, Gene Ellis	Letter re: Yadkin Project ICD comments
Land Trust for Central North Carolina, Jason Walser	January 12, 2003	APGI	Initial relicensing comments
Stuart and Rebecca Andrews	January 12, 2003	APGI, Pat Shave	Email re: initial relicensing comments
Henry Sobiech	January 12, 2003	APGI, Pat Shave	Email re: initial relicensing comments
Anne Price	January 13, 2003	APGI, Pat Shave	Email re: initial relicensing comments
Robert Amos		APGI	Initial relicensing comments
Brittany Bell		APGI	Initial relicensing comments
Nick Bell		APGI	Initial relicensing comments
Roger and Annette Bell		APGI	Initial relicensing comments
Ralph Brinkley, Sr.		APGI	Initial relicensing comments
William Carr		APGI	Initial relicensing comments
George Carter		APGI	Initial relicensing comments
Concerned Property Owners of High Rock Lake, Charles Sink		APGI	Initial relicensing comments
Kevin Eddinger		APGI	Initial relicensing comments
Michael Gregory		APGI	Initial relicensing comments
Judy Heffner		APGI	Initial relicensing comments
High Rock Lake Coalition, Lou Adkins		APGI	Initial relicensing comments
Mary Hotchkiss		APGI	Initial relicensing comments
Charles Jensen		APGI	Initial relicensing comments
David Kelley		APGI	Initial relicensing comments
B. Thomas Lee		APGI	Initial relicensing comments
Robert Loflin		APGI	Initial relicensing comments
E. Wayne Mabry		APGI	Initial relicensing comments
Dan Patterson		APGI	Initial relicensing comments
Piedmont Boat Club, Dan Nicholson		APGI	Initial relicensing comments
James Reep		APGI	Initial relicensing comments
SaveHighRockLake.org, William Carr		APGI	Initial relicensing comments

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
SaveHighRockLake.org, Horris Conner		APGI	Initial relicensing comments
SaveHighRockLake.org, Rick Conner		APGI	Initial relicensing comments
SaveHighRockLake.org, Von Everhart		APGI	Initial relicensing comments
SaveourLake.org, David Halpin		APGI	Initial relicensing comments
SaveHighRockLake.org, Reid Harvey, Jr.		APGI	Initial relicensing comments
SaveHighRockLake.org, Reid Harvey, Sr.		APGI	Initial relicensing comments
SaveourLake.org, Marcell Hogan		APGI	Initial relicensing comments
SaveHighRockLake.org, Sandy & John Lockwood		APGI	Initial relicensing comments
SaveHighRockLake.org, Annmarie & Mike Medlin		APGI	Initial relicensing comments
SaveHighRockLake.org, James Melton		APGI	Initial relicensing comments
SaveHighRockLake.org, Robert Petree		APGI	Initial relicensing comments
SaveHighRockLake.org, Carol Ray		APGI	Initial relicensing comments
SaveHighRockLake.org, Jean Rushing		APGI	Initial relicensing comments
SaveHighRockLake.org, Hollye Robinson		APGI	Initial relicensing comments
SaveHighRockLake.org, Mary Segers		APGI	Initial relicensing comments
SaveHighRockLake.org, Rusty Sloop		APGI	Initial relicensing comments
SaveourLake.org, Kathleen Yothers		APGI	Initial relicensing comments
Gregg Seitz		APGI	Initial relicensing comments
Mike Stroud		APGI	Initial relicensing comments
Howard Swicegood		APGI	Initial relicensing comments
Evelyn Tate		APGI	Initial relicensing comments
Doug and Lisa Tomlin		APGI	Initial relicensing comments
Scott Yates		APGI	Initial relicensing comments
APGI, Jody Cason	February 7, 2003	Stakeholders	Draft agenda for Issue Advisory Group Organizational Meeting on February 28, 2003 (email)

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
APGI	February 28, 2003	IAG Organization-al Meeting Participants	Handouts at Issue Advisory Group Organizational Meeting included : an agenda, meeting guidelines, and fact sheets
APGI, Jody Cason	March 7, 2003	All IAGs	March 2003 IAG Meeting Schedule (email)
APGI, Jody Cason	March 25, 2003	All IAGs	April 2003 IAG Meeting Schedule (email)
APGI, Jody Cason	June 5, 2003	All IAGs	Final meeting summary for February 28, 2003 Issue Advisory Group Organizational Meeting (email)
APGI, Jody Cason	June 5, 2003	CE IAG	Final summary of March 14, 2003 County Economic Impacts IAG meeting (email)
APGI, Jody Cason	June 5, 2003	OM IAG	Final summary of March 14, 2003 Operations Model IAG meeting (email)
City of Salisbury, NC, David Treme	June 17, 2003	APGI, Gene Ellis	Letter requesting appropriate monitoring and studies
APGI, Jody Cason	June 27, 2003	All IAGs	Email update on IAG work
APGI, Jody Cason	July 2, 2003	OM IAG	Agenda for July 7, 2003 Operations Model IAG meeting (email)
APGI	July 7, 2003	OM IAG	Presentation from the July 7, 2003 Operations Model Meeting
APGI, Gene Ellis	July 21, 2003	OM IAG	Email about the Operations Model
APGI, Gene Ellis	July 23, 2003	OM IAG	Email about the Operations Model
APGI	July 29-31, 2003		Presentation from the Yadkin Project Relicensing Public Meetings
APGI, Jody Cason	August 29, 2003	OM IAG	Agenda for September 4, 2003 Operations Model Meeting (email)
APGI, Jody Cason	September 2, 2003	All IAGs	Schedule for upcoming IAG meetings (email)
APGI, Jody Cason	September 23, 2003	All IAGs	Schedule for October and November 2003 IAG meetings (email)
APGI, Jody Cason	October 20, 2003	OM IAG	Final summary of September 4, 2003 Operations Model Meeting (email)
APGI, Jody Cason	December 29, 2003	CE IAG	Final summary of November 5, 2003 County Economic Impacts IAG meeting (email)
APGI, Jody Cason	December 29, 2003	OM IAG	Final summary of November 6, 2003 Operations Model Meeting (email)
APGI, Jody Cason	January 15, 2004	CE IAG	Distribution of Surrounding Counties Economic Impact Analysis Draft Study Plan (email)
APGI, Jody Cason	March 17, 2004	All IAGs	Update on Project relicensing activity (email)
APGI, Jody Cason	April 12, 2004	All IAGs	Email update on how to access relicensing study reports

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
APGI, Jody Cason	April 13, 2004	All IAGs	Request for objections to providing a list to the media of IAG members (email)
APGI, Jody Cason	April 19, 2004	CE IAG	Final summary of February 4, 2004 County Economic Impacts IAG meeting (email)
APGI, Jody Cason	April 22, 2004	CE IAG	Distribution of Surrounding Counties Economic Impact Analysis Final Study Plan (email)
APGI, Jody Cason	April 25, 2004	All IAGs	Agenda for joint meeting of all Yadkin Project Issue Advisory Groups on May 4, 2004 (email)
APGI, Jody Cason	May 3, 2004	OM IAG	Operations modeling update (email)
APGI, Jody Cason	June 17, 2004	Stakeholders	Schedule and agenda for June/July 2004 public meetings (email)
APGI, Jody Cason	June 22, 2004	All IAGs	Media advisory for June/July 2004 public meetings (email)
APGI	June 29-30 and July 1, 2004		Presentation for Yadkin Project Relicensing Public Meetings
High Rock Lake Association, Larry Jones	August 9, 2004	APGI, Jody Cason, and OM IAG	Email request for update on status of the US Geological Survey (USGS) review of the operations modeling dataset
APGI, Jody Cason	August 10, 2004	OM IAG	Email update on status of the US Geological Survey (USGS) review of the operations modeling dataset
High Rock Lake Association, Larry Jones	August 21, 2004	APGI, Jody Cason, and OM IAG	Email request for schedule of any planned lowering of Project reservoir levels
APGI, Jody Cason	August 31, 2004	All IAGs	Email, on behalf of NCWRC, announcing availability of the Fisheries and Wildlife Management Plan for the Yadkin-Pee Dee River Basin
APGI, Jody Cason	September 2, 2004	All IAGs	Final meeting summary for May 4, 2004 joint IAG Meeting (email)
APGI, Jody Cason	September 17, 2004	All IAGs	Schedule of October and November 2004 IAG Meetings (email)
APGI, Jody Cason	September 24, 2004	All IAGs	Email update on recent relicensing activity
APGI, Jody Cason	October 19, 2004	OM IAG	Agenda for Operations Model IAG meeting on November 4, 2004 (email)
APGI, Jody Cason	December 17, 2004	All IAGs	December 2004 Issue Advisory Group Update (email)
APGI, Jody Cason	January 11, 2005	OM IAG	Final summary of November 4, 2004 Operations Model Meeting (email)
APGI, Jody Cason	January 14, 2005	All IAGs	Email announcing February 2005 schedule for Yadkin Project meetings

Table E.8-1: Consultation Record Related to Miscellaneous Relicensing Issues (continued)

