Exhibit E-1 Summary of Consultation

MEETING NOTES

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Parr Hydro Development and Fairfield Pumped Storage Development Relicensing
Agency/NGO Kick-off Meeting

September 19, 2012

Final KDM 10-3-12

ATTENDEES:

Steve Summer (SCANA)
Milton Quattlebaum (SCANA)
Charlene Coleman (American Whitewater)
Hal Beard (SCDNR)
Dick Christie (SCDNR)
Phil Gaines (SCPRT)
Chuck Hightower (SCDHEC)
David Hancock (SCE&G)
Mike Summer (SCE&G)
Terri Hogan (Congaree National Park NPS)
Gerrit Jobsis (American Rivers)
Rebecca Haynes (American Rivers)
Bill Stangler (Congaree Riverkeeper)
Rebekah Dobrasko (SHPO)
Mark Caldwell (USFWS)
Bill Marshall (SCDNR)
Randy Mahan (SCANA)
Tommy Boozer (SCE&G)
Amanda Hill (USFWS)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The meeting opens with introductions, followed by a presentation detailing information about the Parr and Fairfield projects by Bill Argentieri. Bill displays many pictures and maps of the projects so that the stakeholders can get an idea of where the projects are located and how the facilities are set up. He then describes each project in detail. As Alan suggested, this presentation was summarized into a project data sheet and is included at the end of these notes.

After Bill has completed the project overview, the group gets a chance to ask questions. Dick begins by asking if Lake Monticello is within the project boundary and whether there is a Shoreline Management Plan in place. Tommy tells him yes, Monticello is within the PBL and that a shoreline management plan was put into place in 2002. The sub-impoundment is also included in the PBL and SMP. It is stated that SCE&G has not sold property within the PBL down to the 425 feet high water mark on Monticello. Dick also asks where Parr Reservoir officially begins, which is at the southern end of Henderson Island on the Broad River.

Gerrit asks how the Fairfield units could be operated, if the two units on each penstock needed to be operated at the same time. Ray said that each unit could be operated independently. There is no need to operate the two units on the same penstock at the same time.

Gerrit asks the group if the PBL for Parr Shoals extends below the dam. The PBL does not go beyond the dam, although SCE&G may own property downstream of the project. Bill mentions that there are docks on Lake Monticello but none on the Parr Reservoir. However, both Parr and Monticello have public access.

Bill mentions to Rebekah that there are cultural resources that will need to be addressed, and that Stage 1 and Stage 2 analyses will be performed with a local archaeological firm.

Gerrit asks if 256' is the minimum height in which they can operate the Fairfield project, considering the pumped storage set up, or if there is more operational flexibility. Ray explains that there is no more flexibility because silt entrainment issues arise when the pool gets too low. Ray also states that these projects are operated based on a generation schedule and that everything depends on the time of year and the load mix. The question is raised concerning whether or not there is a sediment management plan in place at the Parr project, or if there is any type of sediment management currently ongoing, including the use of sand gates. Ray answers that there are no sand gates and no penstocks at Parr. He explains how the project is set up, where water passes right through the powerhouse with only a trash gate in place. He mentions how there is a new drag rake that helps with sediment, by scooping out the sediment and trash and depositing it into a bin to be hauled off and disposed of elsewhere. Ray does say that he has not heard of there being a big sediment issue at Parr.

Dick brings up the issue of maintaining instream flow minimums, which SCE&G employees admit has been difficult, especially with the instantaneous readings versus daily average readings.

Hal and Amanda asked what the allowed amount of phosphorus in the water is to still be able to pass water quality standards. With the building of the new nuclear stations, that level may have been changed, or restated to consider higher evaporation rates. Chuck couldn't find much information about that during the meeting, but said he would follow up and let the group know.

Alan wrapped up this question and answer session by jumping into the next item on the agenda, an overview of the licensing process. He explained that our goal is the use an enhanced traditional licensing process, which has to be requested when the NOI and PAD are filed. If FERC rejects the request, we will have to use the integrated licensing process, which is very strict on timelines and deadlines. Alan mentions that the enhanced TLP would be a more laid back process for SCE&G and the agencies and NGOs, and that letters from the agencies and NGOs to FERC agreeing to use this process would help in getting it approved. Gerrit asks for details on the enhanced TLP so that the stakeholders can feel comfortable concurring with the use of this process. Alan also tells the group that FERC has decided that the PAD now has to include study plans, and so we want to go ahead and set up our resource conservation groups to get things started and organized. Alan explains a little about the RCGs and preliminary sign-up sheets are circulated around the room. Bill adds that he is planning on having the RCG meetings and technical working committee (TWC) meetings at the Lake Murray Training Center, since it is a fairly central location for everyone involved.

Alan also goes over a few things that are planned for the next 6 months, including the issue identification workshops with the public which are planned for late January, or early February. There is also a float trip planned for late March or early April 2013, which will involve a 2-3 day

paddling excursion over 30 miles of the Broad River, to view some of the project area. Steve Summer brought up the idea of also doing a motorized tour of Parr Reservoir and Lake Monticello.

Again, the floor is opened up to everyone for questions and comments. Amanda asks if the agencies and NGOs can be provided with more information on the projects so that they know what types of questions to ask in the future. She specifically asks for a presentation on current operations. It is decided that there will be a meeting that includes presentations on specific information that the agencies and NGOs want, and that the agencies and NGOs must submit their questions and requests for information by Friday, October 19, 2012. A meeting will be set up in November to address these items.

Ray Ammarell has drawn up a short document detailing the standard project numbers, and it has been included at the end of these minutes. Alan asks if anyone has any reports or information that we have not already collected to send it in so it can be included in the PAD.

A few closing questions were asked. Dick asked about the sediment again, and Ray explains that while the sediment at Parr moves around, it doesn't seem like there has been as much accumulation in the last 40 years as there was earlier on in the life of the project (the Parr Shoals Dam was built in 1914). He explains his theory that the sediment accumulation has reached its equilibrium and whatever sediment is entering the dam is flowing right through. This hasn't affected operations except at Fairfield PS while pumping to Monticello Reservoir during low flows.

Amanda asked about a bathymetry study and Steve says he will get the study that was done for Parr.

Hal asked if there is any connection between the waterfowl impoundment and Parr reservoir. It is determined that there are flap gates that allow for water to come in to the impoundment but not back out to Parr.

These final questions wrapped up the meeting. The next gathering will be sometime in November where SCE&G employees will present information requested by the agencies and NGOs.

Parr Hydroelectric Project

Parr Hydro Development

&

Fairfield Pumped Storage Facility Development

FERC Project No. 1894
Project Data Sheet
September 19, 2012

Kleinschmidt

Parr Hydroelectric Plant

General

- Parr Dam concrete gravity spillway, 37’ high, 2000’ long
- Earthen embankment on west end
- The concrete overflow section (wing wall) on west end approx. 35’ high
- (10) bottom hinged bascule crest gates, each 200’ long and 9’ high
    - Added 1974-1977
- Powerhouse: Steel-framed brick building, containing six vertical turbines with generators
- Non-overflow section on the east end
- Hydraulic crest gates can spill excess inflow

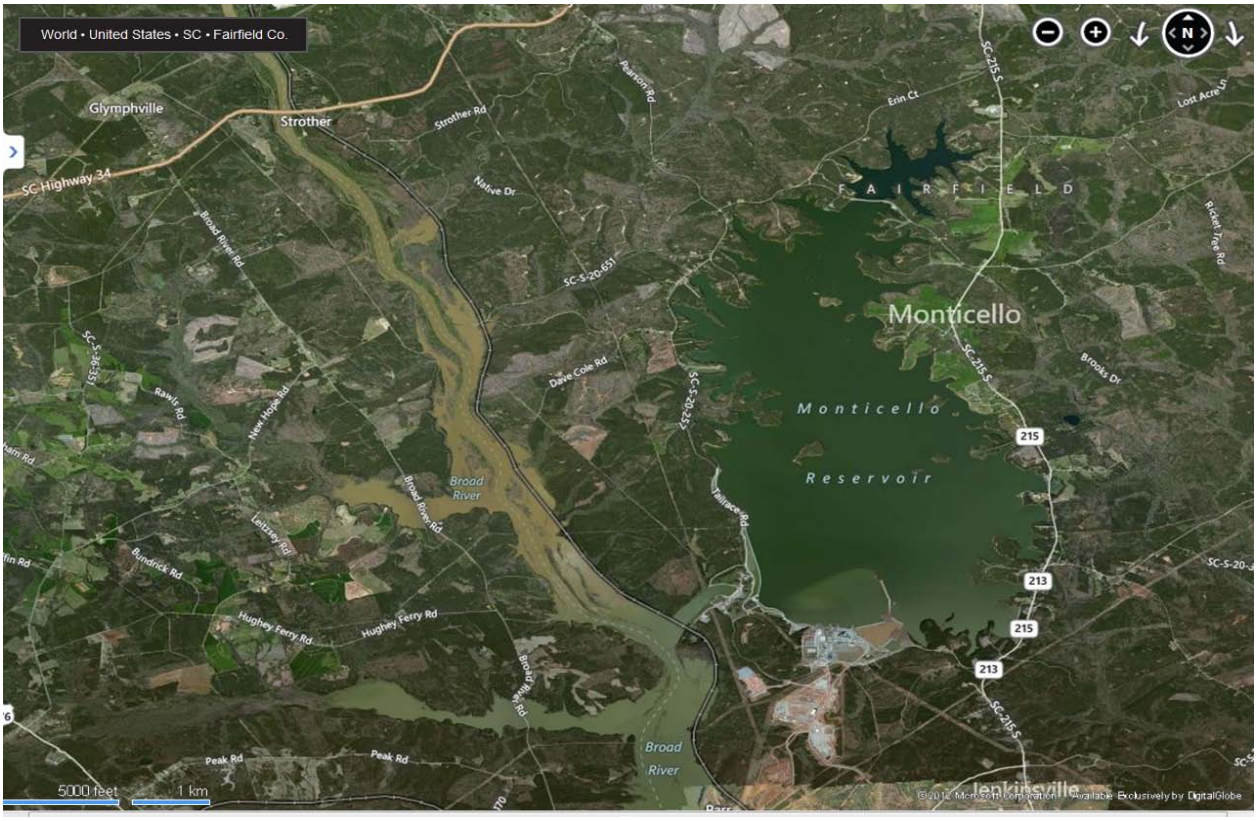
Parr Hydro Plant

Fairfield Pumped Storage Facility

General

- Four earthen dams (A, B, C, and D)
- Earthen Dam Construction:
    - Random fill shells (u/s and d/s)
    - Central impervious core
    - Upstream impervious blanket
- Riprap slope protection on upstream slopes
- Downstream slopes are grassed
- Dam B: main dam across Frees Creek
- Intake structure for plant integrated into abutment of Dam B
- Four steel penstocks lead from the intake structure to the powerhouse

Fairfield Pumped Storage Facility



Parr Hydroelectric Project Operations

Parr Development

- Primarily used for base load
- Licensed capacity 14.9 MW; hydraulic capacity ~6,000 cfs (6 units)
- Parr Hydro operates in modified run-of-river mode
- March – May: 1,000 cfs minimum flow, or average daily natural inflow to Parr Reservoir (less evaporative loss from Parr and Monticello Reservoirs).
- Remainder of year: 800 cfs daily average flow and 150 cfs minimum flow, or average daily natural inflow (less evaporative loss from Parr and Monticello Reservoirs)
- This means that when inflow minus evaporation falls below 800 cfs (1,000 cfs March-May), we do not get to keep any water – what comes in must go out.

Parr Hydro Inflow

- Inflow to Parr Reservoir is the sum of flows at 3 USGS gage sites:
    - Broad River near Carlisle (02156500, 5 miles below Neal Shoals)
    - Tyger River near Delta (02160105)
    - Enoree River at Whitmore (02160700
- New USGS gage installed at Hwy. 34 bridge on Parr Reservoir
    - Broad River at Blair, SC (02160750)

Parr Hydro Evaporation

- Evaporation is estimated based on SC State Climatologist Office data, and surface areas of Parr and Monticello Reservoirs.
- Increased evaporation from VCSNS was provided by plant staff.

Fairfield Development

- Primarily used for peaking, reserve generation when Saluda not available, and off-peak power usage (pumping to store water for generation)
- Fairfield Pumped Storage licensed capacity 511.2 MW; hydraulic capacity 50,400 cfs generating & 41,800 cfs pumping (8 units).
- Operate project so that “releases from lower reservoir during flood flows shall be no greater than flows which would have occurred in the absence of the project.”
- Based on USGS flood study from 1970s, Fairfield should stop generating and Parr’s crest gates should be completely lowered when Broad River flow reaches 40,000 cfs.
    - Measured by adding discharge from 3 USGS gages upstream of Parr Reservoir.

Parr Hydroelectric Project Hydrologic Data

Parr Reservoir (Full)

- 4,400 acres
- 13 miles long
- Storage capacity directly affected by FFPS Ops
- Total storage at full pool – 32,000 acre-feet
- Active storage – 29,000 acre-feet in 10’ operating range
- Reservoir Range – 256’- 266’ (top of crest gates)
- Drainage area – 4,750 sq. miles
- 31 river miles downstream of Neal Shoals
- 24 river miles upstream of Columbia diversion dam

Monticello Reservoir (Full)

- 6,800 acres
- Total volume of water available approx. 9.5 billion gallons of water (29,000 acre-feet)
- Affects Fairfield Pumped Storage Facility only
- Total storage at full pool – 400,000 acre-feet
- Active storage – 29,000 acre-feet in 4.5’ operating range
- Reservoir range – 420.5’- 425’
- Drainage area – 9,400 sq. miles

Safety

- Sirens at plant activate when Parr Crest Gates lower to release water into the Broad River.
- Both Developments have Emergency Action Plans to notify the public if a dam failure is imminent or has occurred.
- Both developments have Public Safety Plans to identify where watering signs are located.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Parr Hydro Development and Fairfield Pumped Storage Development Relicensing
Informational Meeting

December 4, 2012

final KDM 12-27-12

ATTENDEES:

Steve Summer (SCANA)
Milton Quattlebaum (SCANA)
Frank Henning (Congaree National Park NPS)
Hal Beard (SCDNR)
Dick Christie (SCDNR)
Phil Gaines (SCPRT)
Robert Stroud (SCDNR)
David Hancock (SCE&G)
Beth LeMaster (US Forest Service)
Malcolm Leaphart (Congaree Riverkeeper)
Ron Ahle (SCDNR)
Rebecca Haynes (American Rivers)
Tom McCoy (USFWS)
Bill Stangler (Congaree Riverkeeper)
Rusty Wenerick (SCDHEC)
Prescott Brownell (NOAA)
Bill Marshall (SCDNR)
Jon Sherer (City of Columbia)
Randy Mahan (SCANA)
Tommy Boozer (SCE&G)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Tom Hanzlik (SCE&G)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Alison Jakupca (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting by welcoming everyone and asking them to sign the attendance sheet. He then turns the meeting over to Bill, who begins with an overview presentation of the Parr Project. Bill shows several detailed images of the Project, which includes Parr Hydro and Fairfield Pumped Storage, and the project boundary line. Ron asks if any area downstream of the dam is included in the PBL and Bill's answer was no, the project ends at the Parr dam. Above the dam, the PBL ends at Henderson Island and around Cannon's Creek at Highway 176 and Heller's Creek, about three-quarters of a mile below Highway 34.