From	Date	To	Description
APGI, Jody Cason	February 20, 2005	All IAGs	Email announcing March 2005 schedule for Yadkin Project meetings
APGI, Jody Cason	March 17, 2005	All IAGs	March 2005 Issue Advisory Group Update (email)
APGI, Jody Cason	April 20, 2005	All IAGs	Update on IAG work (email)
APGI, Jody Cason	June 16, 2005	CE IAG and RASM IAG	Distribution of agenda for June 30, 2005 RASM IAG and County Economic Impacts IAG joint meeting and Recreation Economic Impacts Draft Study Report (email)
APGI, Jody Cason	June 28, 2005	CE IAG and RASM IAG	Distribution of draft report for County Economic Impacts of APGI's Yadkin Project Study (email)
APGI, Jody Cason	July 31, 2005	All IAGs	July 2005 Issue Advisory Group Update (email)
Salisbury-Rowan Utilities, City of Salisbury, Matt Bernhardt	August 4, 2005	APGI, Gene Ellis	Comments on County Economic Impacts Draft Report (memo)
APGI, Jody Cason	August 24, 2005	CE IAG and RASM IAG	Final meeting summary for June 30, 2005 joint RASM IAG and County Economic Impacts IAG meeting (email)
City of Salisbury, Randy Tinsley	August 24, 2005	APGI, Jody Cason	Comments on County Economic Impacts Draft Report (email)
APGI, Jody Cason	November 18, 2005	All IAGs	November 2005 Issue Advisory Group Update (email)
APGI, Jody Cason	December 30, 2005	CE IAG	Email distribution of the County Economic Impacts of APGI's Yadkin Project Final Study Report
APGI, Jody Cason	January 23, 2006	All IAGs	Notice for February 7, 2006 Substantive Disagreement Meeting (email)
APGI, Jody Cason	January 31, 2006	All IAGs	Additional information about the February 7, 2006 Substantive Disagreement Meeting (email)
APGI, Jody Cason	April 2, 2006	All IAGs	Final summary of the February 7, 2006 Substantive Disagreement Meeting (email)

Notes: APGI – Alcoa Power Generating Inc.
CE IAG – County Economic Impacts IAG
IAG – Issue Advisory Group
OM IAG – Operations Model IAG
RASM IAG – Recreation, Aesthetics, and Shoreline Management IAG

Exhibit E.9

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E.9 References

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Exhibit F

Design Drawings and Supporting Design Report

Exhibit F - Design Drawings and Supporting Design Report

Pursuant to 18 CFR § 388.112, Exhibit F design drawings showing the major Project structures and a Supporting Design Report are being withheld by Alcoa Power Generating Inc. as Critical Energy Infrastructure Information (CEII). The CEII material is contained in Volume II of this License Application. Procedures for obtaining access to CEII may be found at 18 CFR § 388.113. Requests for access to CEII should be made to the Federal Energy Regulatory Commission's CEII Coordinator.

Exhibit G

Project Map

Exhibit G – Project Map

Exhibit G for the Yadkin Project includes 64 sheets that define the location of the Project, principal features, Project boundary and nearby federal lands. Pursuant to 18 CFR § 388.112, Exhibit G has been labeled by Alcoa Power Generating Inc. as Non-Internet Public (NIP) information. This NIP material is contained in Volume III of this License Application. Access to this NIP information is available at the Federal Energy Regulatory Commission's Public Reference Room.

Exhibit H

Information Required for New License

Exhibit H – Information Required for New License

H.1 Plans and Ability of the Applicant to Operate and Maintain the Project

H.1.1 Plans to Increase Capacity or Generation

Throughout the term of the current license, Alcoa Power Generating Inc. (APGI) has maintained the Yadkin Project (Project) to maximize generation value and efficiency. These efforts have included structural modifications, unit refurbishments, generator rewinds, and runner replacements. Under the new license, APGI plans to continue its refurbishment and upgrade program to ensure efficient and reliable electric service in the future. Unit refurbishments and potential upgrades at High Rock, Tuckertown, Narrows, and Falls Developments are proposed for completion under the new license (see Exhibits B.2 and E.2.7).

H.1.2 Plans to Coordinate Project Operation with Other Water Resource Projects

Historically, APGI has coordinated the operation of its facilities with the Tillery and Blewett Falls developments owned by Progress Energy downstream. This coordination has taken place pursuant to an agreement between the parties that dates from 1928 but which has been modified over the years, most recently in 1968, and the related FERC order issued in March 1968. Further modifications to this arrangement may be necessary depending on the terms of a new license for the Yadkin Project.

APGI schedules energy availability by Thursday noon for the coming week, allowing APGI to determine subsequent water flows downstream. Operating schedules are shared daily with the downstream project owner to communicate delivery of water. The U.S. Army Corps (USACE) operates and maintains a flood control project, W. Kerr Scott upstream of the Yadkin Project. Discharges from the USACE project are available on the Internet. APGI's operation of its reservoirs will be within the allowable drawdown limits of the license.

H.1.3 Plans to Coordinate Project Operation with Other Electrical Systems

The APGI generation and transmission system operates as a North American Electric Reliability Council (NERC) Balancing Authority. The facilities are operated in compliance with NERC and Southeastern Electric Reliability Council (SERC) guidelines.

The Project facilities are operated from the Dispatch Center in Alcoa, Tennessee, which is staffed 24 hours per day with NERC-certified operators. In addition, there is a backup Dispatch Center in Badin, North Carolina, that is equipped for full functionality should the need arise.

The Project is connected to the Duke Energy transmission system and the Progress Energy transmission system via APGI's 100 kilovolt (kV) transmission facilities.

H.2 Need of Applicant for Electricity Generated by the Project

Alcoa Inc. (Alcoa) owns all of the outstanding common stock of APGI and is the nation's largest producer of aluminum and aluminum products. Alcoa has several aluminum smelters and related operations in the United States, including extensive operations in the southeast and midwest regions, particularly in North Carolina, South Carolina, Indiana, and Tennessee. Aluminum smelting requires large amounts of low cost, reliable electricity, and energy can comprise more than 30 percent of the cost of producing aluminum. Thus, the competitiveness of Alcoa's primary aluminum business is closely tied to the availability of economical electric power rates. For this reason, Alcoa has located its smelting operations in close proximity to low-cost sources of reliable electric power such as the Yadkin Project hydropower developments, owned and operated by APGI. The Yadkin Project is critical to Alcoa's Primary Metals Operations because it enables Alcoa to maintain its competitiveness in the domestic aluminum market. For many years, the power from the Yadkin Project was a source of power for Alcoa's Badin Works, an aluminum smelter and processing plant. More recently, the smelting operations at Badin were curtailed, but the hydropower developments have continued to supply some power directly to Badin Works, with the remaining power sold to help offset the cost of electricity purchases required for Alcoa's other domestic smelting operations. Currently, the Yadkin Project provides 3 to 5 megawatts (MW) of electricity directly to Badin Works for aluminum refining and other operations that still occur at the plant, with the balance being sold into the wholesale market. Whether the energy from the Yadkin Project is sold into the wholesale market or used to directly supply Alcoa's smelting facilities, access to that source of low cost power is important to Alcoa's Primary Metals Business.

H.2.1 Reasonable Costs and Availability of Alternative Sources of Power

If the power and energy generated by the Yadkin Project were not available, Alcoa would require a replacement source of energy that is of equal value to that being supplied by the Project in order to retain the current economics of Alcoa's primary aluminum operation in the U.S. The Project's non-affiliated wholesale customers would be faced with obtaining firm or spot market power at a cost not to exceed that currently being paid for energy from the Yadkin Project. It is likely that the alternative source of on-peak energy to replace on-peak energy currently being obtained from the Yadkin Project's hydroelectric generation would be generated from coal or natural gas combustion at a higher economic and environmental cost.

H.2.2 Increase in Fuel, Capital, and Other Costs

If APGI were not granted a new license for the Yadkin Project, APGI's cost would include a cost equal to the loss of the market value of the Yadkin Project hydroelectric generation minus the cost of producing such generation. Whether the power generated by the Yadkin Project is consumed by the load at Alcoa's Badin Works or sold on the wholesale market, the difference between the cost of generation and the price on the wholesale market is the value that APGI receives from the Project.

The Project's wholesale customers would incur a cost increase equal to the price of replacement power minus the price currently being paid for the Yadkin Project hydroelectric generation.

H.2.3 Effects of Alternative Source of Power

See Exhibit H.2.

H.2.3.1 Effects on Applicant's Customers, Including Wholesale Customers

As discussed in Exhibit H.2, loss of the value of the Yadkin Project hydroelectric power by Alcoa would affect the costs for Alcoa's primary aluminum business.

In addition, customers other than Alcoa who presently purchase power would have to purchase from alternative sources if Project power were to become unavailable. At present, the only alternative generation for sale in the region comes from coal-fired facilities, gas-fired combustion turbines, or nuclear facilities generally at much higher costs and prices.