Bill then turns the meeting over to Ray, who directs the presentation towards hydraulic conditions at the Project. Historically, Parr dam was a run of river dam, with no flashboards or gates until 1976 when gates were added for the construction of Fairfield Pumped Storage. Now the dam provides limited regulation of flows, less than 40,000 cfs. There is limited storage available in the Parr Reservoir, approximately 29,000 acre-feet. A USGS gage is located about one mile downstream of the dam at Alston, and states that the discharges at the gage are regulated by low to medium flows due to the power plants above the station. Parr Hydro passes instream flow in the Broad River up to 6,000 cfs. The level of daily fluctuation at Parr reservoir is usually around 8 feet, with a maximum of 10 feet, and depends on what time of year it is.

In 1976, ten bascule gates were added to the Parr dam. Each gate is 200 feet long and 9 feet tall, and they are operated in pairs. The 29,000 acre-feet of active storage in the Parr Reservoir, with a ten foot drawdown, is exchanged with the Monticello Reservoir via the Fairfield Pumped Storage Facility. With all six units operating, Parr Hydro can pass up to 6,000 cfs. Parr usually operates continuously to pass the normal Broad River flow, and doesn't increase generation just because Fairfield is operating. Instead that water is stored for later use. Fairfield Pumped Storage operates in a peaking mode, meaning it is operated as a quick option to provide energy during peak usage times of the day.

Article 39 of the current Project license defines flood flows as those exceeding 40,000 cfs, or those that flood South Carolina Highway 28 in Peak, SC. During floods, the Project needs to manage the Parr Reservoir backwater and keep levels from impacting upstream railroad tracks. During high flows, or when natural flows exceed 40,000 cfs, Parr Hydro passes what it can through the powerhouse and spills the remainder. Article 14 focuses on low flows at the Project. There must be an instantaneous minimum flow of 150 cfs and a daily average minimum of 800 cfs or inflow whichever is less. During the months of March, April and May there must be a minimum instantaneous flow of 1000 cfs.

There are three USGS gages in the area to monitor these flows. When the evaporation level, as calculated by the SC State Climatologist, is subtracted from the sum of the three gages, and the flow is less than 800 cfs (or 1000 cfs during March through May), Parr is operated to pass the required flow. During low flows, when there is no excess inflow to supplement the losses from the two reservoirs, the impact on the FFPS operation is less megawatt hours available. Hal makes the point that the reason the minimum flow is raised to 1000 cfs during the months of March, April and May is because that is the time of the striped bass spawning. Ron asks the question, when the Broad River is around 800-900 cfs, how does that low flow affect the pumped storage? Ray explains that the Project is a peaking operation, so it only uses the water from Lake Monticello to spin the turbines as it flows down to the Parr Reservoir.

Malcolm questioned the structural integrity of the crest gates, as they were built in 1976. Ray explains that the gates were in good condition and the dam has rock anchors that tie it down, providing a strong hold. He also states that independent safety inspectors are hired every five years to inspect the dam, along with regular FERC inspections and internal inspections. He assures the group that the dam is in very good condition.

Ray then turns the meeting over to Tommy, who spends some time talking about recreation on the lakes, and the shoreline management plan. He tells the group that there are 384 acres set aside for recreation around the Project. Lake Monticello has a surface area of 6,700 acres, 54 shoreline miles and 21.6 miles of shoreline available for docks. There are 300 surface acres at the recreation lake, with 10.2 shoreline miles. No docks are allowed on the recreation lake. The Parr Reservoir has a surface area of 4,400 acres and 94 shoreline miles. Lake Monticello has boat ramps at Highway 215 and Highway 99. The lake also has about 50 acres of islands. Parr Reservoir has a boat ramp on Cannon's Creek and Heller's Creek. There is also a primitive boat ramp at Highway 34.Terrible Creek has 638 acres set aside as a waterfowl hunting area and Enoree River has another 191 acres for waterfowl hunting. There is no hunting allowed at Heller's Creek. The recreation lake doesn't allow power boats.

Tommy then goes over the Shoreline Management Plan that was in developed in 2002 for Lake Monticello. Tommy says that after the plan was implemented, the number of docks on the lake grew from 16 to about 65. He again mentions that no docks are allowed on Parr Reservoir and the recreation lake. The South Carolina Department of Natural Resources leases approximately 8,000 acres for management within the PBL. The Shoreline Management Plan seems to be satisfying people's needs in the area. Ron mentions that he has noticed times when the boat ramps at Lake Monticello were full and people were waiting to use the area. He doesn't believe the boat ramps available are adequate for everyone who is using them. He asks if studies have been done to see if these facilities are enough. Tommy says no studies have been done, and he hasn't received any complaints, but that this issue will definitely be one looked into during this relicensing process. Everyone in attendance received a copy of the 2002 Shoreline Management Plan for Lake Monticello.

Bill introduces Tom Hanzlik to the group, who is in attendance to further explain the workings of Parr Hydro and Fairfield Pumped Storage. Tom starts off with some general information about Parr Hydro. The total generation is 14.9 MW with six units and a maximum of 6,000 cfs through the plant. It is a modified run-of-river facility and with the Parr Reservoir acting as the lower reservoir for Fairfield. Fairfield generation includes 8 units capable of 75 MWs each, with an operating range of 4.5 feet. Eight Hundred and eighty megawatts are generated per foot of water. One foot out of Lake Monticello equals 2 feet into Parr. When Fairfield is pumping, it uses a load of 83 megawatts per unit, or 1280 megawatts per foot. The reverse is true when pumping, so two feet of water out of Parr equals one foot into Lake Monticello.

The plant's limitations involved the presence of too much water, or not enough. During flood conditions, as Ray explained earlier, the Alston gage must not reach above 40,000 cfs or Fairfield must be shut down and the crest gates lowered at the Parr dam. The reverse happens during drought conditions. FFPS power generation is limited to the amount of water available at Lake Monticello.

The question was raised as to how the operation of Fairfield will change once the new nuclear plants come online. Tom answers that nothing will change with Fairfield in terms of it not being needed. Since it is used for peaking, it will still be a big asset to the company during times of high energy demand. Fairfield will always be the quick and efficient way to produce power for filling in the gaps during peak periods, as opposed to starting up a different plant, run by coal, natural gas, or nuclear. The benefits of Fairfield include flexibility, either as a pump or generator, as it is quick to respond in both modes; maintaining reliability of the transmission grid, when another plant trips off-line; and its rapid loss of load.

Ray also mentions that two coal plants are due to be decommissioned by 2018. This includes 5 units, or about 500-600 MW. The new nuclear plants will replace this loss, but FFPS will still be needed to fill in the gaps. Malcolm mentions that the nuclear plants will increase evaporation at Lake Monticello, but it won't be much in terms of the entire project. It is also mentioned that FFPS is a limited resource and only good for about 8 hours of generation. After it is used up, it must be "recharged" for use again, by pumping the water back to Monticello.

After Tom finishes his presentation, Bill addresses the remaining questions that were submitted by the agencies and NGOs. Bill explains that several topics brought forward, such as instream flow and sediment/sand dynamics, will be discussed in further detail once the technical working committees are formed, specifically the Fish and Wildlife TWC. SCDNR asked for information

about the aquatic habitat conditions in the mile-long bypass reach of the Broad River, immediately below the dam. Bill asked if Ron would elaborate on this issue. Ron explained that an island just below the dam splits the bypass in two, and while flows reach down both sides of the island, one side has significantly lower flows, causing warmer water temperatures and lower dissolved oxygen levels. Ron is interested in studying how this has affected the number of fish species. Prescott mentions an instream flow and habitat characterization study would be helpful. Bill answers this will definitely be something looked into once the TWCs are formed. Fish entrainment, including impingement, bar rack spacing, and velocities at the intake, will be discussed within the fish and wildlife TWC. The issue of projected long term water demands on the Broad River is information that will be included in the PAD.

Bill Stangler asked if there are areas downstream from the Project to improve recreation opportunities on the Broad River and asked for an inventory of SCE&G/SCANA properties downstream of the Project. Bill answered that the Company would consider specific proposals or ideas related to downstream recreation but did not intend on bringing lands downstream of Parr Dam into the Project boundary. An inventory of SCE&G/SCANA properties downstream of the project will not be provided, since these areas are not included in the PBL. A description of water temperatures and anticipated affects of the expanding nuclear facilities, including modeling of the thermal plume, was also requested. It is mentioned that monitoring has been done and will be continued before and after the nuclear plants come online. As much information as is available during the writing of the PAD will be included in the PAD. Only baseline data will be available at the time the PAD is filed, since this will be before the nuclear plants actually go online.

Beth asks why the PBL was set all the way up to Henderson Island. Ray answers this was due to where the USGS backwater profiles reached due to the addition of crest gates on the Parr Dam. The question is asked and affirmed that a relicensing settlement agreement will be pursued.

Before the meeting closes, several upcoming events are discussed. Two public outreach workshops will be held in January. In Fairfield County, the first public outreach workshop is scheduled for Tuesday, January 15, 2013 at 7pm at the Winnsboro Woman's Club. The second public outreach workshop will be held in Newberry County and is scheduled for Thursday, January 17, 2013 at 7pm at the Newberry County Courthouse. Everyone is invited to attend and encouraged to invite others who may be interested in the Parr/Fairfield Relicensing Project.

There are also two more events being scheduled for those interested, including a 2-3 day canoe trip on the Broad River to view the Project area and a 2 day boat tour to view Lake Monticello, and the recreational and Parr reservoirs. These events will be scheduled sometime during the weeks of March 18th through April 8th. Meeting attendees are encouraged to indicate desire and availability for these outings as soon as possible. Everyone who is interested is asked to register with Kelly by February 22, 2013. Reminder e-mails and Doodle polls will be sent out to the group to help with scheduling.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Joint RCG Meeting

February 12, 2013

Final KDM 03-29-13

ATTENDEES:

Steve Summer (SCANA)
Milton Quattlebaum (SCANA)
Frank Henning (Congaree National Park NPS)
Hal Beard (SCDNR)
Dick Christie (SCDNR)
Charlene Coleman (American Whitewater)
Robert Stroud (SCDNR)
David Hancock (SCE&G)
Mark Caldwell (USFWS)
Malcolm Leaphart (Congaree Riverkeeper)
Ron Ahle (SCDNR)
Rebekah Dobrasko (SHPO)
Tom McCoy (USFWS)
Pace Wilber (NOAA)
Joseph Wojcicki (By-PAS)
Karla Reece (NOAA) via Conf. Call
Bill Stangler (Congaree Riverkeeper)
Rusty Wenerick (SCDHEC)
Prescott Brownell (NOAA)
Bill Marshall (SCDNR)
Jon Sherer (City of Columbia)
Randy Mahan (SCANA)
Tommy Boozer (SCE&G)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Mike Summer (SCE&G)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Shane Boring (Kleinschmidt)
Gerrit Jobsis (American Rivers)
Fritz Rohde (NOAA) via Conf. Call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting with introductions and a quick overview of the agenda. The group then begins reviewing and editing the Operating Procedures Document, which was distributed to everyone prior to the meeting. Pace asks if the agencies need to sign the document once it is finalized and Alan answers no.

Pace begins the edits by suggesting that since many people from the general public will be reading this document, a paragraph needs to be included on how this agreement fits into the overall licensing process. Also he suggests that a section is added to the Operating Procedures that includes mandates from all agencies involved, as well as an explanation of the mandates for the public. Alan asks the agency representatives at the meeting to provide these mandates for inclusion in the document. During this discussion, the idea of posting links to the agency and stakeholder websites on the Parr Relicensing website is brought up. Alan and Bill agree that this is fine and that Kleinschmidt will post the links when the Parr website is complete.

Kleinschmidt

A discussion on the involvement of social media occurs when this section in the document is reached. The group decides that social media is okay for some uses but not others, and should reflect only the opinion of the group being represented and not as a way to speak for others. The acceptable uses of social media are clearly defined in the Operating Procedures. Also, a mission statement for the Parr Fairfield Relicensing Group is developed for inclusion in the document.

Mark asks for clarification on the term "individuals" that are to be included in the Parr Fairfield Relicensing Group. This is explained that individuals include the public at large. It is also asked what the difference is between Resource Conservation Groups and Technical Working Committees. Dick explains that they are basically one in the same, with an RCG being a larger parent group to various TWCs, providing an opportunity for people to become involved that may not have the time or technical experience to be involved in a TWC. Pace also asks for clarification on who has the responsibility of keeping FERC updated on the relicensing process. Bill answers that SCE&G is responsible for this and Alan explains how FERC requires updates to be filed by the applicant every quarter.

When the subject of confidentiality agreements is reached within the document, Pace states that their organization will need to have their lawyer look at any agreement prior to signing, and notes that time needs to be a consideration with this. Pace refers Randy to Mike Mastry as a contact for these situations.

A few other notes during discussion of the Operating Procedures include; standardization is needed of the terms "stakeholders" and "participants" within the document; "compromise" and "consensus" need to be clarified; and the term "team" should be replaced by PFRG, RCG and TWC where appropriate.

Randy reminds the group that there is no authorship to the Operating Procedures document, and that is belongs to the whole group, not just SCE&G. The document is agreed upon by everyone in attendance, and after the mandates are received and incorporated, it will be finalized and distributed to the group, as well as be posted to the project website.

Alan reiterates to the group that support of the agencies and stakeholders is crucial in FERC allowing SCE&G to use the enhanced traditional licensing process. Although this won't be necessary until the NOI is filed, it is important for everyone to keep in mind that this concurrence is essential.

Bill also informs the group that future meetings may be located closer to the project, within Newberry and/or Fairfield Counties. Several people question the reasoning for this, especially with TWC meetings, since public attendance is very rare, if at all. Bill says future meeting sites are still being determined and he will keep everyone updated on this issue.

Alan then gives the group an overview of the Public Meetings that were held in January in Newberry County and Fairfield County. Gerrit asks if dates are set for the filing milestone documents throughout the process. While there are planned dates for submitting these documents, actual dates may vary slightly. However, deadlines for the filing of each document do occur and are specified by FERC.

With this, the meeting is adjourned. Action items stemming from this meeting are included below.

ACTION ITEMS:

- All agencies need to submit a mandate for inclusion in the final Operating Procedures Document.
- Links to agency and stakeholder websites will be listed on the Parr Fairfield Relicensing website.
- Kelly will begin including the time and meeting locations on the distributed agendas.
- Kelly will provide Gerrit with an attendance list from the Public Meetings.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality, Fish and Wildlife RCG Meeting

February 12, 2013

Final KDM 03-29-13

ATTENDEES:

Steve Summer (SCANA)
Milton Quattlebaum (SCANA)
Frank Henning (Congaree National Park NPS)
Hal Beard (SCDNR)
Dick Christie (SCDNR)
Bill Stangler (Congaree Riverkeeper)
Robert Stroud (SCDNR)
Mark Caldwell (USFWS)
Malcolm Leaphart (Congaree Riverkeeper)
Ron Ahle (SCDNR)
Tom McCoy (USFWS)
Pace Wilber (NOAA)
Joseph Wojcicki (By-PAS)
Gerrit Jobsis (American Rivers)
Rusty Wenerick (SCDHEC)
Prescott Brownell (NOAA)
Bill Marshall (SCDNR)
Ray Ammarell (SCE&G)
Randy Mahan (SCANA)
Bill Argentieri (SCE&G)
Shane Boring (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Fritz Rohde (NOAA) via Conf. Call
Karla Reece (NOAA) via Conf. Call

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Shane opens the meeting by reviewing the agenda. The purpose of this meeting is to identify study needs and review, edit and finalize a mission statement for the Water Quality, Fish and Wildlife Resource Conservation Group.

The group begins with a draft mission statement and edits it until consensus is reached. The mission statement for the Water Quality, Fish and Wildlife RCG is as follows:

> "The mission of the Water Quality, Fish and Wildlife Resource Conservation Group is to develop recommendations relative to public trust resources (i.e. water quality, water quantity, fish and wildlife, etc) for inclusion in a Protection, Mitigation and Enhancement Agreement (PM&E Agreement). The purpose of the PM&E Agreement is to provide resource management recommendations for inclusion within the Parr Fairfield Hydroelectric Project license application."

After finalizing the WQFW RCG mission statement, Bill focuses the meeting toward identifying information and study needs for the group. He begins with listing all of the study needs the agencies and NGOs submitted during the project kick-off. These include:

- Entrainment and Impingement Study at FFPS and the Parr Dam

- Sediment Study
- Information about the mile long west side of the island located below the Parr Dam
- Temperature and other effects of the expanding VCS Nuclear Plant
- Instream flow requirements below Parr Dam
- Limited habitat assessment/characterization upstream of the Parr Project Boundary Line

Bill then asked the group to share any further study requests or information needs they had for the Project. Ron begins by discussing a potential spawning area for the Robust Redhorse, located just below the dam. He explains that in 5 years of sampling, that area has consistently shown the highest population, and would like to see a study developed to determine if the species is spawning in this area, when, under what conditions, etc. Ron also lists the need for fish community resource data for Lake Monticello, Parr Reservoir and the Broad River, and a study of the shoreline habitat on Lake Monticello. He believes the habitat has been degrading over time and would like to see if and how this has had an impact on fish communities. Other studies suggested include an American eel population dynamic study below Parr Dam, a waterfowl survey, spider lily survey, macroinvertebrate study, and a mussel and snail survey. Steve Summer mentions that a macro study and a mussel survey are being completed for the expansion of the nuclear plant, so this data will be available for the Parr Project as well. Mark Caldwell suggests a general rare, threatened and endangered species survey should be conducted as well, and notes that any surveys conducted for a listed species must be performed by someone permitted by the US Fish and Wildlife Service. Hal asks the group if an aquatic vegetation survey has been completed for Lake Monticello. An aquatic vegetation survey has not been done and it is added to the list. The idea of creating a water budget for the Project Vicinity is brought up, including historic pre-dam data and evaluating project effects of the downstream water budget. It is decided that this subject will be best dealt with in the Operations RCG. Robert mentions conducting a possible Creel survey. A general water quality study that includes historical to present data covering DO, pH, nutrients, metals and conductivity needs to be performed. Group discussion turned to any available bathymetry of Parr Reservoir. Bill indicated that GEL engineering collected some bathymetric profiles in Parr reservoir as part of a sediment study and indicated this information could be shared with the WQ TWC who was tasked with addressing sediment impacts on aquatic resources. The group concurred this information would be beneficial in moving forward to address this issue. Gerrit asks for an inventory to be developed listing all of the small dams located along tributaries that feed into the Project, but are located outside of the Project Boundary Line. This inventory could be used for evaluating the feasibility of removing some of the dams as a mitigation option. Discussion follows regarding this as outside of the PBL and not within FERC relicensing jurisdiction. Gerrit says that American Rivers already has a preliminary list that the group can build upon. Alan reiterated that this was not in the scope of relicensing but in the interest of maintaining open communication and information exchange between the interested parties and asks Gerrit if he would like the opportunity to give a presentation on the existing data. Gerrit agrees to this. Hal mentions that removing a dam is not always the best option in some cases, especially in regards to sediment release. This is something to keep in mind if dam removal does become an option.

Pace requests a copy of a GIS map of the Project Boundary Line. Gerrit also requests a map of SCE&G land holdings downstream of the Parr Dam. Bill A mentioned that these lands are outside of the Parr Project boundary and not within the FERC relicensing jurisdiction.

The group then focuses on developing Technical Working Committees and deciding which studies need to be addressed in which TWCs, versus the RCG as a whole. The group also evaluates which

study requests can be addressed by existing data and which issues should be dealt with in a different RCG. It is decided that the aquatic vegetation survey should be included as part of the Lake and Land Management and Recreation RCG. Information regarding water temperatures and anticipated effects of the new nuclear facilities can be found in the FEIS for that project and the thermal plume study conducted for the new nuclear project's NPDES.

Four TWCs are identified as follows; the Instream Flows TWC; the Water Quality TWC; the Fisheries TWC; and the RT&E TWC. A complete list including all study requests identified and which TWC they have been assigned to is attached at the end of the notes. The TWCs are composed of the following WQFW RCG stakeholders:

- Instream Flows TWC – Gerrit Jobsis, Dick Christie, Bill Marshall, Ron Ahle, Bill Stangler, Prescott Brownell, Tom McCoy, Scott Harder, Steve Summer, Milton Quattlebaum, Bill Argentieri, Alan Stuart, Kelly Miller
- Water Quality TWC – Gerrit Jobsis, Bill Marshall, Ron Ahle, Bill Stangler, Jaclyn Daly, Rusty Wenerick, Tom McCoy, David Eargle, Scott Castleberry, Steve Summer, Milton Quattlebaum, Bill Argentieri, Alan Stuart, Kelly Miller
- Fisheries TWC – Milton Quattlebaum, Steve Summer, Gerrit Jobsis, Ron Ahle, Dick Christie, Tom McCoy, Fritz Rohde, Hal Beard and/or Robert Stroud, Chad Altman, Bill Argentieri, Alan Stuart, Kelly Miller
- RT&E TWC – Gerrit Jobsis, Bill Marshall, Bill Stangler, Tom McCoy, Karla Reece, David Eargle, Scott Castleberry, Steve Summer, Milton Quattlebaum, Bill Argentieri, Alan Stuart, Kelly Miller

During discussion of the various studies, an evaluation of diadromous fish passage alternatives was mentioned as a possible study to be included as part of the Santee River Basin Accord for Diadromous Fish Protection, Restoration, and Enhancement. Sometime in the near future it is proposed that SCDNR present to the group an overview of current studies completed and ongoing as part of the Santee River Basin Accord.

The WQ TWC members decide that a WQ TWC meeting should be held before the float trips that are scheduled for March. Gerrit asks if it will be possible to set up recurring meeting dates for some of the groups, bunched together over a few days in a week. Bill says this idea will be considered.

With this, the meeting adjourned. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- SCE&G will develop a conceptual plan for an Entrainment and Impingement study for the Fisheries TWC to review.
- SCE&G will develop a conceptual plan for a Waterfowl Survey for the RCG to review.
- Bill A will provide GIS data of Parr PBL

- Gerrit will schedule a time to present information about small dams located within the Project Vicinity.
- SCDNR will present an overview of the current studies being conducted under the Santee Basin Accord
- Kelly will set up a Doodle Poll and schedule a WQ TWC meeting for late February/early March.

Water Quality, Fish and Wildlife RCG Study Requests

Instream Flows TWC

- Information of in-stream flow requirements below Parr Dam
- Information about aquatic habitat conditions in mile-long section on west side of island of the Broad River immediately below the dam.
- Habitat assessment upstream of Parr Dam to the end of the Project Boundary
- Limited habitat assessment upstream of Parr Project Boundary

RT&E TWC

- Mussel and snail survey
- Crayfish survey
- RT&E survey
- Spider lily survey

Fisheries TWC

- American shad spawning below Parr Dam
- Diadromous fish passage alternatives evaluation
- Information about fish entrainment and impingement at Fairfield PSS and Parr Dam - SCE&G develop conceptual for RCG review
- Robust Redhorse spawning area just below Parr Dam
- Fish community resource data on Parr, Monticello reservoirs and Broad River
- Shoreline habitat on Monticello Reservoir
- American eel abundance (population dynamics)

Water Quality TWC

- Any study or report about the dynamics of the sediment/sand movements and load throughout a year with the operations of the Project
- Historical water quality data
- Project effects on water quality
- Description of water temperatures and anticipated effects of existing and expanding nuclear facilities – FEIS and thermal plume study for new nuclear
- Macroinvertebrate survey

WQFW RCG

- Inventory of small dams for feasibility of removal potential offsite mitigation – evaluate details for RCG review
- Waterfowl survey - SCE&G develop study plan for RCG review and approval

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Lake and Land Management and Recreation RCG Meeting

February 19, 2013

final KDM 03-29-13

ATTENDEES:

Milton Quattlebaum (SCANA)
Mike Summer (SCE&G)
Dick Christie (SCDNR)
Bill Stangler (Congaree Riverkeeper)
Robert Stroud (SCDNR)
Charlene Coleman (American Whitewater)
Malcolm Leaphart (Congaree Riverkeeper)
Mark Davis (SCPRT)
Tom McCoy (USFWS)
Billy Hendrix
David Hancock (SCE&G)
Tommy Boozer (SCE&G)
Gerrit Jobsis (American Rivers)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Alison Jakupca (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Prescott Brownell (NOAA) via Conf. Call
Joseph Wojcicki (By-PAS)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

After introductions, Alan opens the meeting by giving a brief overview of the RCG meetings held on February 12th.

The group then focuses on developing a mission statement for the Lake and Land Management and Recreation RCG. Dick Christie has drafted his own version and the group uses this as a starting point. Gerrit says he would like the mission statement to include mention of the area downstream of the Parr Dam, in terms of possible recreational opportunities. Bill Stangler agrees that this should be included. This sparks a discussion on whether project effects on recreation downstream of the dam should be included in the mission statement. The question arises of whether downstream recreation potentials should be included in the mission statement at all, since FERC cannot approve anything outside of the Project Boundary Line. Eventually a consensus is reached and the final mission statement for the LLM/Rec RCG is as follows:

> "The mission of the Lake and Land Management and Recreation Resource Conservation Group is twofold:
> 1. Evaluate the effects of the Project operation on recreation resources and explore the potential for enhanced recreational opportunities. Develop a consensus based Recreation Plan to address public recreation within the Parr Project boundary for the term of the new license.
> 2. Develop a consensus based Shoreline Management Plan to identify appropriate shoreline activities within the Parr Project boundary and

guidelines to ensure these activities are conducted in a manner to avoid or minimize environmental impacts."

After the mission statement is developed, the group begins to identify potential information needs. This group was divided into two Technical Working Committees (TWCs), a Recreation TWC and a Lake & Land Management TWC. All members of the RCG will participate in both TWCs. An aquatic vegetation survey of Parr Reservoir and Lake Monticello was mentioned in the WQFW RCG meeting and determined to be better dealt with in the LLM/Rec RCG. Gerrit then asks SCE&G for an overview of what recreation opportunities are currently in existence. Tommy then gives the group a presentation detailing these facilities. All of the facilities listed below can be found in the Shoreline Management Plan (SMP) with a map showing their location.

- Scenic overlook on Lake Monticello
- Hwy 215 public boat ramp on Lake Monticello
- Hwy 99 public boat ramp on Lake Monticello (includes primitive camping)
- 384 acre Recreation Lake with Park site and public boat ramp
- 8 islands on Lake Monticello
- Cannons Creek public boat ramp (includes primitive camping)
- Hellers Creek public boat ramp
- Terrible Creek Waterfowl Management Area
- Hwy 34 public boat ramp
- Enoree River Waterfowl Management Area
- One Future recreation site on Lake Monticello
- One future recreation site on Broad River

Bill Hendrix suggests opening a new access point on the Broad River that would allow for easier access to the Tyger and Enoree Rivers. After the presentation, the group lists Recreation study or information needs for the Project. These are listed below.

- Potential new recreation sites upstream of the Project Boundary Line and on Parr Shoals Reservoir
- A Recreation Use Needs Study (RUNS), which includes a comprehensive inventory of recreation facilities, including amenities, for the Project,
- A study examining the effects of reservoir fluctuations on recreation
- Potential for more portage facilities close to Parr Dam
- A study examining Project effects on downstream flow with respect to recreation
- Areas downstream of the project that could improve recreational opportunities on the Broad River – as noted previously, this is outside of the Parr PBL

Two studies will definitely be completed by the Recreation Technical Working Committee (TWC), including a RUNS and a study examining downstream flows.

Tommy then gives an overview of the SMP. David mentions that dock restrictions for Lake Monticello and Parr Reservoir are very strict. Gerrit asks about the land that is not developed, like the waterfowl management areas. He would like to know how they are managed, and what the restrictions are to the public. Gerrit asks if a designated area for camping can be set up on Parr Reservoir for recreators. Alan says this is something that will be considered and the need for

facilities will be evaluated in the Recreation Use Needs Study performed during relicensing. Dick adds that land that isn't designated for something else should be designated for public use. This will clarify to land owners and public recreators which land areas are available for public use. Another specific need for the Lake and Land Management TWC is updating the map included in the SMP. The group plans to go through the current SMP text and make sure everything is covered and all RCG members are satisfied with the document. The group listed the following information needs for the L&LM TWC.

- Waterfowl Management Area
- Aquatic vegetation survey of Parr and Monticello reservoirs
- SMP
- Shoreline classifications for both Parr and Monticello

Alan reminds everyone about the boat tours that are scheduled for March. The group decides that Lake Monticello will be toured on March 26th and the Parr Reservoir will be toured on March 27th. The next LLM/Rec RCG meeting will be scheduled for April, after the kayak trip and boat tours. With this the meeting is adjourned. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Kelly will send the group a copy of the Recreation Plan and SMP from the current license for the Project.

Recreation, Lake and Land Management RCG

- Waterfowl Management Area – (L&LM)
- Aquatic vegetation survey of Parr and Monticello reservoirs – (L&LM)
- SMP - (L&LM)
- Shoreline classifications for both Parr and Monticello - (L&LM)
- Description and location of public access facilities and recreational uses on project waters and adjacent lands. (Recreational Use Needs Study) Recreation
- Are there areas downstream of the project that could improve recreational opportunities on the Broad River? This should include an inventory of SCE&G/SCANA properties and their potential as canoe/kayak access points and/or campsites. Recreation
- Inventory of Recreation Sites (ADA Compliant, etc.) - Recreation
- Potential new recreation sites - Recreation
- Portage facilities at Parr Dam - Recreation
- Effects of reservoir fluctuations on recreation on Parr Reservoir - Recreation
- Recreational downstream flow - Recreation

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Operations RCG Meeting

February 19, 2013

Final KDM 03-29-13

ATTENDEES:

Milton Quattlebaum (SCANA)
Dick Christie (SCDNR)
Robert Stroud (SCDNR)
Malcolm Leaphart (Congaree Riverkeeper)
Gerrit Jobsis (American Rivers)
Tom McCoy (USFWS)
Joseph Wojcicki (By-PAS)
Bill Stangler (Congaree Riverkeeper)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Kelly Miller (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Bret Hoffman (Kleinschmidt)
Prescott Brownell (NOAA) via Conf. Call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The meeting opened with the group working to develop a mission statement for the Operations RCG. Dick presented an initial mission statement and the group tweaked it until consensus was reached. The mission statement for the Operations RCG is as follows:

> "The Mission of the Operations Resource Conservation Group (ORCG) is to develop consensus based recommendations for inclusion in the FERC license application that will balance the need for flexible, efficient hydropower operation with the interests of stakeholders as identified in the Lake and Land Management, Recreation and Water Quality, Fish and Wildlife RCGs."