H.2.3.2 Effects on Applicant's Operating and Load Characteristics

As it is unlikely that alternative electric energy would be generated within APGI's system, electrical energy from any alternative source of power would be a net flow of power into the Yadkin Balancing Authority from the Duke Energy or Progress Energy transmission systems. The load at the Alcoa Inc. Badin Works would be fed by the alternative source of power instead of the Yadkin Project hydroelectric generation.

H.2.3.3 Effects on Communities Served or to be Served

The Yadkin Project does not sell power either wholesale or retail directly to communities. However, the Yadkin Project does enhance the reliability and power quality of the communities located in the area surrounding the Project. The Yadkin Project operates as a separate balancing authority within the SERC, responsible for the proper and reliable operation of its electric system in coordination with the electric power systems of neighboring utilities, specifically Duke Power Company and Progress Energy North Carolina. This includes responsibility for assuring that the power flows in and out of APGI's system are balanced, that voltage is maintained, and that frequency is held within strict limits. These actions by APGI, in concert with other utilities in North and South Carolina and Virginia, ensure that retail customers in North Carolina receive a reliable supply of electricity, with adequate reserve margins in both generation and transmission. The Yadkin Project also provides reactive power for voltage support of the transmission grid. There are instances that the Yadkin Project provides electrical energy for retail utilities when those utilities purchase Yakin Project power during times of equipment failure, weather related outages, maintenance outages and equipment upgrades. For instance, during the summer of 2005, the Yadkin Project provided electrical energy for Duke Power to communities north of APGI's High Rock transmission line connection with Duke Power while local transmissions lines were being upgraded by Duke Power.

H.3 Need, Reasonable Cost, and Availability of Alternative Sources of Power

H.3.1 Average Annual Cost of Power Produced by the Project

Table H.3-1 presents the average annual cost of the power produced by the Yadkin Project over the last two years. This includes the cost of capital and amortization.

Table H.3-1: Average Annual Cost of Power Produced by the Yadkin Project

Year	Cost
2004	$16,335,879
2005	$15,755,551

H.3.2 Resources Required to Meet Capacity and Energy Requirements

H.3.2.1 Energy and Capacity Resources

Currently the Yadkin generation capacity and energy is greater than the resources required by the load being served within the Yadkin system. Energy production that is greater than the required resources is sold on the wholesale market. Should additional resources be required in the future those resources would be purchased on the wholesale market.

H.3.2.2 Resource Analysis

Because of the requirement for low cost power arising out of the economics of aluminum manufacturing, there do not appear to be such alternatives to replace the capacity and energy from the Yadkin Project available in the wholesale market. Although capacity and energy could be purchased over the short and long-term to replace Yadkin Project power, the purchase price for such resources almost certainly render this power uneconomic for aluminum production. However, this would not be true regarding the wholesale customers who currently purchase some of the Yadkin Project output as such sales are made at market prices.

H.3.2.3 Effects of Load Management Measures

Load management measures would not have an effect, for the reasons stated above.

H.3.3 Costs of Alternative Sources of Power

H.3.3.1 Annual Cost of Each Alternative Source of Power to Replace Project Power

The annual cost to replace the Project capacity and energy with purchased power from the wholesale market would be at least equal to the estimated annual value of Project power which is $43,600,000 (see Exhibit D.5).

The least cost option for the construction of new generating facilities to replace the Project capacity and energy would be a conventional or advanced combustion turbine at $374/kilowatt (kw) to $395/kw (see Table H.3-2). The operating cost of any fossil fuel power plant is highly dependent on fuel cost. The estimated construction cost of a 250 MW conventional or advanced combustion turbine would be in the range of $94,000,000 to $95,000,000 with an annual operating cost of $59,000,000 to $69,000,000 to produce energy equal to the Project power (see Table H.3-3). This includes O&M and fuel cost. Property tax, depreciation, cost of capital, and any regulatory costs are not included.

Table H.3-2: Cost and Performance Characteristics of New Central Station Electricity Generating Technologies[a]

Technology	Size (MW)	Leadtimes (Years)	Total Overnight Cost in 2004 (2003 $/kW)	Variable O&M (2003 mills/kWh)	Fixed O&M (2003 $/kW)	Heatrate in 2004 Btu/kWh)
Scrubbed Coal New	600	4	1,213	4.06	24.36	8,844
Integrated coal-gasification Combined Cycle	550	4	1,402	2.58	34.21	8,309
IGCC with Carbon Sequestration	380	4	2,008	3.93	40.26	9,713
Conv Gas/Oil Comb Cycle	250	3	567	1.83	11.04	7,196
Adv Gas/Oil Comb Cycle	400	3	558	1.77	10.35	6,752
ADV CC with Carbon Sequestration	400	3	1,114	2.60	17.60	8,613
Conv Combustion Turbine	160	2	395	3.16	10.72	10,817
Adv Combustion Turbine	230	2	374	2.80	9.31	9,183
Fuel Cells	10	3	4,250	42.40	5.00	7,930
Advanced Nuclear	1000	6	1,957	0.44	60.06	10,400
Distributed Generation-Base	2	3	807	6.30	14.18	9,950
Distributed Generation-Peak	1	2	970	6.30	14.18	11,200
Biomass	80	4	1,757	2.96	47.18	8,911
MSW – Landfill Gas3,108	30	3	1,500	0.01	101.07	13,648
Geothermal	50	4	3,108	0.00	104.98	45,335
Conventional Hydropower	500	4	1,451	4.60	12.35	10,338
Wind	50	3	1,134	0.00	26.81	10,280
Solar Thermal	100	3	2,960	0.00	50.23	10,280
Photovoltaic	5	2	4,467	0.00	10.34	10,280

a. Information in this table is taken from Table 38 in Cost and Performance Characteristics of New Central Station Electricity Generating Technologies in Energy Information Administration/Assumptions to the Annual Energy Outlook 2005.

Table H.3-3: Cost of a 250 MW Conventional and Advanced Combustion Turbine to Produce 982,000 MWh

Technology	Variable O&M Cost	Fixed O&M Cost	Average Natural Gas cost cents/10^6 2004[a]	Fuel Cost	Total Annual Cost[b]	$/MWh
Conv Combustion Turbine	$3,103,120	$2,680,000	596.1	$63,319,495	$69,102,615	$70.37
Adv Combustion Turbine	$2,749,600	$2,327,500	596.1	53,754,545	$58,831,645	$59.91

a. Natural gas cost is from Table 4.5 Receipts, average Cost, and Quality of Fossil Fuels for the Electric Power Industry, 1993 through 2004 Energy Information Administration Electric Power Annual 2004.
b. Total cost is O&M and Fuel Cost. Property taxes, cost of capital, depreciation, and any regulatory costs are not included.

H.3.3.2 Basis for Determination of Annual Cost of Each Alternative Source of Power

The basis for determination of the cost of purchased power is the value of Project power from Exhibit D.5. To develop this estimate, APGI modeled the existing Project operations with the addition of proposed generating unit upgrades in the Yadkin Project Operations Model, OASIS, for the 1930 to 2003 period of record using the average monthly on and off-peak energy values for 2004 presented in Exhibit D.8.

The basis for determination of the construction and operating cost of a combustion turbine facility with a capacity of 250 MW and energy production equal to the Project power is data from the Energy Information Administration/Assumptions to the Annual Energy Outlook 2005 and the Energy Information Administration/Electric Power Annual 2004.

H.3.3.3 Relative Merits of Each Alternative

The estimated long-term average annual cost of the Project power is $28,310,097 (see Exhibit D.4). This is the long-term cost of power production that seems to be appropriate to compare to the cost of alternative sources of power. The cost of replacement power from the wholesale market is estimated to be $43,600,000. This is a 55 percent increase in the cost of power and equal to the current Project power value. The source of generation for power from the wholesale market would be from fossil fuels (or possibly nuclear generation).

The estimated average annual cost of operating a combustion turbine is $59,000,000 to $69,000,000, which is a 110 to 145 percent increase in cost. This increase in cost does not include the debt and equity cost of capital and the depreciation for the $94,000,000 to $95,000,000 cost of the construction of a combustion turbine facility.

In addition, either of these alternatives would have the added environmental impact of additional fossil fuel combustion releases which would impact air quality in the region. Significant quantities of carbon dioxide and nitrous oxide and lesser quantities of carbon monoxide and sulfur dioxide would be produced as a byproduct of combustion.

H.3.4 Effect on the Direct Providers of Alternative Sources of Power

There would be additional resource requirements on the power system(s) and transmission system(s) that supply the energy to the Yadkin Project if replacement energy were purchased on the wholesale market. The specific power facilities and transmission facilities that would be affected are unknown.

H.4 Effect of Obtaining or Losing Electricity on the Applicant's Own Industrial Facilities

The effect of obtaining or losing electricity on Alcoa's industrial facilities is discussed previously in Exhibit H.2.

H.5 The Impact on the Operations and Planning of the Applicant's Transmission System

H.5.1 Effects of Power Flow Redistribution

The Yadkin Project is connected to the Duke Energy transmission system and the Progress Energy transmission system at Badin and High Rock via the APGI 100kV transmission facilities.