The group then shifts focus to discussing the possibility of developing a water budget/model for the Broad River in the Project Vicinity, using as much information as is available. The State may be creating a water budget for all of South Carolina within the next two years. This is something to stay aware of, as it will provide information for the Project water budget. The consideration of Project effects on the downstream water budget is an important piece of the overall model. Bret mentions that the information used to create the model needs to include any upstream changes, such as withdraws or changes in upstream project operations, as these could shift the curve of the model. The group also wants to find information regarding the projected long term water demands on the Broad River.

Now that the Operations RCG is formed, Bill A will provide a reference sheet with the Fairfield Pumped Storage and Parr Shoals Hydroelectric Plant standard Project numbers information. Dick asks if there are any future plans for changing plant operations. Bill and Ray answer that no changes have been identified at this point.

The group continues to discuss issues and information requests as related to operations. A request is made for instream flow compliance records. Discussion of whether or not a sediment management plan should be included in the operations RCG or in the WQFW RCG. The group decides to keep development of any plan as an operations issue and will decide how to address it in the future if sediment is determined to be problem. Addressing potential sedimentation impacts on the ecosystem will be evaluated in the WQFW TWC and that information will be shared with the Operations RCG. Other issues the group is concerned with are the effects dam operations have on the Congaree River and how project operations affect instream flows. Ray says he will pull together some information sheets for the next meeting to use as a starting point for developing some study plans on these issues. Gerrit mentions that an operational model will be a great tool for aiding the other RCGs and TWCs with some of their issues/decisions. A complete list of Operations Information Needs is included at the end of this document.

Dick asks about trash management at the Parr Dam. Ray explains that the trash rakes are cleaned off periodically, and the collected material is carted off to a separate location to decompose.

Alan asks if anyone wants or needs a presentation on anything to get a better understanding of operations at the Project. Gerrit says he has questions on how the projects operate, considering the nuclear plant, the high flows allowed, and daily operations of the plant during various conditions. Ray says he will get with John Knight and Tom Hanzlik to get this information for the group. Prescott mentions he would like a presentation that shows upstream and downstream habitats and flow conditions in each area. Alan suggests this would be a good presentation for the WQFW RCG. Prescott says he will send some example presentations that include the type of information he wants. Bill S. says he will provide the group with an updated paper that details interactions between the Broad, Saluda, and Congaree Rivers.

With this the meeting adjourns. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Bill A will provide a standard Project numbers reference sheet at the next meeting
- Ray will develop a presentation with Project operations information for the next meeting.
- Kelly and Ray will get together to determine the next appropriate meeting time, according to the information Ray is able to find. A doodle poll will then be sent out to the group.
- Bill S. will provide the updated paper on the Broad, Saluda, and Congaree interactions.
- Prescott will provide example presentations showing upstream and downstream habitats and flow conditions in each area.
- Bill A will provide instream flow license compliance records by the next meeting.

Operations Information Needs

- What effects do dam operations have on the Congaree River? It is noted that operations appear to affect the minimum (lower) and maximum (higher) outflows relative to corresponding inflows and that flow pulses increase with flow. Are these measureable at Congaree? The Jobsis (Erich Miarka) study is referenced. (Operations)
- Description of current operations and proposed future operations at the project and related effects on instream flows. (Operations)
- Water budget/allocation model– (Operations)
- Project effects on downstream water budget – (Operations)
- What are the projected long term water demands on the Broad River? This will require coordination with the City of Columbia and analysis of their plans for projected population growth and water supply demands. It will also have to consider future demand from facilities like VC Summer and other water users. (Operation)
- daily operations, low flows, drought, & flood
- operational constraints
- Information sheet: A comprehensive explanation of the hydro operations at the Parr Shoals Project. Including: daily operations, low flows, drought, flood and status on existing units (working condition) (Operation)
- Information sheet: A comprehensive explanation of the operations at the Fairfield Pump Storage station. Including: daily operations, low flows, drought, & flood. (Operation)
- Future operational plans
- Instream flow compliance records
- Sediment management plan
- Low Flow Protocol - LFP

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality TWC Meeting

February 28, 2013

Final KDM 04-05-13

ATTENDEES:

Bill Marshall (SCDNR)
Ron Ahle (SCDNR)
Rusty Wenerick (SCDHEC)
Shane Boring (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Randy Mahan (SCANA)
Jaclyn Daly (NOAA) via conference call
Tom McCoy (USFWS) via conference call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting with introductions, and then explains that a few people (Milton, Steve, Randy and Bill Stangler) will be joining the meeting later. Because of this, the agenda is shifted around so that the macroinvertebrate study is discussed in the afternoon.

The group begins discussing historical water quality data by going over some examples of the types of studies SCE&G has performed at Lake Monticello and Parr Reservoir, including identifying the parameters covered. Alan mentions that lots of data exists, but it needs to be consolidated into one report, where all the data is available in one location. Jaclyn requests that the report include the water quality standards that exist for some parameters. Rusty also suggests that the report include a map of the Project Vicinity that points to specific areas where water quality readings were taken, along with any data points that exceed standards.

Alan asks the group to decide what parameters should be included in this report that will indicate and evaluate any project effects. Ron mentions that he would like to see a comparison between the water that is being taken out of Parr Reservoir and the water that is being returned to Parr Reservoir. He would like to see a "before and after" type of analysis, to see if the nuclear plant has any effect on the water quality of Lake Monticello, Parr Reservoir, and to a lesser degree, the Broad River.

Rusty mentions there are a few sites within the Project Area that DHEC has listed as having violations for copper levels and pH over the last few years. He says that these areas are no longer being monitored, but the sites remain on the 303d list of impaired waters until data is collected that proves it is clear of these violations. Rusty shows the group a map (Figure 1) that displays the sites monitored by DHEC and reminds the group that all data can be found in Storet. Ron mentions that he also has data he has personally collected during his time in the field and would be willing to share this with the group for inclusion in the report.

Jaclyn asks if algal blooms are monitored within the reservoirs, since an increase in these can be toxic to fish. Alan says this can be determined if chlorophyll A is monitored, which may be so in Lake Monticello, but is unlikely at Parr Reservoir, since it isn't a true reservoir.

Alan asks Rusty what information he needs for the 401 water quality certification. Rusty says that DHEC will examine any places where there have been violations, look at the specific parameter in violation, and determine if the Project contributed to the exceedance in limits. He notes that it might not be possible to determine if the Project is affecting these limits. The watershed is likely causing increases in things like phosphorus at the impoundment however DHEC might look to see how plant operations can be used to mitigate that water quality problem. Bill Marshall mentions that DHEC will also be interested in how the Project effects water quality downstream. Rusty agrees, and notes that copper is known to have exceeded limits in the past at sites downstream of the Project. Ron says that copper could be coming from plant operations, but Alan says it could also just be from the natural environment.

Jaclyn suggests the group also consider looking at new emergent contaminants. The group says that this information would be available through NAWQA, the National Water Quality Assessment Program, a USGS program that examined the Santee watershed, which includes area in North Carolina down to the South Carolina coast. Celeste Journey is the contact person for this information. Rusty suggests the group look at existing data before going any further in searching for these emerging contaminates. Shane mentions that after all data is collected, the group needs to review it and narrow down the specific parameters that have a true nexus to the Project. Ron reminds the group of his earlier suggestion of examining water as it moves to and from the Parr Reservoir, adding that this could be an ideal way of identifying any Project effects.

To address the issue of stratification, Shane says there may already be a vertical profile in existence that shows this for Lake Monticello and Parr Reservoir. It is noted that Lake Monticello is at an elevation of 425 feet at full pool, but can go down to 418 feet in an emergency situation and with FERC approval. The maximum depth of Lake Monticello, located at Frees Creek, is 160 feet, with an average of 75 feet.

Rusty notes that the WQ TWC will be interested in seeing the water budget the Operations RCG is developing.

Bill M asks about NPDES discharges in the areas. Bill A says the Parr Fairfield Project does not have an NPDES discharge, although the nuclear plant does. Rusty says he will look at GIS information to determine if there are any more NPDES permitted areas within the Project Boundary Line.

Information Needs (Water Quality Parameters)

The group reaches consensus on what parameters need to be included in the baseline water quality report. These parameters are temperature; dissolved oxygen (DO); pH; conductivity; total dissolved solids (TDS); total suspended solids (TSS); turbidity; phosphorus; chlorophyll A; metals; nutrients; organic compounds, specifically chlorinated pesticides; fecal coliform and/or E. coli; and radionuclides. The group also agrees to look at any available information on new emerging contaminants through USGS NAWQA sampling and any available vertical profile data that might address stratification. Water Quality sampling of Parr Reservoir before and after pumping

operations. Sources for collecting the data listed above include SCE&G, USGS, DHEC, DNR, Storet, and the Operations RCG water budget (after it is developed).

The group then begins discussion of the Sediment Loading Assessment performed by GEL engineering. Alan mentions that an issue for many people involved in the Parr Relicensing is sedimentation. This sediment study that was performed in 2008 was sent to the group to spark discussion. Alan asks what the group wants to do with this issue. Bill M asks how seriously sediment affects FFPS operation. Bill A says there is sediment at the project but the only issue with it is that when sand is pumped through the system, it can cause deterioration of the blades. However, this is a maintenance issue and the sand doesn't affect generation. Bill A also tells the group that sediment would only be a problem at Parr if it reached the top of the Parr Dam. Any sediment below the one foot line at the top of the dam is insignificant. The only sediment that leaves the project is what goes through the turbines. The sand gates have not been operable for many years and there is no intention of changing that. There are no sand gates at Fairfield.

The trash rake was added to help keep the forebay area clean, so there really is no need to make the sand gates operable again. The trash rake at Parr is a drag rake. It extends approximately 50-75 feet in front of the dam, drags along the bottom of the reservoir, up along the rack and deposits into a trough. The sediment, logs and debris it collects in the trough are loaded up and carried away to a landfill. Bill A tells the group that they have seen better performance out of the units since all of the debris in the forebay area has been cleaned out and is kept clean. Another benefit of this trash rake system is that the movement of the rake stirs up sediment, which allows it to move through the turbines and out into the river. Because of this system, it seems the amount of sediment that is being transferred through the Project is equal to what is entering the reservoir. This means the sediment level within the Project is at equilibrium, as Ray Ammarell had previously said. Tom asks if a diagram of the trash rake can be provided. Bill A says he will have Ray include this information in his operations presentation.

Bill A tells the group that SCE&G is not advocating a need for dredging to eliminate some of the sediment within the Project. He says this would not be economical, as the sediment collected is not able to be resold due to quality. Bill A also says there is a man who dredges around the Hwy 34 bridge and has been doing so for about 2 years. Bill S asks if this has any affect on what is accumulating below the dam. Bill A answers that this amount is insignificant.

Ron says that if a sediment budget can be shown of what sediment enters and exits the Project (including quantity and quality) then DNR would have no concerns with sediment. Equilibrium would be the best possible situation for the Project, since there would be a constant movement of sediment into and out of the reservoirs. Bill M agrees, saying that at other hydro projects, sediment can be released downstream in large volumes, which is not the best thing for a river. He mentions that if FERC has no issue in regards to dam safety, the equilibrium situation would be great.

The group focuses on the GEL report and tries to determine the composition of the sediment that is entering the reservoir. Everyone believes it is most likely the fines, or silty type sediment, that is passing through the Project. This information will also be included in the water quality report that was discussed earlier in the meeting. Ron and Rusty ask if a sediment contaminant study has been completed in the Project Area. Bill A says that a sediment investigation study plan was developed for the VC Summer Units 2 and 3.

Information Needs (Sediment)
The sediment discussion highlights several information needs including determining a sediment budget; determining the quantity, composition and location of the samples taken for the GEL report; finding out if FERC has a dam safety issue with sediment build-up; finding out if inoperable sand gates will be an issue for acquiring a new license; and acquiring the VC Summer Units 2 and 3 sediment investigation report.

After lunch, Steve and Milton join the meeting. Steve tells the group that monthly water quality profiles are being done at Parr Reservoir as part of the water quality certification for the new nuclear units. Monthly water quality profiles have been conducted in Monticello Reservoir for many years in support of the existing nuclear unit. Steve addresses the issue of stratification at the Project. He explains that generally, Parr Reservoir doesn't stratify because it isn't a true reservoir. Steve explains because of the operation of the Fairfield Pumped Storage Facility and the nuclear plant, Lake Monticello is like three different reservoirs in one, with respect to stratification. The upper end of the lake stratifies like a normal reservoir. The section of the lake across from FFPS stays mixed down to 60 feet, due to the regular pumping and releasing of water. The eastern side of the lake is where the thermal plume from the nuclear plant discharge is located. Steve points out that the water circulation for the nuclear plant is very small compared to the amount of water that is moved back and forth from FFPS.

Steve says SCE&G has three water quality sampling locations in Parr near the discharge area and sediment sampling locations above Heller's Creek and at the discharge location for the new nuclear units. He says that sampling for macroinvertebrates, fish, sediment and water quality for the new nuclear units are all performed on Parr Reservoir. Steve says that a study performed recently by John Alderman identified a new area just below Parr Hydro that has the highest amount of mussels in all of the Broad River Basin. Alan asks if the group would like to see a macroinvertebrate study completed, separate from what is already being collected for VC Summer. Currently SCE&G is sampling for macros at a site above Heller's Creek, a site below the discharge, and in the Parr Hydro tailrace once a year. Ron mentions he would like to see a dredge done at the tailrace area at FFPS. Milton says he will dredge at three locations, from the railroad trestle up to the bend in the tailrace, this spring to see if there are any signs of macros. Rusty says he would like to Jim Glover and his group to look at the macros study plan that is currently used by SCE&G for VC Summer to make sure it is also suitable for the Parr Project. Milton says he will send a copy of the study plan to Rusty and Kelly for distribution.

Information Needs (Macros and Mussels)
Items of note stemming from the macroinvertebrate discussion include the identified needs to sample the Fairfield tailrace area at three locations for possible macro habitat; review the VC Summer Units 2 and 3 macroinvertebrate studies; review VC Summer Units 2 and 3 mussel study; and acquire feedback on these reports from DHEC aquatic biologists.

The group then shifts focus to discuss the nuclear plant's affect on water temperature of Lake Monticello. There were originally two temperature monitors in Monticello Reservoir between FFPS and Hwy 99; only one is currently in existence (FPPS forebay). Bill A asks the group if temperature information from Unit 1 needs to be included in the water quality report. Bill S says that if the nuclear plant has been in compliance for their NPDES permit, there should be no concerns with Unit 1. The group agreed.

Steve and Ron mention that Lake Monticello is probably warmer than Parr Reservoir in the winter and cooler than Parr in the summer, due to the pumping of Fairfield and the differences in depth of the two reservoirs. The new nuclear units 2 and 3 will discharge into Parr Reservoir. Rusty mentions that the NPDES permits for the new units considered how the Parr Project operates, and unless the operation is changed, the new discharge's affect on temperature won't need to be addressed. The group decides to look at the historical water quality data and see if anything needs to be addressed. Since everything for the new nuclear units has been permitted, all angles have been examined and determined to be acceptable.

Bill A then reviews what was covered in the meeting and finalizes the list for what data will be included in the water quality report. SCE&G and Kleinschmidt personnel will gather all the existing water quality data, form the report, and distribute it to the group for review. Everyone agrees to plan on meeting again in June.

With this, the meeting is adjourned. All action items from this meeting are listed below.

ACTION ITEMS:

- Kelly will send Jaclyn a copy of the American Rivers flows report by Erich Miarka.
- Ron will provide to the group WQ data he has collected
- Rusty will look at the DHEC GIS data and identify all NPDES permitted areas within the Project Boundary and report this information to the group.
- Milton will send a copy of the Macroinvertebrate Study Plan to Rusty and Kelly.
- Milton will send a copy of the Mussel Study Plan to Kelly
- Kelly will send out the macro report to the WQ TWC members and the mussel report to the WQ TWC and RT&E TWC.
- SCE&G and Kleinschmidt will compile all existing water quality data, form a report and distribute to the TWC for review.
- Bill A will include design details and operation of the Parr Hydro trash rake in the operations presentation.
- Kelly will set up a doodle poll for selecting a meeting date in June.

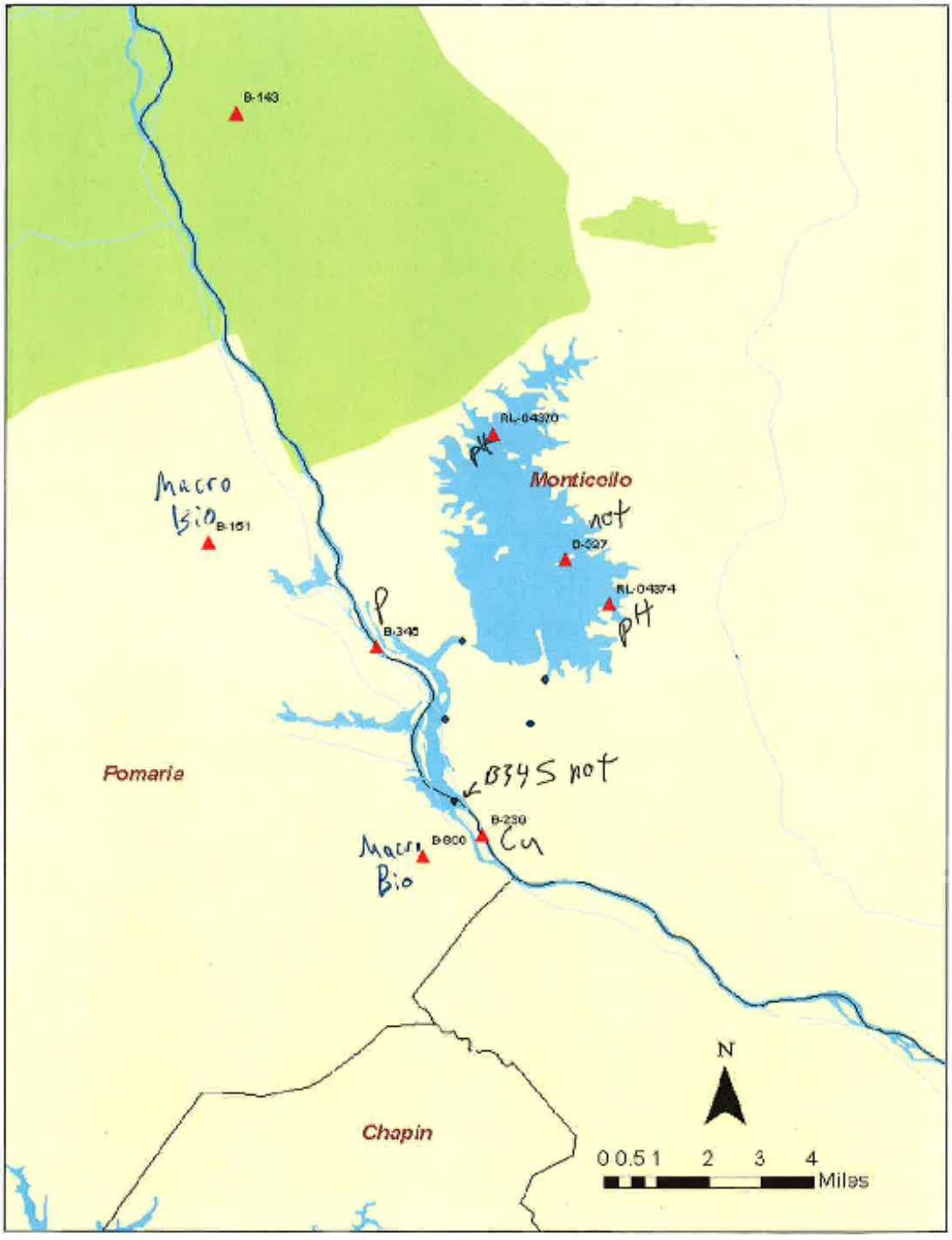


Figure 1: Map of DHEC monitoring sites at Parr and Monticello Reservoirs

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Instream Flows TWC Meeting

May 7, 2013

Final KDM 05-31-13

ATTENDEES:

Bill Marshall (SCDNR)
Ron Ahle (SCDNR)
Gerrit Jobsis (American Rivers)
Shane Boring (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Ray Ammarell (SCE&G)
Vivianne Vejdani (SCDNR)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Randy Mahan (SCANA)
Dick Christie (SCDNR)
Tom McCoy (USFWS) via conference call
Prescott Brownell (NOAA)
Kerry Castle (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting by briefly going over the agenda, then gives the group an overview of the float trip taken on March 19th and 20th. During this review, the group looks at the Project Area on a map, which sparks a discussion on the habitat just below the Parr Dam.

Ron explains how he is concerned about the separation in the habitat along the first mile of the Broad River, just below the Parr Dam. He says this is a highly utilized area of the river by fish species, and the side of the river along the west bank can grow stagnate during periods of low flow. Shane asks if a critical habitat study should be performed in this area. Ron says there are several critical habitats that need to be studied before the rest of the river is characterized. Prescott and Ron both mention they would like to have a habitat map made for as far down river as possible. Ron says that a habitat map should at least be made for the area immediately below the Parr Dam.

Gerrit tells the group he would also like to look at access along the river, since there are several areas that aren't accessible. Prescott mentions that he is interested in studying the tributaries along the river. Ron mentions that there is a good amount of data already available on the tributaries, collected by the DNR Stream Team.

Alan refers the group to a study on the Broad River, completed by Jason Bettinger (referred to throughout these notes as the Bettinger Study), as a possible starting point for the Parr Project's Mesohabitat Assessment and Instream Flow Study. The group notes that the Parr Project area was not included in this study, as the area in the Bettinger Study begins at Neal Shoals and extends upstream. However, the methodology used in the paper might still be utilized by the group.

After discussion on various needs for the Mesohabitat Assessment and Instream Flow Study, Gerrit focuses the group back on the agenda by beginning to list the goals and objectives for the study. Through much discussion the group agrees on four goals with corresponding objectives, as well as additional studies that need to be completed. These goals, objectives, and studies and included as an attachment at the end of these notes.

Steve and Ron then discuss the habitat issues at the west bank area. Ron says he believes that the decrease in DO and increase in temperature along the west bank area is related to the operating of the Fairfield Pumped Storage Project. Steve asks Bill if he has a copy of some aerial photos that were taken prior to Project construction since the west bank features are the result of natural topography, of which Bill answers he is not sure. Steve says he will try to find the photos, since they might show how river flow was distributed between the east and west bank area before the Project was built. Steve says that the issue will be getting water into that west channel during low flow situations. Gerrit says that Duke Energy is building a separate dam to help control flows at one of its projects. He believes the group needs to focus first on deciding what the flow needs for the area are, by seeing the area during higher flow situations. This will allow the group to evaluate how flows might be manipulated to create an even distribution over the area during low flow situations. Steve adds that LIDAR information will also be helpful, and that baseline data on temperature and DO in the west bank area will be needed to feed into the module. Ron mentions that spring through fall data needs to be collected, since he hasn't studied the area except during the summer. Kerry asks if turbidity will need to be examined along with the temperature and DO. The group considers this but decides that turbidity data is not necessary.

While looking at a photo of the dam, the group notes that there is a bit of leakage, which could be beneficial to the seemingly flow deprived west bank area. Ron agrees, but points out that during the summer, any benefits of the slight leakage at the dam may be diminished by the time they reach the central rocky location in the west channel.

The group then focuses their attention towards defining the geographic scope of the Mesohabitat Assessment and Instream Flow Study. The next hydro on the Broad River, downstream of the Parr Fairfield Project, is the Columbia Hydro Project. The upper reach of the PBL for the Columbia Hydro is noted as being at a Rocky Shoals Spider Lily population located just above the upper tip of Boatright Island. The group discusses whether or not this should mark the end of the scope for the Mesohabitat Assessment. It is decided that the scope for the Mesohabitat Assessment will stretch from Parr Dam downstream to the lower end of Bookman Island. Bill S. points out that there is a tributary on the lower end of Bookman Island, named Big Cedar Creek, and the scope should include this as well.

After deciding the scope, the group begins discussion on which definitions to use for the various mesohabitats. Two slightly varying sets of definitions are considered, including one used during the Saluda Hydro Relicensing Project, and one used in the Bettinger Study. Alan points out that using the definitions from the Bettinger study will be good for consistency, however, the group seems to prefer the definitions used during the Saluda Relicensing. Shane points out that there are several other commonly accepted definitions for the various mesohabitats and so the group decides to consider these options also. This issue is left undecided for now.

The group agrees to stay with the methodology that was used in the Bettinger Study. The group then discusses what the ideal flow would be when conducting the study. Ron says that lower flows

make it easier to delineate the habitats, while Shane says the flow should be near the mean annual flow when mapping. Ron suggests a flow that is below 2,000 cfs would be best for conducting the study, and everyone agrees.

The focus then turns to identifying target and driver species for the various Habitat Use Guilds. Ron offers his personal list of fish species he has observed in the Broad River to be used as a starting point. The group decides on a list of driver species including:

- Smallmouth Bass
- American Shad
- Brassy Jumprock
- Whitefin Shiner
- Robust Redhorse
- Santee Chub
- Striped Bass
- Piedmont Darter
- Snail Bullhead
- Redbreast Sunfish
- Channel Catfish

Although the list is longer than is customary, Alan says that it can be included in the study plan with a caveat that says some of these species will later be grouped into guilds. Alan makes the point that the species which have HSI curves need to be identified, and suggests that Shane and Brandon Kulik work together on this task. Shane and Brandon will also recommend surrogates for the group to consider that can be used for the species that do not have HSI curves and work on guild classifications.

The group then focuses on establishing general transect locations for the study. Dick mentions that in the Bettinger Study a majority of the river was categorized as being glides, pools and shoals, and that these will be areas to look for when deciding on transect locations. Ron specifies that he would like at least one transect to be established right below the Parr Dam, in the area he has identified as a critical habitat. The group launches into a heavy discussion on where the transects should go and how many are needed. Eventually everyone agrees to four general areas for the study to implement the IFIM technique. These include an area immediately below Parr Dam, upstream of Haltiwanger Island, along the Coleman property, and at Haltiwanger Island. Additionally, two other sites were identified for studying wetted perimeter/staged discharge relationships, at Huffman Island and Bookman Island. These locations are included in Figure 1. With these sites agreed upon, the group decides to schedule a field trip to identify the specific locations for transects. Group members interested in participating in this trip are Ron Ahle, Shane Boring, Gerrit Jobsis, Bill Stangler, Bill Marshall, Alan Stuart, Vivianne Vejdani, Milton Quattlebaum, Tom McCoy, Prescott Brownell, Steve Summer, Ray Ammarell and/or Bill Argentieri.

To close the meeting, the group discusses scheduling, keeping in mind that the final study plan needs to be developed by early 2014 to be included in the PAD, which is due late 2014/early 2015. The actual IFIM study will be started during the summer of 2015. The group plans to meet again during the July-August timeframe to discuss the draft study plan and HSI curves. With this, the meeting adjourns. Action items stemming from this meeting are listed below, along with an attachment that includes all decisions made during the meeting.

ACTION ITEMS:

- Shane Boring will contact Brandon Kulik to work together on identifying relevant HSI curves and surrogates for the study. Shane will also ask Brandon to make guild recommendations.

- Shane Boring will research other options for mesohabitat definitions to be used in the study.

- Kelly will schedule the "Transect Identification Recon Trip" with the interested parties for June 18th and 19th.

- Kelly will schedule a follow-up meeting/conference call during the July-August timeframe for the discussion of HSI curves and study plan development.

Goals and Objectives of Mesohabitat Assessment and Instream Flow Study

Goal 1: Characterize the flow/habitat relationships for aquatic species present in the lower Broad River below Parr Dam

- Objective A: Classify and quantify/map (characterize/define) Mesohabitats occurring within study area
- Objective B: Establish target species/guilds
- Objective C: Identify study methodology (recommended IFIM)
- Objective D: Identify tributaries and study areas (reaches) on the lower Broad River of interest for the study

Goal 2: Determine effects of Parr and FFPS operations on flows of the lower Broad River below Parr Dam

- Objective A: Identify operational ranges/constraints of two facilities
- Objective B: Evaluate effects of Project operations on Parr Dam releases at various inflow ranges into Project

Goal 3: Develop recommendations for Parr Hydro Project operations to enhance flows for aquatic resources in the Congaree River (this does not include a transect study)

- Objective A: Influence on diadromous fish (includes striped bass, sturgeon)
- Objective B: Influence on other resident aquatic species (including RT&E)
- Objective C: Influence on Congaree National Park
- Objective D: Consideration of Saluda operations consistent with goals of the Santee Basin Accord

Goal 4: Develop flow recommendations for lower Broad River below Parr Dam

- Objective A: Evaluate baseline habitat
- Objective B: Evaluate high and low flows
- Objective C: Seasonal and inter-annual variations of flow recommendations
- Objective D: Evaluate low flow protocol recommendations

Additional studies:
Temperature and DO in the west channel below Parr Dam (three monitoring locations)
Recreation flows – operation of Parr
Navigation flows – operation of Parr
Water Quality – operation of Parr

Define Geographic scopes of Mesohabitat Assessment and Instream Flow Study / Discuss Mesohabitat Assessment (including methodologies)

Geographic Boundary - Parr Dam to downstream end (lower extent) of Bookman Island, just below the confluence of Big Cedar Creek

Methodologies –
Mesohabitat unit definitions for visual assessment. (NOTE: May be modified by use of Saluda descriptions)

Habitat	Type Description
Riffle	Relatively shallow (<0.5m), swift flowing section of river where water surface is broken.
Glide	Relatively shallow (<1m); with visible flow but mostly laminar in nature; minimal observable turbulence; relatively featureless bottom.
Run	Deep (>1m), swift flowing sections with turbulent flow; surface generally not broken.
Pool	Deep (>1m) slow moving sections.
Shoals	Shoal area; which may contain a variety of habitat complexes.