As addressed previously in Exhibit H.2.3.3, the Yadkin Project system is used to increase reliability of electricity in the geographic region. During periods of forced outages on generating units in adjacent utilities, and in high North-South or South-North power flows, the Yadkin Project generation is redirected on the interconnected transmission system to offset high line loading during abnormal conditions. Redistribution of the power flows reduces the line loading to within acceptable engineering limits. Reductions or restrictions in the amount or timing of APGI's power generation would prohibit APGI from alleviating these overloading conditions which could lead to opening of line breakers on the transmission system to redirect the flow of power in the immediate area, and thus affect reliability of electricity.

H.5.2 Advantages of the Applicant's Transmission System

The Yadkin Project transmission system was originally primarily used to connect the generating facilities of the Project, and to provide a path for additional power to increase the reliability of the electricity supply to Alcoa's Badin Works during low Project generation periods through interconnections with local utilities Duke Energy and Progress Energy North Carolina. Originally these transmission facilities were all part of the Project, but as Duke Energy and Progress Energy expanded their own transmission facilities in the region, it became apparent that the bulk of the Yadkin Project 100 kV transmission facilities had become part of the larger interconnected transmission grid. Subsequently, the Project license was amended to remove all but two transmission lines from the Project.

The two transmission lines that remain in the Project are 1) the four- circuit 13.2-kV line that connects the Narrows Powerhouse to a switchyard located at Alcoa's Badin Works and 2) the single-circuit 100-kV line that connects the Falls Powerhouse to the Badin substation. Thus, there is limited transmission in the Yadkin Project that would materially help regional electrical reliability. Delivery of Project energy to Alcoa's Badin Works and/or to the interconnections with Duke Energy and Progress Energy at the Badin substation and High Rock powerhouse does benefit the regional distribution of the Project's power and to help provide voltage regulation in the area. These uses will remain an important function of Yadkin's transmission system when a new license is granted.

APGI's non-Project transmission system consists of approximately 15 miles of single-circuit 100-kV transmission lines that run from the High Rock Development, through the Tuckertown Development and continue to a switchyard at Alcoa's Badin Works.

H.5.3 Single Line Diagrams

The electrical one-line diagram is shown in Figure H-1.

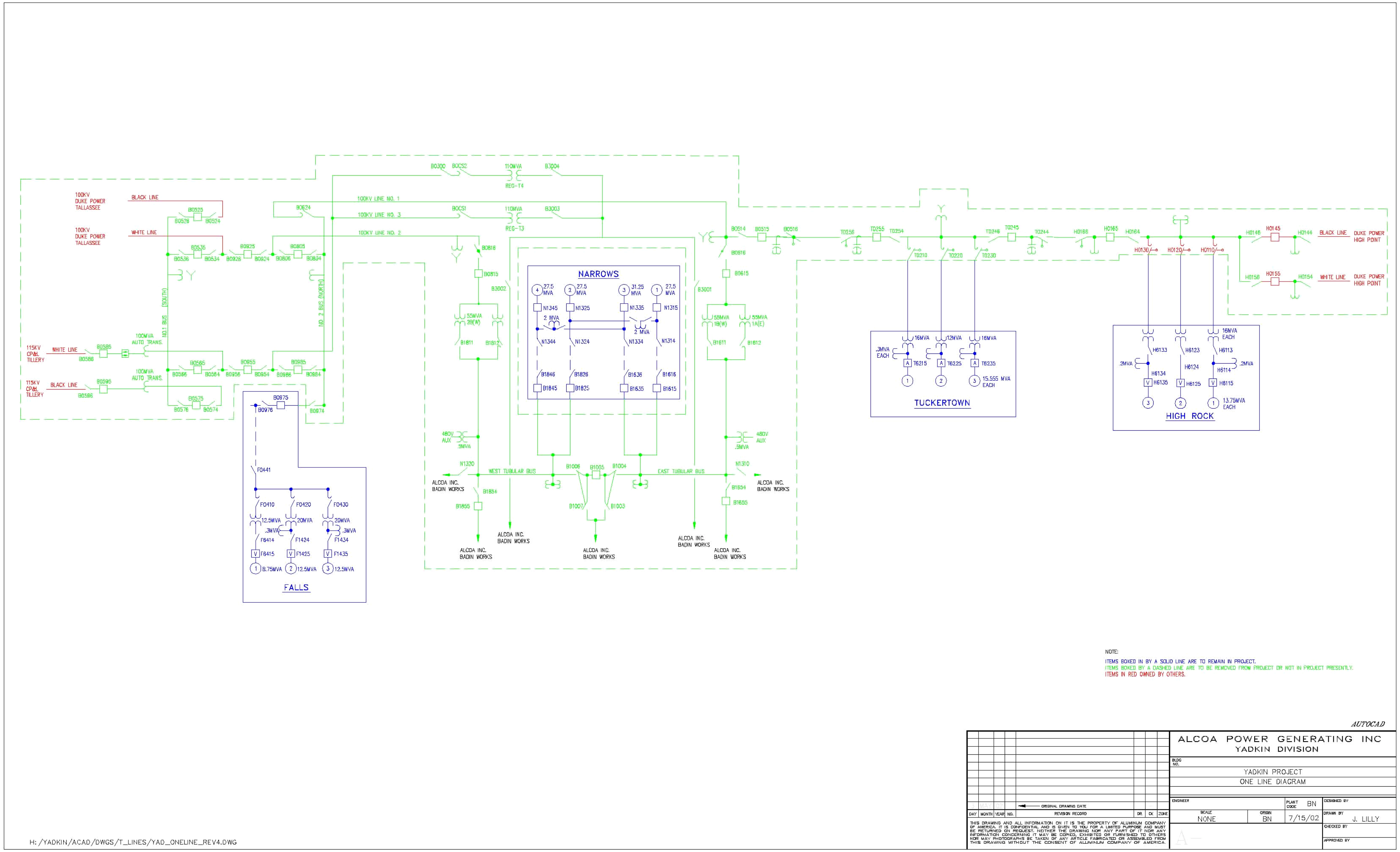
H.6 Plans to Modify Existing Project Facilities

During the new license, APGI proposes to replace existing turbine runners, rewind generators, and refurbish auxiliary equipment at all Project developments (see Exhibit B.2). The facilities proposed for refurbishment are nearing the end of their useful operating lives and are in need of overhaul or replacement. Replacement of the turbine runners will result in increased hydraulic efficiency. Similarly, rewinding the generators and completing associated refurbishments to the electric controls will increase the efficiency by which mechanical energy is converted to electric energy.

In evaluating the proposed unit upgrades, APGI considered the potential effects of the unit upgrades on environmental resources. In this regard, APGI proposes to enhance Project water quality by modifying the design of the replacement runners and draft tube cones in such a way as to enhance the dissolved oxygen conditions in the Project tailraces at the High Rock and Narrows developments. This proposal is discussed in more detail in Exhibit E.2.7.

The planned unit upgrades, refurbishments, along with the installation of technology to improve dissolved oxygen will conform with the comprehensive plan for improving the waterway and for other beneficial uses as defined in Section 10(a)(1) of the Federal Power Act (FPA).

Figure H-1: Yadkin Project One-Line Diagram



H.7 Financial and Personnel Resources

As a wholly-owned subsidiary of Alcoa Inc., APGI has sufficient financial resources to continue operating and maintaining the Project, as well as perform the unit refurbishments/upgrades that are being proposed under the new license.

As previously mentioned, all four Project developments are operated by full-time Power Dispatchers under the direction of the APGI Operations Manager. Operation and generation dispatch is remotely controlled from the Dispatch Center located in Alcoa, Tennessee. The Project is staffed by a crew either located at High Rock or Narrows powerhouses, or at the plant in Badin, North Carolina. The crew consists of multi-craft hydroelectric mechanics, electronics technicians, and supervisors.

The technical support staff is based in Badin, North Carolina and Alcoa, Tennessee, in the same building as the Dispatch Center. The support staff consists of electrical and mechanical engineers, and technical and office personnel. Members of the technical support staff have formal education in their field of expertise and are expected to stay abreast of developments in the hydroelectric industry through continuing education opportunities.

The entire staff receives annual safety training that goes beyond the current state and federal requirements.

Routine maintenance for all four developments is performed by either contracted maintenance crews or by maintenance crews based at the facilities. Major maintenance is normally contracted under specifications by APGI's Engineering Department.

H.8 Proposed Expansion of Project Lands

APGI does not propose to expand the Project to encompass additional lands.

H.9 Applicant's Electricity Consumption Efficiency Improvement Program

H.9.1 Applicant's Record of Encouraging Power Conservation and Plans for Promoting Power Conservation

All of the electricity that APGI generates at the Project is for the benefit of its ultimate customer, Alcoa, and specifically, Alcoa's smelting facilities, whether the Project power is sold in the wholesale market or used directly. The nature of the aluminum smelting process makes energy efficiency a top priority for Alcoa.