Use same methods Jason Bettinger used for his study in the upper Broad River, such as GPS for start and end of each classification.

Mesohabitat study should be conducted below 2,000 CFS

Define Species of Interest for Instream Flow Study

Summary of Habitat Use Guilds

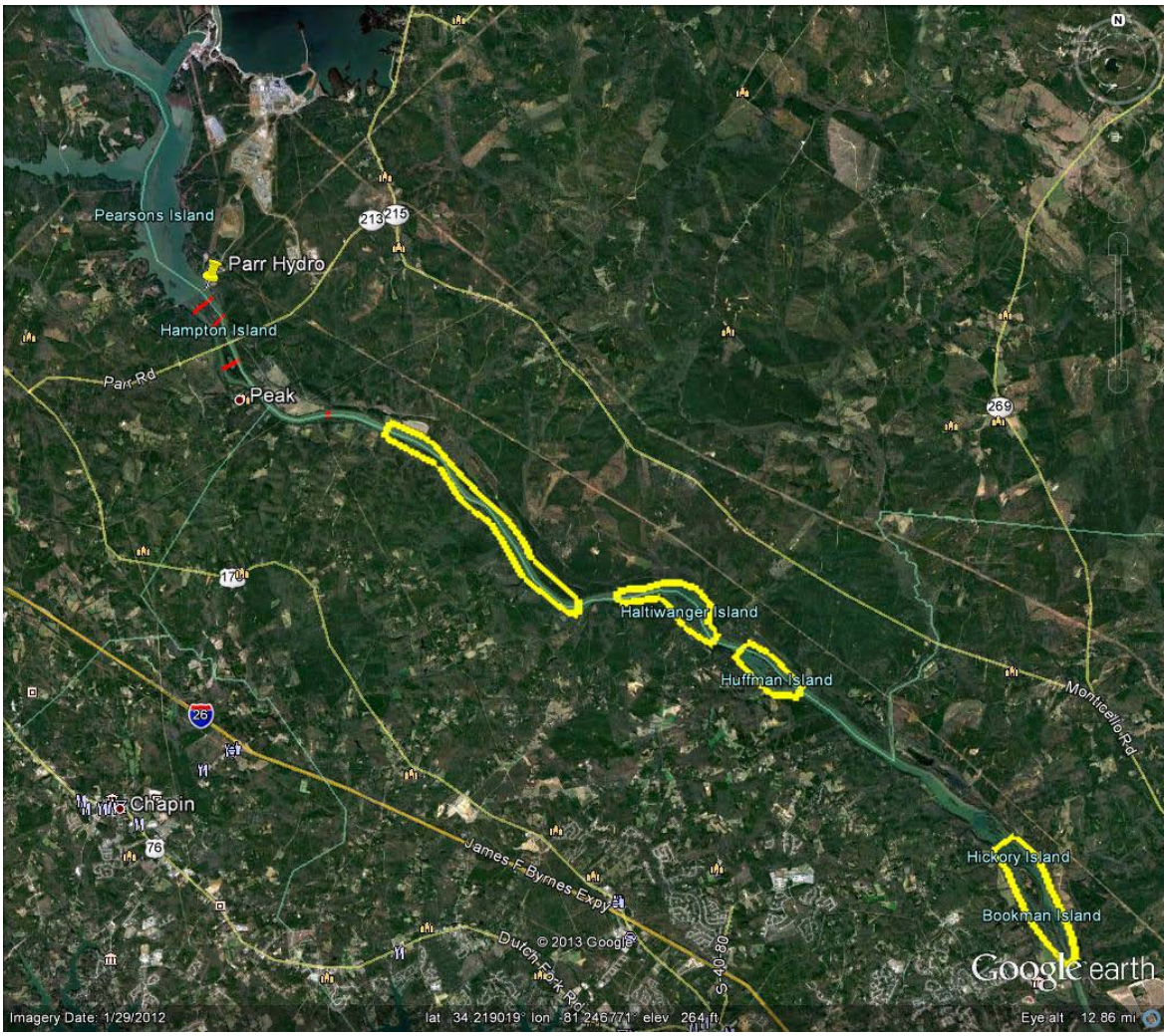
Driver Species:
American shad
Brassy jumprock
Channel catfish
Piedmont darter
Redbreast sunfish
Robust Redhorse
Santee chub
Small mouth bass
Snail bullhead
Striped bass
Whitefin shiner

Discuss Methodology (including HSI curves, number and location of transects, areas of specific interests)

Look for HSI curves that exist for driver species and make recommendations for surrogates and guilds

Methodology (number and location of transects, areas of specific interests): IFIM above Huffman Island, wetted perimeter for Huffman and Bookman islands.

Figure 1 General Transect Locations



Kleinschmidt

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Recreation TWC Meeting

May 14, 2013

Final KDM 06-17-13

ATTENDEES:

Bill Marshall (SCDNR)
David Haddon (SCE&G)
David Hancock (SCE&G)
Alan Stuart (Kleinschmidt)
Alison Jakupca (Kleinschmidt)
Jeff Carter
Dick Christie (SCDNR)
Tommy Boozer (SCE&G)
Prescott Brownell (NOAA) via conference call
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Randy Mahan (SCANA)
Kelly Miller (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Billy Hendrix
Elly Jones (SCPRT)
Vivianne Vejdani (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

After introductions, Bill A. gave the group a presentation on the property owned by SCE&G located below the Parr Dam. Bill emphasizes that this land is located outside of the Project Boundary Line. A map of the properties is located at the end of these notes. The Frost Mill parcel is approximately 62 acres of land where wood chips and other wood by-products are dumped. The Summer Shoals area has a public road (Fulmer Bottom Road) which leads down to the property however there are several other parcels of land that have no public access. Bill S. asks if SCE&G owns the islands below Haltiwanger Island, known as Chapel Shoals Island and Huffman Island. Bill A. says he is not sure, but he will find out and report back to the group through email.

Alan then focuses the group's attention toward reviewing the current Recreation Management Plan (RMP) for the Project. Bill M. asks if Tommy and David Hancock can go through each site again and explain what amenities are at each site. This information is as follows:

Lake Monticello

- Scenic Overlook – Includes ball field, tennis courts, restrooms, fishing pier, picnic tables, paved walking trail and a playground. It is to be noted that SCE&G only maintains the tip of the overlook. Fairfield County maintains the remainder, as they lease that land from SCE&G.
- Hwy 215 Boat Ramp – Includes a paved parking area, boat ramp with a floating dock, picnic table and shelter. No restrooms.
- Hwy 99 Boat Ramp – Includes a paved parking area, boat ramp and dock, restrooms, picnic tables and shelters. Primitive camping is allowed.

- Future park site – Includes a parcel of land with no public access to it. This area is set aside as a possible future recreation site.
- 7 islands – There are 7 islands on Lake Monticello, and all are used for recreation.
- Recreation Lake Impoundment – A 300 acre lake set aside completely for recreation. Includes a beach area, parking area, boat ramp, shelters, picnic tables, and restrooms. There are no docks on the recreation lake. The lake is surrounded by recreation-designated land, accessible only by boat, which can be used for camping. The beach area is open for use from April 1st until October 1st.

Parr Reservoir:

- Cannons Creek Boat Ramp – Includes shelters, restrooms and a boat ramp.
- Hellers Creek Boat Ramp – Includes picnic tables, shelters, and a boat ramp. No hunting is allowed in this area.
- Terrible Creek Waterfowl Area – Includes 638 acres available for hunting. This is a draw hunt, open one day a week, and has seven blinds, allowing up to 14 people.
- Hwy 34 Boat Ramp – This is a primitive unpaved boat ramp area, with no amenities.
- Enoree River Waterfowl Area – Includes 191 acres for first come, first serve hunting.

While Tommy is reviewing the various recreation sites at the Project, several comments and questions come up. Billy mentions that there are no trespassing signs located on the recreation-designated area surrounding the lake. Tommy clarifies that this area can be used for recreation however the signs are referring to an area leased from SCE&G by SCDNR. No trespassing is allowed on this property, as SCDNR uses it for various projects. Dick says this area may need to be identified with a name for clarification purposes. Also, regarding the Hwy 34 boat ramp, Jeff mentions that this area may need to be improved, if only for safety reasons. He points out that this would be helpful to SCDNR by providing easy access to that stretch of the river, in case of a drowning.

Tommy also mentions a parcel of land currently designated for recreation, known as the Lyne Tract, located very close to the Fairfield Pumped Storage Development. Although it is currently set aside for future recreation, this area is used for project operations, and may not even be safe for recreation, since it is located so close to pumped storage facility. David Hancock and Bill A. agree that this area, including the land located on both sides of the tailrace area, needs to be reclassified.

Billy inquires about a landing located at the top of the Enoree River, which he says is located within the PBL. He would like for this access area to be improved. The group discusses the exact location of this landing and decides it is near Maybinton Road in Newberry County. No one is sure if it is actually within the PBL, but Bill A. and Tommy say they will look into this further.

Alan then focuses the group toward discussion of the Recreation Use Needs Study (RUNS). The group brainstorms what needs to be included in the study, along with methods for data collection. Dick mentions that he would like to see duck and turkey hunting seasons to be included in the study, since there are two locations within the PBL designated solely for waterfowl hunting. Dick says that SCDNR's main issue with regards to recreation is capacity. He says they want to come away from the study with a greater understanding of current and future recreation use at the Project.

Bill M. brings up the idea of targeting specific groups through the RUNS, such as waterfowl hunters. Alan agrees and mentions contacting John Durham of the Tyger-Enoree River Alliance,

who attended one of the public meetings in January. Bill S. adds that the Flyaway Foundation and Delta Waterfowl are two local groups who participate in recreation at the Project. These are all good groups to focus on interviewing for the study.

After everyone has submitted their ideas for the study, Alan has the group review the mission statement for the Recreation RCG to make sure the Recreation Plan study complies with the mission statement. Alan says the next step will be to draw up a draft study plan for the group to review. Brainstorming ideas for the draft study plan were collected by Bill A. and are attached to the end of these meeting notes.

The group then moves to the last item on the agenda, regarding downstream recreational and navigational flows. Dick says that there is a method identified in SC Water Plan for determining the flows needed to maintain navigation. These specifics are found in a 1988 report entitled Instream Flow Study, Phase II: Determination of Minimum Flow Standards to Protect Instream Uses in Priority Stream Segments. Basically it states that a minimum continuous flow for navigation should be at minimum, a depth of one foot across a channel 10 feet wide, or across 10% of a total stream width, whichever is greater. The minimum depth of one foot does not have to occur across a continuous 10% of the stream width however, each point of passage must be at least 10 feet wide.

The group discusses how they believe the shallow spot of the river is located around the second shoal below the dam, above Haltiwanger Island. Bill S. says that some of the areas between the islands should also be examined for constriction. All of these areas should be scouted during the IFIM study, to determine where the most shallow spot is located. Bill S. and David Haddon agree to speak to some people they know who are very familiar with the river and who may be aware of more restrictive areas of the river. Dick notes that the flow needs to be high enough to allow for fish and wildlife health, water quality, and recreational navigation. Although recreational flows included as part of this issue, the group agrees that the greater issue of navigational flows needs to be addressed within the Instream Flows TWC. Bill S. agrees, and states that in his opinion, although navigational and recreational flows are different, if navigational flows are addressed, by default recreational flows should also be sufficient, generally speaking.

Bill M. notes that there are some people who would like to paddle the entire Broad River, and in order to do this would need access to travel around the Parr Dam. He says that possibly a portage trail should be developed and, although he is unsure of what the demand would be, would like this or other ideas for portage around the dam to be considered.

As the meeting is wrapping up, Alan reviews the schedule for the remainder of the relicensing process. Dick expresses concern at the seeming halt in the process, between now and the submitting of the PAD. Alan says that during this time, SCE&G and Kleinschmidt will be writing study plans which will be returned to the TWCs for review. Alan also mentions that we can send out a draft copy of the PAD prior to submittal to FERC, for stakeholder review. He says we can revise the schedule to include a few extra meetings for reviewing the draft study plans and PAD, so everyone is still actively involved in the process.

Alan reminds everyone that the next Operations RCG meeting has been rescheduled for June 27th. With this, the meeting is adjourned. Any action items stemming from this meeting are included below.

ACTION ITEMS:

- Bill Stangler and David Haddon will talk to some people they know who may be more familiar with the shallow spots in the downstream area of Broad River, concerning navigational flows.

- Dick Christie will gather any information SCDNR may have on the duck hunting seasons in the area of the Project.

- Bill A will investigate ideas for canoe/kayak portage around Parr Dam.

Recreation Use Needs Study

- Current use – Monticello Reservoir – February to Labor Day, Broad River Reservoir – Memorial Day to Labor Day
- Projected use
- Lake Park sites – interview
- Broad River Park Sites - interview
- Duck Season – Broad River Reservoir - Saturday after Thanksgiving to January 20??
- Goose Season – Monticello Reservoir – Fall - January
- Turkey Season – Broad River Reservoir - April
- Fishing Tournaments
- Hunting Capacity – are facilities enough to handle level of hunting
- Study period – one year
- Survey Interview Questionnaire – activity (fishing [bank/ pier / boat], pleasure boating, and hunting), park site condition assessment, crowding, what would be useful in future (amenity recommendations), camping, picnicking, wildlife viewing and photography, hiking, island use
- Demographic – zip code, county, birth year, number of people in party
- Time spent on lake
- Reason for choosing this area
- What other lakes to you recreate at?
- Destination
- Time of day – 8am – 12 noon, 12noon – 4pm, 4pm – 8pm
- Days of week – combination of week days and weekends, Memorial Day and Labor Day – random schedule
- Monticello Reservoir – interview locations Rt 215 Park Site, Rt 99 Park Site, impromptu fishing area east side of Rt 99, Recreation Lake (boat ramp and beach area), and Ball Park (Fairfield Overlook)
- Parr Reservoir (Broad River) - interview locations – Cannon's Creek Park Site, Heller's Creek Park Site, 34 Bridge Park Site, Enoree River Bridge (counter only/interview?)
- Target focus groups with questionnaire – waterfowl hunters, Flyway Foundation and Delta Waterfowl
- SCDNR provide waterfowl use data at DNR waterfowl hunting areas.

Recreational and Navigation Flows

One way downstream navigation - establish minimum continuous flow for navigation, – should be covered by IFIM study results. Description from SCDNR policy – "A minimum depth of one foot across a channel 10 feet wide or across 10 percent of total stream width, whichever is greater. Minimum depth does not need to occur across a continuous 10 percent of stream width, but each point of passage must be at least 10 feet wide."

Evaluate channels around islands. If one channel meets the criteria but the other side doesn't, DNR considers this as meeting the policy. Scout areas during IFIM study

Once navigation is addressed, the group believes recreation concerns on the Broad River have been addressed.

Evaluate portage around Parr Dam (west end)

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Rare, Threatened and Endangered Species TWC Meeting

May 16, 2013

Final KDM 06-17-13

ATTENDEES:

Bill Marshall (SCDNR)
David Eargle (SCDHEC)
Justin Lewandowski (SCDNR)
Shane Boring (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Gerrit Jobsis (American Rivers)
Vivianne Vejdani (SCDNR)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Randy Mahan (SCANA)
Karla Reece (NOAA) via conference call
Bill Stangler (Congaree Riverkeeper)
Sam Stokes (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting with introductions and a review of the agenda. Alan explains that Tom McCoy of the USFWS will not be able to join us for the meeting, but did send a list from the USFWS of rare, threatened and endangered species from Newberry and Fairfield Counties. Steve asks why blueback herring is on the USFWS list for Fairfield County, and Alan says that this is considered an at-risk species. Alan asks Bill M. if he sees any species that are missing from the list from a SCDNR perspective. Shane has a list of the SCDNR RT&E species, and says that the federally listed species match between the two lists. Bill M. mentions that Dick Christie gave him a list of species, mostly aquatic, and of varying levels of concern. The list includes the Newberry burrowing crayfish, a species with which the group does not seem familiar. Steve mentions that he knows Arnie Eversole, who may have more information on this particular species.

Alan asks the group what species they want to be studied. Bill M says that all of the species listed by Dick Christie need to be looked for during any studies completed for the Project. Gerrit says that American Rivers has an interest in the Project's 401 water quality certification, and thusly any species that may be associated with water quality. Alan asks the group if, with regards to a literature based survey, do all of the species listed need to be included in the survey? Bill A. begins a comprehensive list of species to be studied by combining the state conservation priority species from Dick's list with the species on the USFWS inventory, provided by Tom.

Alan asks if Steve and Milton are still doing fish surveys for the new nuclear project. Milton says they are within the Parr Reservoir.

Bill A. asks for clarification on how a "literature based study" will be performed. Shane explains that during a literature based study, a target species list is created based on consultation with the

agencies, where then this list of species' preferred habitats are compared to the habitats present within a specific study area, to eventually determine which species are likely to occur within that study location.

Alan suggests that we include all of the RT&E species from the lists provided in the literature based study, and then tie the aquatic species back into the IFIM study, to prove that there is adequate and appropriate habitat for them. In regards to the bald eagle, it is easily observed that they are living in the area, and that they have plentiful and appropriate habitat. Shane adds that it will be important to show how SCE&G has implemented guidelines allowing for a healthy population of bald eagles on their land.

For clarification purposes, Alan asks again if there are other species that SCDNR would like to be studied. Bill M. says that he will talk with Dick to determine if there are any terrestrial species that need to be included. Bill M. asks if SCE&G documents any terrestrial species on their property. Steve says they do not generally do studies on terrestrial species, but there have been some surveys performed over the years on small mammals and plants. Sam Stokes says that since the Project area has been a disturbed site for many years, it wouldn't be typical to perform a terrestrial survey. He notes that terrestrial surveys are typically performed at undisturbed sites.

Steve remembers a plant species, known as Columbo that he and Milton surveyed for years ago. Bill M. says this species is on the list as a G5 and an S2, so it is added to the list of plant species to be studied. Steve notes that this plant needs to be studied in the springtime, as it dies back and is difficult to identify during other times of the year. The group agrees to just identify the species as being one known to occur within the Project Boundary. Steve says that this species is unlikely to occur near the Project shoreline, so it probably won't need to be addressed by the Shoreline Management Plan (SMP). Bill M. says that there are most species on the list provided by Dick, and they should be acknowledged as being within the PBL, if in fact they are.

A list is eventually fleshed out and is included at the end of these notes. Shane makes the point that these lists will be our starting point for inclusion in the study plan, and that it will then be up to the agencies to decide if any other species need to be included in the study.

Alan then focuses the group on the mussel and snail surveys. Steve notes that water quality monitoring is still being performed for the new nuclear project, which includes some macro and fish surveys in the Parr Reservoir and the area immediately downstream of the Parr Dam. Sediment, metals and other water quality parameters are also being studied in the area of the future new nuclear discharge, in the Parr Reservoir. John Alderman also performed a mussel survey in the fall of 2012, where he identified approximately nine different mussel species in the area from the powerhouse to about halfway down the first island downstream of the Parr Dam. Alan asks if the study looked for snails also, and Steve says he remembers two species of snails being identified as occurring within the study area, however snails were not looked for specifically.

Alan asks the group to identify what else we need to study, if anything, in terms of properly evaluating the affects of project operations. Do we need more studies done on mussels and snails, beyond what has already been completed? In addition to the Alderman study mentioned above, Jennifer Price completed a macroinvertebrate study in 2010. Bill A. suggests he and Alan talk with Tom McCoy to see what the USFWS's interest is in preparing another study on this matter. Bill M.

suggests everyone thoroughly review the two current studies to better understand what was found, and what may be lacking.

Gerrit points out that the data we have is already five years old and that by the time the license is due for renewal, it will be at least ten-year-old data. He wants to know if updated information will be needed, in case a new species is uncovered, or the presence of previously thought-to-be "rare" mussels are identified in greater numbers in a certain area. He mentions this as something for the group to think about.

The group decides that the mussel experts at SCDHEC and Tom at USFWS need to decide if another study is needed. We will reconvene to discuss this further, since no one is exactly sure yet if another study is needed or not.

The group then shifts its focus to the Rocky Shoals Spider Lily (RSSL). Bill S. says he conducted a presence/absence survey from the Parr Dam downstream to the Columbia Dam. He noted only two locations with the RSSL, one at Bookman Island, and another at a small island near Harbison State Park. He says there are only two seen locations, but other than a visual confirmation, nothing has been formally documented at this point. David Eargle mentions that he has seen a population at Haltiwanger Island however, Bill S. is not aware of this particular one. He says he will try to conduct another informal visual survey during the blooming season this year. Shane tells the group that the main point for discussion is identifying what the potential projects affects are that need to be addressed regarding the RSSL populations. He points out that the populations tend to move around some, depending on higher flows.

Gerrit tells the group that he is aware that there was a concern in August of predation to the RSSL by deer, so stakeholders examined wading depth as a measure of protection. They determined a flow that would provide a depth of water high enough to prevent deer from being able to graze on the plants, without keeping the plants submerged. Flow recommendations need to be made with consideration of this possibility.

Overall, we are aware of where the populations are located (with the need for a simple survey to be conducted by Bill S. upon his availability over the next three months), so now the group needs to identify ideal flow ranges for the plants. Deer predation is a valid issue, along with competition with other plan species. Inundation is acceptable for short periods of time however the plants do need to immerge at some point. It will be ideal for the plants to have flows mimic those of natural events.

The group decides that the proposed study should include field verification, in which basic metrics are collected, including location, basal area, and year to year basal change. Gerrit suggests the survey should be conducted two years in a row, while Shane suggests maybe a year should be skipped in between. Alan and Bill A. say that from a scheduling standpoint, the study will have to be completed during two consecutive years.

The group then discusses the possibility of a crayfish study. Everyone agrees that Alan and Bill will meet with Tom McCoy to scope out this study, as the USFWS holds the most interest with this issue. There are currently no crayfish studies underway, as part of the nuclear plant expansion.

Bill M. asks if eels are going to be studied. Alan mentions that these are being covered as part of the Instream Flows TWC. We are waiting for the fisheries study to be completed before meeting to discuss the eels further.

Karla Reece then joins the meeting via conference call to discuss the issue of sturgeon passage. She tells the group she just received confirmation from Bill Post that sturgeon are passing through Granby, however, they may not be able to pass through the Columbia Dam. If the sturgeon are not able to pass through Columbia, there will not be a need for a study at Parr. She says that she will regroup internally and reconvene with the TWC to let us know what she finds out. Bill A. asks for clarification on whether we are discussing Shortnose Sturgeon, or Atlantic Sturgeon, and Karla says both.

Regarding Section 7 consultation, the National Marine Fisheries Service (NMFS) will only require consultation if sturgeon are able to pass up to Parr Dam. Gerrit says that we know we have Shortnose Sturgeon below the Columbia Dam, and that there has been spawning in the area. He asks how do flows affect the species, and what are the species' needs regarding flows? Karla says she will look into that, to determine if flows from Parr are having any affect on the sturgeon spawning downstream. If so, this will affect the possibility of Section 7 consultation.

Bill A. asks if we need to include sturgeon in the IFIM study consideration, along with the other target species identified at the meeting. Gerrit mentions that the time frame would be different for sturgeon than for the shad and other target species for the IFIM. Alan asks Karla to provide us with as much information as she can, as soon as she can for us to move forward. He points out that we do not need anything formal at this point, since the relicensing process hasn't officially begun.

The group agrees to meet again in late June/early July to discuss Karla's findings.

Alan tells the group that we are planning to issue a draft PAD to the group for review in the fall of 2014, to allow for everyone to see if anything has been missed before the package goes to FERC for approval. With this, the meeting is adjourned. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- A small group including Alan and Bill A. will meet with Tom McCoy to get the USFWS' input on the issues/studies discussed during the meeting.

- Bill S. will survey the area downstream of the Parr Dam to identify and confirm all possible Rocky Shoals Spider Lily populations.

- Karla will find out as much information on the sturgeon issues within the Project Area as soon as she can and will report back to the group by late June/early July.

- David Eargle will have the mussel experts at DHEC review the two current macroinvertebrate studies and determine whether another study in the Project Area is needed.

- Shane will begin developing study plans for the literature-based RT&E study and the RSSL study.

RT&E Meeting Issues

RT&E Survey (literature based)
Species to be investigated in addition to USFWS list:

State conservation priority species:
Newberry burrowing crayfish - highest
Robust redhorse – highest
Piedmont darter - high
Seagreen darter - high
Highfin carpsucker - highest
Quillback - high
Santee chub - high
Striped bass – high
Bald eagle – State Threatened

Terrestrial (Vascular Plants):
Frasera caroliniensis (Columbo)
Additional plant species in the database

Develop study plan to address what species will be evaluated and how our literature search will be conducted.

Mussel & snail survey

Jennifer Price study
Alderman study (NND)

Rocky Shoal Spider Lily:

Sufficient flows recommendations on low flow (deer perdition), high flows (inundation)
Upstream of Bookman Island
Upstream of shoals above I-20

Field verification:
Shoals at upstream of islands (Haltiwanger – Frost Shoals)

Metric:
Location
Basal area
2 year survey

Crayfish:

Discuss with Tom McCoy

Sturgeon – Shortnose / Atlantic:

Karla will re-group with other NMFS to discuss status of SNS and Atlantic sturgeon downstream of Parr-Hydro

Provide to the group with any information needs by June/ July time frame

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Lake and Land Management TWC Meeting

May 21, 2013

Final KDM 06-18-13

ATTENDEES:

Gerrit Jobsis (American Rivers)
David Haddon (SCE&G)
David Hancock (SCE&G)
Alan Stuart (Kleinschmidt)
Alison Jakupca (Kleinschmidt)
Tommy Boozer (SCE&G)
Vivianne Vejdani (SCDNR)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Randy Mahan (SCANA)
Kelly Miller (Kleinschmidt)
Jeff Carter
Dick Christie (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting by giving an overview of the agenda. He then turns the floor over to Tommy, who begins leading the group through the current Shoreline Management Plan (SMP) for Lake Monticello. As the group reviews the current SMP, there is discussion on updates and information needs for inclusion in the new SMP. Itemized notes taken during the meeting on suggested changes and information needs for the SMP, along with a draft outline for the document are included at the end of these notes.

Tommy explains that the Parr Reservoir was not included in the SMP, which is something the LLM TWC will need to address. He also tells the group that no dock permits have been issued in the Parr Reservoir, so any existing docks are examples of encroachment. On the issue of permits, Alan suggests that the new SMP only include shoreline management information, with permitting matters to be included in a separate handbook. This handbook with the permitting requirements set up by SCE&G does not need FERC approval, so it would be beneficial to keep the two documents separate.

Tommy moves to the Game Management section of the SMP, and explains that both reservoirs are designated Wildlife Management Areas (WMAs).

Gerrit and Randy discuss some of the language used in this section and agree how it is very vague in spots. Dick agrees saying he finds the document to be confusing and believes it doesn't serve its purpose for specifying shoreline management. He says that it includes a lot of information on lake use, but not on how to properly and appropriately manage the shoreline. David Hancock tells the group that originally the document was intended to be part of a dock management program for Lake Monticello, as an SMP was not required with the original license. Dick tells the group that FERC

has produced a document that guidelines what they want to see in an SMP. He suggests this would be good to reference when the group begins working on the new SMP.

Regarding waterfowl management for the Broad River and the Enoree River, Tommy says that updated hunting regulations need to be referenced when writing the new SMP. Dick suggests this information be included in a Lake Uses section. Alan also suggests this information could be included as an appendix.

David Haddon asks if SCDNR and SCE&G police the hunting properties at the Project. Tommy says that only SCDNR polices the areas, but that SCE&G does control the area of the lake that is included in the nuclear exclusion zone. Randy says that SCE&G is going to protect their property however SCDNR has the responsibility of protecting the areas designated for certain programs. Randy also explains that since Lake Monticello is now designed as a water of the state, versus being classified as private waters, it can now be enforced by the state of South Carolina. Dick suggests a subcommittee be formed to look into the legal issues and regulations for these reservoirs. Randy agrees, saying SCE&G, SCDNR, and SCDHEC need to get together and decipher who is responsible for enforcing the various regulations for the two reservoirs.

Jeff asks if the SCDNR regulation book displays where the WMA lands are specifically. Dick says this information actually changes year to year, and that maps are printed annually to designate where the lines are drawn. Although there is public access to the maps, Jeff says that he believes a lot of people probably end up unintentionally breaking the law by hunting illegally in the regulated WMAs, simply because they are unsure of where the lines are located. David Hancock says he thinks that there may be a greater issue with people hunting WMA land who cross over onto private land. He does mention that he believes the SCE&G land department does a good job at marking the PBL, so hunters are aware of that specific property line. However, David also says he thinks they need to do a better job around the developed areas on Lake Monticello, by displaying signage that specifies there is no hunting on these lands. Dick says this is why they need to be more diligent in assigning land use classifications, so that all land within the PBL is identified for specific uses. The group brainstorms some land classifications that they are sure will be needed, and this list is included at the end of these notes.

Tommy then moves on to discussing the shoreline activities section in the current SMP. He says there is a non-disturbance policy on the shoreline of Lake Monticello, except for the allowance of access paths. He mentions that most of the access paths aren't even ten feet long just due to the size of the lots. Tommy also explains that in coves there is a distance requirement of 200 feet in order to build a dock. In other words, if a cove is not at least 200 feet from bank to bank, a dock cannot be built due to constriction concerns.

Within the current SMP, it is stated that every five years SCE&G will collect $100 per dock from the permit holder. Alan asks Tommy if this should be included in the updated permitting handbook, since this fee is not enforced currently. Tommy says that the fees are not collected on Lake Murray, so they will not be collected on Monticello. However, he thinks it should still be included in the handbook in case SCE&G does begin enforcing the fee requirement. Dick tells the group of a program that SCDNR has started on the Catawba-Wateree Project impoundments, where Duke Energy collects a one-time fee of $250 for the building or rebuilding of a dock. The money, along with some initial funds contributed by Duke Energy, goes toward funding a program for habitat enhancement around the lakes. Dick says that to date this has been a great program and may be

implemented at the Duke Energy-owned Keowee-Toxaway Project. As SCE&G would work in conjunction with SCDNR, this would be included as part of the permitting program set up by SCE&G. All activities funded by the program are approved by a board. Everyone agrees that this sounds like a good idea and will keep it in mind as a possibility. The group also agrees to work on the SMP before focusing their efforts on permitting.