Alcoa and other primary aluminum companies produce aluminum from alumina by an electrolytic reduction process that requires large amounts of electric energy as an industrial input. Electric energy accounts for more than 30 percent of the cost of a pound of aluminum produced at an aluminum smelter, and as such, is often the largest single variable cost in the production of aluminum metal and the most significant factor in determining a company's competitive position in the market

Alcoa's smelters are constantly seeking opportunities to reduce operating costs. Such cost savings are often realized through improved energy efficiency both in the industrial smelting process and in the generation of electric power. As described in Exhibit H.6, Plans to Modify Existing Project Facilities, APGI has initiated phased-in refurbishments and upgrades of aging equipment in order to generate additional electric power from the same water flows on the Yadkin River. In addition, the aluminum smelting industry in general and Alcoa in particular are constantly searching for ways to improve energy efficiency in the smelting process. The Aluminum Association, Inc. estimates that optimization of aluminum smelting processes has reduced the energy demands by more than 20 percent (from more than 8kWh to approximately 6.5kWh per pound) over several years.

Finally, Alcoa also has implemented a long-term energy strategy for the past several decades. New policies developed in the wake of the energy crisis of the 1970's sought to increase self-sufficiency in energy generation and greater energy efficiency at every step of the manufacturing process. More recently, Alcoa has formulated an energy efficiency plan that benchmarks best practices in the industry and makes them available to Alcoa locations. The foundation of the plan is the formation of a network of energy users at Alcoa locations that embrace and employ best practices for improving energy efficiency.

H.9.2 Compliance of Power Conservation Programs with Applicable Regulatory Requirements

The power conservation efforts described in Exhibit H.9.1 meets the intent of the Federal Power Act Section 10(a)(2)(C). There are no State regulatory requirements applicable to the Yadkin Project concerning power conservation programs.

H.10 Identification of Indian Tribes Affected by the Project

Since the distribution of the Initial Consultation Document (ICD) in September 2002, APGI has worked to engage the Catawba Indian Nation (CIN) and the Eastern Band of Cherokee Indians (EBCI) in the relicensing of the Yadkin Project. In addition to the identified tribes, APGI also provided a copy of the ICD to the North Carolina Commission of Indian Affairs.

The current Catawba Indian Nation Reservation is located in South Carolina on the Catawba River. The traditional ceded homelands of the tribe do extend through the entire Piedmont of North Carolina. The Catawba Indian Nation indicated an interest in the Yadkin Project relicensing and has participated as a member of the Cultural Resources Issue Advisory Group. The Catawba Indian Nation identified several interests regarding the Project relicensing that are discussed in more detail in Exhibit E.4.

In a meeting in July 2004, EBCI shared with APGI a map of lands to which they attach religious or cultural significance, and none of the five counties immediately adjacent to the Yadkin Project were identified as significant. EBCI has remained on APGI's distribution list for all relicensing related materials, meeting notices and communications. However, the EBCI did not directly participate in the Issue Advisory Groups.

Contact information for the two tribes with an expressed interest in the Yadkin Project relicensing is provided below:

The Catawba Indian Nation of South Carolina
Chief Gilbert B. Blue
996 Avenue of the Nations
Rock Hill, SC 29730

The Eastern Band of Cherokee Indians
Chief Michell A. Hicks
88 Council House Loop
Cherokee, NC 28719

H.11 Measures Planned to Ensure Safe Management, Operation, and Maintenance of the Project

APGI strictly adheres to the FERC regulations for maintaining safety at all of its developments within the Project. As such, APGI prepares quality control programs during construction, repair, and modifications of Project works; prepares adequate provisions for installing and maintaining appropriate monitoring instrumentation wherever any physical condition has the potential to affect the safety or stability of the Project; and prepares public safety plans. In addition, APGI performs periodic inspections, every five years, of the Project facilities by an independent consultant, performs power and communication lines testing, and performs annual spillway gates testing.

Also in accordance with FERC guidelines, the Project has an Emergency Action Plan (EAP), which was most recently revised and updated in December 2005. The EAP serves as a tool to APGI personnel as well as public safety agencies to ensure public safety while minimizing property damage in the unlikely event of a failure or potential failure of High Rock, Tuckertown, Narrows, or Falls Dam.

The reservoir and tailrace elevations are monitored continuously by float-operated or sonic transducers. The elevations are recorded hourly at the Dispatch Center in Alcoa, Tennessee. Any significant change in the reservoir or tailrace elevations will be noted by the power dispatcher.

High Rock and Narrows powerhouses are manned by APGI mechanics. The Tuckertown and Falls Developments are unmanned, but are inspected each manned shift. The staff is well trained and routine surveillance of potential hazards is included in the operation of the facilities. Any abnormal condition is reported to the power dispatcher, the operations general supervisor, and/or the maintenance coordinator.

Instrumentation monitoring plans are also set up at the Project facilities to monitor conditions at the developments to alert staff to possible problems.

Weekly inspections of pertinent operating and safety features are performed by the APGI operating personnel. In addition, annual inspections of the Project structures are conducted by APGI's supervisory and engineering personnel with documentation of conditions. Routine maintenance for all four developments, including trash removal, is performed by either contracted maintenance crews or by maintenance crews based at their facilities. Major maintenance is normally contracted under specifications by APGI's Engineering Department.

The backup diesel generators are inspected on a weekly basis and tested on a monthly basis to ensure operability of the spillway gates. The spillway gates are tested annually at each development and a full-open gate testing is performed on a five year basis. The data communication lines are tested daily, and voice communication lines are tested weekly.

H.11.1 Existing and Planned Operation of the Project During Flood Conditions

During unusually high flow conditions (greater than 30,000 cubic feet per second [cfs]), maintenance personnel are sent to the Project dams, as required, to operate bypass and spillway gates, and monitor general conditions at the Project dams. Each Project development uses a "Standard Gate Operating Procedure" for discharging water through the spillway gates during flood conditions.

All four dams are continuously monitored at the Dispatch Center located in Alcoa, Tennessee through a Supervisory Control and Data Acquisition (SCADA) system. The SCADA system provides real-time monitoring, reporting, and alarming of key elements associated with the normal operation of the dams, including, but not limited to, power generation, unit operation, and reservoir and tailrace elevations. APGI's operation of all four hydro developments as an integral system allows for advance notice of impending flood flows, including localized storm events. Any significant change in the reservoir elevation due to inoperability of the gates or other conditions will be noted by the Dispatcher who will alert the necessary personnel at Alcoa's plant in Badin, North Carolina. These remote monitoring devices provide for a timely response to an adverse condition if it were to occur.

The principal means of communication during an emergency, including flood events, consist of the Yadkin PBX system, the public telephone, cell phones, and two-way radios carried by APGI maintenance crew while working on the dams. There are two base stations for the two-way radio system, one at High Rock Powerhouse and one at Building 105 (Badin Plant) - a backup station, in case the High Rock Powerhouse station system is inoperable. Communication is possible between the base station and the mobile units, between the independent mobile units, as well as the Dispatch Center in Alcoa, Tennessee

H.11.2 Warning Devices Used to Ensure Downstream Public Safety

APGI maintains a comprehensive public safety program to ensure the structural adequacy of the Project dams and the safety of the public within the Project area. All four of the Project dams are inspected annually by a team of APGI's supervisory and engineering personnel. Independent consultants, approved in advance by FERC and engaged by APGI, thoroughly examine the development structures once every five years and publish a comprehensive Safety Inspection Report. The most recent Independent Safety Inspection Reports for the Project developments were prepared in 2003 and 2004 by PB Power.

APGI maintains a current EAP for the Project in the event of high flows, or the unlikely event of a failure or potential failure of the Project dams. This plan is designed to minimize danger to people and property downstream of the High Rock, Tuckertown, Narrows, and Falls Dams. The EAP provides guidelines for notification and early warning of local, state, and federal agencies, emergency services staff, and the public in the event of an actual or potential failure. Developed in accordance with FERC guidelines, the EAP is tested and updated annually. This EAP includes a flood warning notification to the National Weather Service and other agencies during periods of high release (high flows) from the Project developments.

Some of the specific safety measures employed at the Project include fencing, lighting, signs at the dam forebays and tailraces, and turbulent water and spillway warning signs.

At all four Project dams, a warning/sounding alarm is present at the spillway gates and tailwater of generating units. Sounding the alarm prior to starting a unit or opening a spillway gate is a separate control action from opening of the spillway gate.

H.11.3 Proposed Changes Affecting the Existing Emergency Action Plan

APGI does not propose any changes to the operation of the Project that might affect the existing EAP. The EAP was most recently updated in December 2005.

H.11.4 Existing and Planned Structural Monitoring Devices

Instrumentation monitoring plans have been set up at each of the Project facilities to monitor conditions at the developments and to alert staff to possible problems. The following sections discuss monitoring at the Project developments. No changes are proposed at this time.

H.11.4.1 High Rock Dam and Powerhouse Monitoring Devices

The instrumentation program consists of deformation monitoring (inclinometers, extensometers, crackmeters, and survey points), piezometers, thermistor readings, seepage measurements, precipitation measurements, and reservoir and tailwater level monitoring devices.

H.11.4.2 Tuckertown Dam and Powerhouse Monitoring Devices

The instrumentation program consists of deformation monitoring (inclinometers), piezometers, seepage, and reservoir and tailwater level monitoring devices.

H.11.4.3 Narrows Dam and Powerhouse Monitoring Devices

The instrumentation program consists of deformation monitoring (extensometer and inclinometers), seepage, and reservoir and tailwater level monitoring devices.

H.11.4.4 Falls Dam and Powerhouse Monitoring Devices

The instrumentation program consists of deformation monitoring (survey) and reservoir and tailwater level monitoring devices.

H.11.5 Project's Employee and Public Safety Record

As previously mentioned, the entire APGI staff receives annual safety training that goes beyond the state and federal requirements. The safety process consists of a highly developed combination of protective equipment, procedures, inspections, observations, and audits. The success of the process is evident in the fact that APGI has not had a lost workday due to injury since September 23, 1986.

The Project is a popular destination for boating, camping, fishing, swimming, and various other recreation activities. The high use and popularity of the Project's large reservoirs, currently with 40 recreation facilities and access areas available to the public use, contributes to the high number of public safety incidents. Table H.11-1 presents a brief description (with dates) of reported deaths and injuries that have occurred within the Project boundary from the beginning of 2004 through December 31, 2005.

Table H.11-1: Summary of Injuries and Deaths at the Yadkin Project 2004 -2005

Date	Reported Injury/Fatality
3/21/2004	Drowning of a 35 year old male on High Rock Reservoir. Boat overturned in rough waters. Victim was not wearing a life jacket.
6/2/2004	Overturning of a boat in the Tuckertown Powerhouse tailrace on Narrows Reservoir.
10/29/2004	Apparent suicide (shooting). A 22 year old male found in picnic table at the Southmont Public Access Area on High Rock Reservoir, Davidson County.
11/18/2004	Drowning of an 81 year old male on High Rock Reservoir, near a commercial lake access area off Bringle Ferry Road, Rowan County. Victim had a history of heart problems and his boat was found tied to a pier.
6/3/2005	Drowning of a 43 year old male on High Rock Reservoir. Victim was hit by a propeller when he fell off from a boat that took on water.
7/21/2005	Drowning of a 21 year old male on High Rock Reservoir. Victim was swimming near edge of roped off swimming area approximately 50 feet from shore. Victim was not wearing a life jacket.
8/06/2005	Drowning of a 30 year old male on Narrows Reservoir. Victim was swimming outside the roped swimming area to the opposite shore approximately 30 yards away.
9/17/2005	Death of a 26 year old male on Falls Reservoir. Victim was a diver performing work in the intake area of Falls Powerhouse.
12/22/2005	Drowning of a 14 year old male on High Rock Reservoir. Victim was duck hunting with three other males when their boat capsized. The other three persons were rescued.

H.12 Current Operation of the Project

The High Rock Development is a storage facility that is operated in a store-and-release mode. The Narrows Development has storage available, but is generally operated as essentially a run-of-river[1] facility on a daily basis. Based on the limited available storage capacity, the Tuckertown and Falls Developments are essentially operated as run-of-river facilities on a daily basis. Generally, the plants operate during peak hours to maximize the economic value of the power produced. During periods of high stream flow, the system is operated continuously.

As part of its current license with the FERC, APGI operates the Project under operating guides developed with consideration given to many diverse interests including energy generation, recreation, environmental stewardship, downstream municipal and industrial needs, and others. Specifically, the water releases from the Project developments are governed by two FERC orders: one order governs the Project operation under an operating guide for the High Rock Reservoir, and the second order governs the headwater benefits agreement between APGI and Progress Energy.

The High Rock Development is currently operated in accordance with an approved operating guide curve which regulates generation, not headwater elevation. Within the limitations of available streamflow, the operating guide curve is designed to maintain higher water elevations from mid-May to mid-September, followed by a fall-winter drawdown to allow for refill during the late winter and spring runoff. The operating guide curve, reviewed and approved by FERC, was established in 1968, ten years after issuance of the existing license. During periods of low High Rock water levels and low streamflows, the operating guide has an overriding reservoir elevation requirement for APGI to limit discharge to a maximum amount of water on a weekly basis from early March to mid-September to help maintain High Rock water levels.

In addition to the operating guide curve, APGI operates in accordance with an associated 1968 agreement and FERC order related to headwater benefits. Water storage in the APGI reservoirs during periods of high streamflow allows a controlled release to enhance watershed power generation. This regulation of flow provides benefits to APGI and to Progress Energy, by seasonally increasing the flow available for hydropower generation at the downstream facilities. By way of the March 1968 FERC order, Progress Energy pays APGI an annual headwater benefits fee for this benefit. The agreement with Progress Energy requires that that the regulated weekly average streamflow, during the ten-week period preceding the recreation period (May 15 through September 15) is not less than 1,500 cfs; during the period May 15 through July 1, is not less than 1,610 cfs; and during the period July 1 through September 15, is not less than 1,400 cfs.

Available storage at Narrows Reservoir may be used during periods of low streamflow to maintain the required minimum downstream releases. Table H.12-1 lists the drawdown relationship between High Rock and Narrows reservoirs as defined by the current Project license.

Current Project operation is discussed in more detail in Exhibit B.

[1] Run-of-river means that the average daily discharge is approximately equal to the average daily inflow, with daily fluctuations occurring to meet system operating demands.

Table H.12-1: Drawdown Relationship Between High Rock and Narrows Reservoirs

High Rock Reservoir		Narrows Reservoir	
Elevation (ft)	**Drawdown (ft)**	**Elevation (ft)**	**Drawdown (ft)**
623.9	0.0	509.8 – 507.7	0.0 – 2.1
622.9	1.0	508.2 – 503.2	1.6 – 6.6
599.9	24.0	508.2 – 503.2	1.6 – 6.6
599.9	24.0	502.7	7.1
597.9	26.0	493.7	16.1
593.9	30.0	478.8	31.1

H.13 History of the Project and Record of Programs to Upgrade the Operation and Maintenance of the Project

H.13.1 High Rock Development

High Rock Development was the third of the Project developments to be built. The turbines for Units 1, 2 and 3 were put in service in 1927. There have been no upgrades to the original Units under the existing license. The Unit 1 generator was rewound in 1988. Other available structural/maintenance records are summarized below:

- At the time of the original construction, the embankments were not riprapped at locations adjacent to the shallow bodies of reservoir water. However, after the reservoir was filled, it was found that sufficient wave action existed to erode the embankments. These locations were repaired with riprap to prevent further damage.

- In 1954, the elevation of the top intake deck and non-overflow gravity sections was raised to elevation of 638.9 ft. This 1954 concrete was extensively dowelled to the original 1927 concrete. Along with increasing the height, the thickness of the no-overflow sections as well as portions of the intake/powerhouse (service and unloading bay) was also increased.

- Based on a review of underwater diving inspections and tailrace investigations, there is evidence of scour of the spillway and powerhouse. Repairs have been made multiple times (1961, 1993, and 1996) in the past to maintain the powerhouse and spillway in good condition.

- During a dive inspection in 1983, an area of undermining was located at the southwest corner of the powerhouse and repaired using grout bags as formwork, and then grouting behind the grout bags to simply fill the remaining voids. The area was repaired again in 1996/1997 by first removing the grout bags and then installing reinforcing bars, dowels and grout.

- The stability analysis of the High Rock Dam was subsequently updated to meet the FERC requirements, including stability under probable maximum flood (PMF) loading. The results of the analyses indicated that spillway bays 1-10 required remediation. Remediation of the spillway bays at High Rock consisted of installing 20 multi-strand, epoxy coated and filled post-tension anchors. Construction activities began in September 1999 and work was completed in 2001.

- The hoist cables for all ten Stoney gates were replaced between September and November 2003. The replacements were made to maintain the gate lifting devices in good condition.

H.13.2 Tuckertown Development

Tuckertown Development was the fourth of the Project developments to be built. The turbines for Units 1, 2 and 3 were put in service in 1962. There have been no upgrades or modifications to the original Units under the existing license. There were no major structural or maintenance activities performed at the Tuckertown Development under the current license term.

H.13.3 Narrows Development

Narrows Development was the first of the Project developments to be built. The turbines for Units 1, 2 and 3 were put in service in 1917, and Unit 4 went on line in 1924. The present runners were installed in Unit 1 in 1988, Unit 2 in 1964, Unit 3 in 1996 and Unit 4 in 2001. The original generators for Units 1 and 2 were installed in 1917. The original generators for Units 3 and 4 were installed in 1923 and 1924, respectively, and rebuilt in 1947 and 1946, respectively. A new generator was installed in Units 1 and 2 in 1964. Units 1 and 2 were rewound and rotor poles reinsulated in 1997. An upgrade of Unit 3 was completed in 1996, and an upgrade of Narrows Unit 4 was completed in 2001 and the upgrade of Narrows Unit 2 is anticipated to be completed in 2008. Other available structural/maintenance records are summarized below:

- The bypass spillway was originally constructed as an open excavation cut through the rock, approximately 115 ft wide, 1,100 ft long, the depth varying with the contour of the hillside. For a distance of approximately 130 ft downstream of the flood gates the bottom and sides of the bypass channel were lined with concrete. During July 1919 high flood waters were discharged through the dam. The flood waters were discharged through the bypass spillway depositing rock and other debris in the main channel below the powerhouse, which affected the operation of the turbines. As a result, a channel was constructed and a crib built so that the discharge from the bypass spillway would be carried further downstream before it merged with the main river stream below the powerhouse. The chute was further extended and extensive repairs were made in 1923 to prevent further erosion and the washing of materials into the river downstream of the powerhouse.

- A rock reef located about 1,200 ft below the powerhouse was removed during 1922. This rock reef also hindered the free flow of water from the tailrace and was thought to affect the turbine efficiency. During subsequent flood events, it was found that the rock crib erected in 1919 was not of sufficient length to provide the necessary protection for keeping wash material and debris from entering the tailrace area. In addition, it was noted that the bottom and sides of the channel excavated in the rock were severally damaged and extensive repairs would be necessary to prevent further erosion. Before this work had begun, a model of the bypass spillway, true to scale, was constructed so that the action of the water could be observed on the proposed repairs. The repair work consisted of excavating the rock so that a solid foundation of concrete could be placed on the bottom and sides, which had not been originally concreted. Also, floods passing over the east end of the main dam spillway washed out areas of the protecting rock ledge in the river between the toe of the dam and the powerhouse. To prevent further damage in this area an armor coating of concrete was installed. Hardaway Contracting Company was given the contract for this work in July 1923 and the work was completed in 1925.

- During 1925, flood water passing over the main dam spillway washed loose rock into the tailrace area to such an extent that the debris interfered with the efficiency of the turbines. This material was removed from the river by the Hardaway Contracting Company.

- A 2-foot steel extension was installed on the gates in 1918, thereby increasing the height of the gates approximately 2 ft.

- As a result of seepage observed flowing from the bottom of the inter-gallery drains A-1, A-2 and A-3 in gallery "A" within the intake section, an exploratory drilling and grouting program was performed in 1986 to identify and control the seepage. A total of eight holes were drilled from the piers into the concrete to seek out and identify seepage paths, and to permit grout injection for sealing purposes. In addition, surface repairs were carried out within Penstock Nos. 3 and 4, which included the removal of spalled and cracked concrete, the installation of new concrete and the patching of voids at the steel liner transition area. Inter-gallery Drains A-1, A-2, and A-3 were drilled and cleared of obstructions to restore them to useful function.

- The main spillway deck consists of an integral concrete slab and beam support system spanning between spillway piers. The deck over the trash gate section that is adjacent to the intake is 6 inches thick with no support steel. No expansion joints were included in the original design of the spillway deck. Visual inspections showed abrasion of the concrete in an arc on the right pier side of each gate (viewed looking in the downstream direction) along a path which the gates travel when opened. Normal thermal conditions combined with the lack of expansion joints caused the trash gate deck slab, adjacent to the intake, to buckle in the early 1990s. The first four pier caps adjacent to the trash gate deck slab separated from the piers and translated approximately 1 inch towards the intake structure. Full-open gate testing performed in 2001 showed gate binding prior to the full opening at nine of the Tainter gates. A two-phase remediation program was established to allow the Tainter gates to be fully opened. The initial phase of remediation activities included the cutting of one slot in the spillway deck at the right non-overflow section and Pier No. 1, and six sets of slots, one set each in Pier Nos. 5, 7, 11, 15, 19 and 21 in 2002. The initial phase of the work was completed in October 2002. The second phase of the remediation effort involved the remediation of the gates themselves, and was initiated in August 2003 and was completed in early 2004.

H.13.4 Falls Development

Falls Development was the second of the Project developments to be built. The turbines for Units 1 and 2 were put in service in 1919, and Unit 3 went on line in 1922. Since that time, both Units 2 and 3 have required realignment to correct runner clearance problems (runner began to rub against its discharge ring resulting in the need to realign the unit) on about a 10 year cycle. Unit 1 has experienced similar though somewhat less severe runner clearance problems with the initial runner clearance problems surfacing in the mid 1930s. The difficulties associated with the vertical alignment of the units led to extensive rehabilitation efforts. Alignment adjustment was no longer possible for Units 2 and 3 in 1961, and the turbine-generators were removed and upgraded in 1962. A similar replacement/upgrade was performed on Unit 1 in 1981. The rehabilitation of all three units included the removal and replacement of mass concrete from the powerhouse floor down to just below the stay ring for each of the three units. The concrete piers between the units, and the east (downstream) and north (river side) walls remained in place. Following the rehabilitation efforts there has been no significant trends in the runner clearance measurements since the Unit 1 replacement in 1981 and small progressive movement towards the downstream-river corner of the powerhouse at Units 2 and 3 since their replacement in 1961. Subsequent to the major upgrade, the turbine-generator alignments have been less frequent.

Additionally, a 2-foot extension consisting of wooden boards was installed on the gates in 1923, thereby increasing the height of the gates approximately 2 ft. In 1929, the 2-foot wooden extensions were replaced by 2-foot steel extensions. In 1946, the 2-foot steel extensions were increased to 4 ft.

H.14 Summary of Unscheduled Outages Over the Last Five Years

Table H.14-1 presents a summary of unscheduled outages over the last five years, including the cause of the outage, the duration of the outage, and the corrective action taken.

Table H.14-1: Summary of Unscheduled Outages Over the Last Five Years

Generating Unit	Date	Cause	Duration (hours)	Corrective Action
Tuckertown #3	3/2000	Field ground	19.2	Cleaned slip rings
High Rock #1	8/2001	Low governor air pressure	16.0	Replaced leaking air valve
Tuckertown #3	8/2001	Turbine lube flow switch	78.4	Replaced flow switch
Falls #3	8/10/2001	Governor trouble	20.6	Replaced LVDT
Falls #3	9/2/2001	Intake gate operating hoist	315.5	Rebuilt gear boxes
Tuckertown #3	1/16/2003	86E Stator ground	11.1	Tested windings no ground
Narrows #1	1/6/2003	86N Governor trouble	10.6	Repaired governor
Falls #1	2/23/2003	Tree in transmission line	9.5	Removed tree and repaired line
Falls #2	2/23/2003	Tree in transmission line	9.5	Removed tree and repaired line
Falls #3	2/23/2003	Tree in transmission line	10.9	Removed tree and repaired line
Tuckertown #2	5/9/2003	86N governor controller	13.7	Repaired controller processor
Narrows #2	8/28/2003	86E & 86N Breaker bushing field	89.1	Replaced bushing
Falls #2	8/27/2003	86N governor trouble	32.2	Repaired governor
Falls #1	10/28/2003	Governor trouble	23.5	Repaired governor
Tuckertown #3	12/30/2004	Turbine pit sump level high	17.5	Repaired sump pump float
Narrows #3	12/30/2004	DC ground, turbine bearing oil flow	39	Repaired DC lube pump
High Rock #3	4/4/2005	Generator Breaker	12.3	Repaired Gen. Bkr.

H.15 Licensee's Record of Compliance

APGI has an excellent record of compliance with the terms of the existing license. Complaints to FERC alleging non-compliance have all be resolved in APGI's favor.

H.16 Project Actions Affecting the Public

H.16.1 Electricity, Recreation, Relicensing

APGI's operation of the Yadkin Project affects the public in a number of ways. One is that a significant portion of the electricity currently generated by the Project is being sold to utilities that serve the public. Second, the Project reservoirs provide many recreational benefits to the public, as well as, surrounding property owners (operating guides that are designed to allow higher water levels during the summer recreation season, a private access permitting program, etc.), including numerous, well-maintained public recreation facilities on Project waters, which allow hunting, picnicking, boating access, fishing, swimming, and other water-based recreation. In addition, other similar facilities are owned or managed by surrounding counties, the State of North Carolina, or the USFS. Third, the Project is operated in a manner consistent with APGI's strong environmental stewardship values. For example, for many years, APGI has voluntarily worked with agencies and others to enhance fisheries and wildlife resources. Finally, for its relicensing of the Yadkin Project, APGI chose to use a Communications-Enhanced Process that allowed numerous opportunities for issue identification and open communication with interested parties, including the general public, beyond those offered by the traditional relicensing process.

H.16.2 County Economic Impacts Study

During the initial consultation phase of the relicensing process, APGI was requested to evaluate the relationship of the Project reservoirs to the economies of the surrounding five counties, under current reservoir operations and other alternative water level scenarios. In response to this request, APGI undertook a study titled County Economic Impacts of APGI's Yadkin Project (County Economic Impacts Study[2]) which was carried out in accordance with a study plan that was developed in close consultation with the County Economic Impacts Issue Advisory Group (Appendix H-1).

The overall objective of the County Economic Impacts Study was to document and analyze the relationship of the Project reservoirs to the economies of the surrounding five counties, under current reservoir operations and other alternative water level scenarios. The study also characterized tourism expenditures and opportunities at baseline and under alternative water level scenarios. The study also combined the results of the Recreation Economic Impact Study (see Appendix E-20) with the findings from the County Economic Impacts Study to present a comprehensive report on the impacts of alternative water level scenarios on the counties' economies.

Reservoir Management Scenarios

APGI defined three reservoir management scenarios for High Rock Reservoir to represent the potential range of management options which could be compared to existing reservoir management conditions. Scenario 1 would maintain water levels within 3 ft of full pool year round. Scenario 2 would allow water levels to vary over the same range as they currently do, but would extend the relatively full pool conditions six weeks earlier in the spring and six weeks later in the fall. Scenario 3 would maintain lower water levels during the summer recreation season and would allow water levels to fall farther in the winter than they currently do (see Figure E-9). Table H.16-1 summarizes the impacts of these scenarios on businesses and property values in the two counties adjacent to High Rock Reservoir. The following sections describe how these impacts were estimated.

[2] Heller, Katherine, Laurel Clayton, and Wanda Throneburg. RTI International. 2005. County Economic Impacts of APGI's Yadkin Project Final Report. December 2005. (Appendix H-1)

Table H.16-1: Estimated Impacts of Alternative Water Level Management Scenarios for High Rock Reservoir on Businesses and Property Values in Adjacent Counties

Annual Business Impacts	**Estimated Total Annual Change in Revenues for Directly Affected Businesses**					
	Alternative 1		**Alternative 2**		**Alternative 3**	
	Low	**High**	**Low**	**High**	**Low**	**High**
Total direct impacts	$3,397,000	$6,802,000	$678,000	$3,397,000	-$6,802,000	-$33,964,000

	Estimated Economy-Wide Annual Impacts					
Regional Economic Impacts	**Alternative 1**		**Alternative 2**		**Alternative 3**	
	Low	**High**	**Low**	**High**	**Low**	**High**
Davidson County	$3,475,000	$6,964,000	$695,000	$3,475,000	-$6,964,000	-$34,800,000
Rowan County	$922,000	$1,847,000	$182,000	$922,000	-$1,847,000	-$9,238,000
Five County Region	$4,479,000	$8,883,000	$885,000	$4,443,000	-$8,883,000	-$44,398,000

Property Value Impacts	**Estimated Home Sales Prices at Baseline and Under Alternative Water Level Management Scenarios**			
	Historical	**Alternative 1**	**Alternative 2**	**Alternative 3**
Distance from shoreline	12’ range	3’ range	10’ range	20’ range
	Rowan County			
Homes <0.05 miles	$136,700	$167,500	$143,500	$109,300
Homes between 0.05 and 0.5 miles	$137,300	$146,900	$139,400	$128,800
Homes >0.05 miles	$88,200	$94,300	$89,500	$82,711
	Davidson County			
Homes <0.05 miles	$150,800	$184,800	$158,400	$120,600
Homes between 0.05 and 0.5 miles	$129,600	$138,600	$131,600	$121,600
Homes >0.05 miles	$106,000	$113,400	$107,700	$99,500

Property Tax Impacts	**Possible Change in Tax Receipts for Homes Within Two Miles of High Rock Reservoir Shoreline**			
	No. of Homes	**Alternative 1**	**Alternative 2**	**Alternative 3**
Rowan County	2,623	$219,800	$48,100	-$195,800
Davidson County	1,451	$133,200	$29,800	-$118,200

Impacts on Reservoir-Related Businesses

Many types of businesses rely to some extent on the Yadkin Project reservoirs for their business. APGI's County Economic Impacts Study (Appendix H-1) looked at an exhaustive list of businesses compiled from a variety of sources, and worked with APGI and others to narrow the list for detailed study to those businesses whose major source of revenue was thought to be related to the reservoirs; the study termed these "Priority A" businesses. The study's authors contacted the businesses for a preliminary interview; then, after the Reservoir Management Scenarios were defined, they contacted them again to ask about the impacts of the water levels specified in the Scenarios. The study used their responses to estimate percentage impacts on revenues; to preserve confidentiality, county-level North American Industry Classification System (NAICS) code data was used as the basis for estimating impacts under "low" and "high" impact measures based on the interview findings.

The study found that most businesses would benefit from Scenarios 1 and 2 and would be hurt by Scenario 3. Impacts on directly affected industries ranged from a gain of more than $6 million in annual industry revenues in Rowan and Davidson counties for high impacts under Scenario 1 to a loss of more than $33 million for high impacts under Scenario 3. Using the U.S. Forest Service's IMpact analysis for PLANning (IMPLAN) regional input-output model to estimate impacts throughout the economy of the five-county region that would result from these direct impacts, the study found that Scenario 1 may increase output in the region by as much as $8.9 million per year under the high impact estimate, Scenario 2 may increase output in the region by as much as $4.4 million per year, and Scenario 3 may reduce output and spending in the region by as much as $44.4 million per year. These region-wide impacts include the direct impacts plus changes in spending by directly affected businesses, plus changes in consumer spending that result from changes in owners' and employees' incomes. While gains or losses for individual businesses could be substantial, overall these totals represent relatively small impacts on the regional economy (at most a gain of less than 0.1 percent or a loss of less than 0.4 percent of the total sales or revenues for businesses in the five-county region.

Impacts on Property Values

To address the question of how the value of residential property close to a reservoir is affected by reservoir water level management, APGI's County Economic Impacts Study (Appendix H-1) used a statistical analysis using the hedonic method. The hedonic method is a multiple regression technique that allows for the isolation of the effect of individual characteristics of a home and its environment on its sale value. The study collected data on water levels, and residential property characteristics and sales values for homes within two miles of the shorelines, for two Yadkin project reservoirs (High Rock and Narrows/Badin) and six others in North Carolina and South Carolina.

The analysis found that proximity to a reservoir enhances sales values. For homes within 0.05 mile of shore, sales prices were more than twice the values for comparable residences elsewhere; the impact of the reservoir declines with distance and is insignificant beyond a half mile from shore. Reservoir management affects the proximity premium, especially for shoreline residences. Using home sales in Rowan County and Davidson County, the study estimated that

Scenario 1 would increase sales prices of Rowan County properties within 0.05 miles of the High Rock Reservoir shore by about $31,000, and homes between 0.05 and 0.5 miles from shore by about $7,000. Scenario 3, on the other hand, is estimated to reduce sales prices of shoreline properties by about $27,000 and to reduce sales prices for other nearby properties by about $5,000. In Davidson County, Scenario 1 is estimated to increase sales prices of properties within 0.05 miles of the High Rock Reservoir shore by about $34,000, and homes between 0.05 and 0.5 miles from the shore would see an increase of $8,000. Scenario 3 would reduce sales prices for shoreline properties by $30,000 and would reduce the sales prices for other nearby properties by about $7,000.

Possible changes in county property tax receipts were estimated by assuming that all the properties within 2 miles of the shoreline were revalued as predicted by the hedonic model, then applying 2004 tax rates to the changed values. If all 2,623 residential properties located in Rowan County within 2 miles of the High Rock Reservoir shoreline experienced the predicted changes in value, under Alternative 1 property tax receipts could increase by nearly $220,000; under Alternative 2, they could increase by about $48,000; and under Alternative 3, they could decline by about $196,000. In Davidson County, if all 1,451 residential properties experienced predicted changes in value, tax receipts could increase by about $133,000 under Alternative 1, increase by about $30,000 under Alternative 2, and could decrease by about $118,000 under Alternative 3. These estimates are rough approximations that assume all properties experience predicted changes in value, that assessments are revised to reflect these changes, and that 2004 tax rates apply.

H.17 Reduced Ownership and Operating Expenses if the Project License were Transferred

If APGI did not receive the new license for the Project, its annual operating costs would be reduced by the amount shown in Exhibit D. In this case, APGI would no longer be responsible for Project operation or paying taxes and administrative fees associated with the Project.

H.18 Annual Fees Paid Under Part I of the Federal Power Act

Since the initial licensing of the Project, APGI has paid annual FERC administrative charges as presented in Table H.18-1.

APGI does not pay fees for the use of federal lands within the Project boundary because there are no federal lands within the Project boundary. There are no Indian lands included within the Project boundary.

Table H.18-1: FERC Annual Administrative Charges[a]

Fiscal Year	FERC Administrative Charge	Other Federal Agencies Administrative Charge[b]	Total Administrative Charge
1994	$145,849	$16,217	$162,066
1995	$369,566	$0	$369,566
1996	$657,244	$0	$657,244
1997	$360,848	$51,117	$411,965
1998	$342,067	$35,449	$377,516
1999	$364,566	$69,592	$434,158
2000	$310,221	$84,034	$394,255
2001	$335,671	$23,844	$359,515
2002	$341,297	$92,106	$433,403
2003	$306,957	$0	$306,957
2004	$677,030	$0	$677,030
2005	$414,735	$0	$414,735

a. All dollars are actual, as of the year identified.
b. There were no known administrative charges paid to other federal agencies.