Gerrit asks if there is a land use classification system set up for Parr Reservoir. Tommy says that there isn't one at this time, but that that is something the group is going to work on through this process.

Alan asks if the SMP should include more information about bio-stabilization. David Hancock says that the shoreline around Lake Monticello is very hard to deal with, so bio-stabilization efforts may not help or even be possible in areas. Since the PBL would have to be cleared to do the work, these efforts may do more harm than good. Dick agrees, but says they do need to look into a way to preserve their land, since there is significant erosion happening in specific areas. He says that SCE&G should keep an eye out for future technology that may allow for easier bio-stabilization of the shoreline.

Gerrit asks if the objective of today's meeting is to develop a study plan, or a new shoreline management plan. Alan explains that the ultimate goal of the TWC is to develop a new shoreline management plan, and we want to include a draft of the SMP in the PAD for FERC. The first step of developing the SMP is to create an outline of what will be included in the final SMP, which is what we are working on in this meeting. While the draft SMP is not a "study plan" that FERC will need to approve, it is beneficial to include in the PAD, so that FERC can provide their opinion on it along with any suggestions or guidelines for the final document. The group decides that the draft SMP to be included in the PAD will consist of a preamble and a table of contents. Gerrit suggests that Kleinschmidt and SCE&G draft the outline and then bring it back to the group to approve. Everyone agrees that this would be most efficient, and Alison offers to develop the draft outline and bring back to the group for review at the next meeting.

Through the remainder of the meeting, the group tosses around various points of discussion, which will be addressed fully as the process of developing the SMP advances. These topics include:

- Reviewing and clarifying the existing Memorandum of Understanding (MOU) agreement between SCE&G and SCDNR.
- Defining any prohibited activities on the islands. Dick sites Article 18 to the group, which says recreation should be allowed except when trying to protect life, health and property.
- Clarifying what land is approved for hunting, and where the WMAs are located.

Bill makes the point that there is no need to begin working on a Woody Debris Management Plan, Buffer Zone Management Plan, and Sedimentation and Erosion Control Plans until the PAD and NOI are approved by FERC, as all of these plans may not be needed for this project.

Alison suggests that the final SMP be developed as two documents combined together, with each half of the combined document dedicated toward a specific reservoir. Ultimately, there will be two SMPs, one for Lake Monticello, and one for the Parr Reservoir. Everyone agrees that this organization makes the most sense, and will be easy for the public to follow.

Dick asks that a large map be produced that shows the PBL along with SCE&G owned lands around the Project, to be used as a tool within the TWC. This large map will allow for everyone to more easily visualize the Project Area and where all of the lines are drawn. Tommy says he will work on developing two maps, one for Monticello Reservoir and one for Parr Reservoir. It is also suggested that SCE&G talk with Fairfield and Newberry counties about adding a layer on their maps with the PBL, so the public can easily access this information.

The group agrees to meet again in the July/August timeframe, once there is a draft outline for the SMP to review and finalize for addition into the PAD. It is noted that at the first public meeting, SCE&G needs to advertise that they are developing a new SMP for the Project and that interested members of the public need to get involved in the process. With this the meeting is adjourned. Action items from this meeting are listed below.

ACTION ITEMS:

- Alison will develop a draft outline for the new SMP.
- Tommy will work on creating two large maps of the Project Area that includes the PBL and identifies SCE&G owned lands.

Shoreline Management Plan – Suggested changes:

I.3 Undeveloped Areas

Company-owned land lying within the boundary lines of the Project will be maintained through a sound forest management program, where appropriate. New plan should clarify this description.

I.4 Game Management - Include details of fishing and hunting guidelines.

Clearly identify GMA property for hunting areas

Prohibit hunting on lands below residential property

Land Classification:
Nuclear Exclusion Zone
Operations
Forest Management
Recreation
Wildlife Conservation

Discuss boat lifts in new SMP

Proposed outline of new SMP:

1.0 INTRODUCTION

2.0 PURPOSE AND SCOPE OF THE LAND USE AND SHORELINE MANAGEMENT PLAN

3.0 SHORELINE MANAGEMENT PLAN GOALS AND OBJECTIVES
3.1 Consultation
3.1.1 Recreation/ Lake and Land Management Resource Conservation Group
3.1.2 Lake and Land Management Technical Working Committee
3.1.3 Meeting Schedule

4.0 INVENTORY OF EXISTING ENVIRONMENTAL RESOURCES
4.1 Acreage of Project lands and existing classifications
4.2 Geology and Soils
4.2 Water Quality
4.3 Aquatic Resources
4.4 Terrestrial Resources
4.5 Cultural Resources
4.6 Land Use and Aesthetics
4.7 Recreation Facilities and Use

5.0 HISTORY OF THE PARR/MONTICELLO SHORELINE MANAGEMENT PLAN
5.1 Current Document
5.2 Project Boundary

6.0 LAND USE CLASSIFICATIONS (Parr Reservoir and Monticello Reservoir)
6.1 Forest Management

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Other Information Needs:

Updated maps of Project with acreages of SMP classifications

Review and revisit or clarify existing MOU agreement with DNR

Develop Permitting Guidelines

Better describe hunting on SCE&G property not within WMA property

Kleinschmidt

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Operations RCG Meeting

June 27, 2013

Final KDM 07-16-13

ATTENDEES:

Vivianne Vejdani (SCDNR)
Dick Christie (SCDNR)
Scott Harder (SCDNR)
Malcolm Leaphart (Congaree Riverkeeper)
Gerrit Jobsis (American Rivers)
Prescott Brownell (NOAA)
Joseph Wojcicki (By-PAS)
Erich Miarka (Gills Creek Watershed Association)
J. Hagood Hamilton, Jr. (SCANA)
Bill Stangler (Congaree Riverkeeper)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Kelly Miller (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Bill Marshall (SCDNR)
Jon Quebbeman (Kleinschmidt) via Conf. Call
Randy Mahan (SCANA)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting with introductions, and then turns the floor over to Gerrit. Gerrit begins with showing information collected from the USGS gages at Carlisle and Alston. The gage at Carlisle is located upstream of the Project, while the Alston gage is located downstream of the Parr Dam. The first slide Gerrit presents is of flow data collected at each gage over the previous week. He then shows a slide that includes flow data from each gage over the past thirty days, making the point that the Project does have an effect on flows. He says that American Rivers has been interested in the phenomenon of how the Project changes the flows of the Broad River, and so they asked Erich to study this effect as part of his graduate work with the University of South Carolina.

The result of this study was Erich's thesis paper entitled "Flows Effects of the Parr Hydroelectric Project," which was distributed to members of the Operations RCG in advance of the meeting. Erich then presented his findings, allowing for questions during and after the presentation. One issue that was raised was the selection of the Indicators of Hydrologic Alteration (IHA) software that Erich used to analyze the flows. As Erich indicates in his paper, the standard method of using IHA did not apply in this particular situation, however, the nature of the data and location of the gages did fit the intended use of the software. Also, IHA is designed to use daily data versus the 15 minute discharge data that Erich substituted. Erich explains to the group that this replacement in effect did not make a difference to the overall results, as long as one keeps in mind that this substitution was done. Erich also admits that some of the numbers may be larger than expected, and larger than actual, due to him not accounting for flow attenuation when determining inflow. He also points out that the number of reversals indicated in the study may not be realistic, since there was no threshold limit in determining a reversal. Keeping these considerations in mind, Erich asks the group for any questions.

Ray and Bill A. ask Erich why he decided to use hourly data instead of daily data, which was also available. Erich says he felt like the hourly variability would have been lost if he used a daily average, and that hourly variability is what he wanted to capture through this study. He reiterates that if it is noted that the units were changed from daily to hourly in the IHA software, it doesn't matter which data is used. Gerrit agrees, stating that American Rivers was interested in seeing the changes in flows in regards to how they affect the river. It is important to examine how the hourly fluctuations affect the aquatic environment. Ray points out that although it may seem like a simple substitution, the model may have been built with constraints that could skew the hourly data. Since the software was designed to handle only daily data, using hourly may not just be a simple substitution, as this type of software is often very complex.

Jon then adds his comments on the study. He says that he doesn't agree with the surrogate river used as part of the study to determine the pro-rating ratio. He also mentions he would like to see a more robust modeling system used. He says that selection of specific periods in time is not representative of an entire year or decade. Jon believes that it should be easy to run this same analysis on a continual basis to gain a greater understanding of what's typical for this stretch of the Broad River. He adds that straight line proration is not appropriate to use here. Erich responds by saying that 83% of the study areas is covered by gages, so only 17% of the data was prorate, which he believes is fairly insignificant. Erich adds that he thinks it is important to show what Project operations are capable of doing. Gerrit agrees with Jon and says that the Project can and should be studied more robustly, but that Erich's study contains some important results and can be used as a starting point for future study. Jon says that he just doesn't want the results of the study to be misinterpreted as what the Project is definitely doing. He thinks this is an example of what the Project can do, but not what is actually happening. He points out that any dam is going to alter the flow regime of a river. However, determining the actual effects that the Project is having is what's important, and since Jon doesn't believe the study is taking into account typical operations (since periods of time were chosen to study versus a continuous time period that stretched back one or several years) the actual effects are not accurately represented.

After discussion on Erich's paper concluded, Ray presents the group with information on Parr Hydro project regulation effects, the Project's license compliance summary, and an overview of the Parr and Fairfield plants. These presentations are attached at the end of these notes. Several questions arose during these presentations and are discussed below.

Scott asks Ray if the evaporation numbers included as part of the inflow/outflow values take into account the evaporation from the nuclear plant. Ray answers yes the evaporation is calculated over the entire Monticello reservoir.

Gerrit asks how low the gates can operate at the Parr Dam and how low the units can operate. Malcolm then asks if they have any water quality issues regarding nitrogen due to aeration. Ray says he doesn't have the answers to these questions, but that he will find out and get back with the group.

After lunch, Alan leads the group in a discussion on identifying any information needs and how the group would like to address these needs. Bill A. brings up a list of information needs that were identified early on by the agencies and NGOs to use as a starting point.

The group first tackles the issue of determining what effects Project operations have on the Congaree River. Bill S. adds that we need to look at how operations impact fisheries and aquatic resources, along with flood inundation at the Congaree National Park (CNP). Alan asks the group what specific information is needed, and how do we go about getting that information? He also asks if we want to use a long term record, or just a snap shot. Gerrit says a snap shot can be used to simulate how the flows would be without the Project. Ray adds that we would then have to develop a hydrologic model. We can then determine how the Project affects flows, river levels and ultimately the national park.

Jon suggests the use of a model known as HEC-EFM, which can use any timescale, and can be tied directly to GIS information. Gerrit mentions that the CNP already collects data over many transects across the park and it would be great if this HEC-EFM model could interact with the one already used. Jon says that if the model already used at the CNP is HEC-RAS, the information can easily be transferred into the HEC-EFM. Ray points out that if you have HEC-RAS model information you can then use the HEC-EFM model to produce the GIS data that can potentially be used with any GIS application available. Bill S. mentions a model known as TUFLOW has been used at CNP. Jon says that this model is very different from the HEC-EFM, which is much more user friendly. Scott asks if the models take into account the downstream attenuation. Jon says he knows that the HEC-EFM does, but he isn't sure about the TUFLOW.

Jon and Ray agree that routing can be done using a one dimensional approach, as a 2-D model might give more information than is actually needed. Gerrit agrees.

Jon tells the group that metrics need to be determined to develop an effective HEC-EFM model. Gerrit says that species of importance have already been determined as part of the IFIM study.

The group agrees that it will be important to examine the Broad River and the Saluda River, since both have an effect on the Congaree River. The group then discusses how this will be possible, through the use of historical data to create a baseline model. Jon points out that developing the various models will not be difficult instead the hard part of the process will be to develop the metrics. The group tells him that some of the metrics will be determined based on the IFIM study, while the others have already been established for the CNP.

The group decides to use the existing USGS data to establish a baseline, and then create an operations model utilizing this baseline and the already determined metrics. Scott wants to know if a reasonable model can be built that will accurately capture the complexity of the Project. Jon says that it can, but it will be difficult and the resulting model will be very complex. He adds that as with any model, everyone needs to keep in mind that the results will be greatly simplified.

The group then discusses the creation of a water budget, or allocation model. Gerrit mentions there is a possibility that a statewide basin model might be created in the near future, and that could be utilized here. However, he states that we won't know until August if this project will be funded. A water allocation budget will be part of the operations model that was discussed earlier. It will be used as a constraint within the model.

The possibility of a sediment management plan is mentioned. The group is reminded that the Water Quality TWC is working through this issue and will report back to the Operations RCG on what they determine. Currently the Water Quality TWC is considering whether a sediment management

plan is needed or not, and if not, addressing the need for a plan to be in place to handle future sediment management considerations.

As the meeting wraps up, Ray and Jon plan to get together to begin initial development of the operations model, with plans to get Scott involved further in the process. Gerrit asks if the group wants to evaluate Erich's study any further. Jon says that more information along the lines of his study will be coming out of the operations model.

The group will plan to reconvene in the late September/early October timeframe to discuss a study plan for the operations model. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Ray and Bill A. will follow up with answers to some of the operations questions that were asked during Ray's presentation.
- Jon Quebbeman will prepare an outline of development of the Operations Model for distribution to RCG.

- What effects do dam operations have on the Congaree River? It is noted that operations appear to affect the minimum (lower) and maximum (higher) outflows relative to corresponding inflows and that flow pulses increase with flow. Are these measureable at Congaree? The Jobsis (Erich Miarka) study is referenced. (Operations)
  - Effects on aquatic resources
  - Effects at Columbia USGS gauge
  - Effects on the Congaree National Park
  - Magnitude and frequency of flows at CNP gauge
  - What are we trying to compare?
  - Inflow vs what is seen at Columbia USGS gauge and CNP
  - HEC- EFM (ecosystem function model)
  - First cut – one dimensional, unsteady state conditions model
  - Possibly build HEC-RAS model of Congaree River reach
  - What is happening now?
  - What changes could be made to improve flow conditions?
  - Use USGS data that already exists
  - Might need to develop an operations model in addition to our flow routing model
  - Time step to be used – hourly???

- Description of current operations and proposed future operations at the project and related effects on instream flows. (Operations)
  - Related to Broad River
  - Not proposing any change in future operations at this time
  - Evaluating current operations and potential operations that may benefit IFIM results and CNP needs
  - Effects of Parr Project on downstream flow – similar to IHA analysis

- Water budget/allocation model– (Operations)
  - Project effects on downstream water budget – (Operations)
  - What are the projected long term water demands on the Broad River? This will require coordination with the City of Columbia and analysis of their plans for projected population growth and water supply demands. It will also have to consider future demand from facilities like VC Summer and other water users. (Operation)
  - daily operations, low flows, drought, & flood
  - operational constraints
    - Water allocation assessment/budget
    - Inflow patterns/data set – potential changes in future inflow patterns and water demands (constraints in flow model from above)
    - Potential to use statewide model to address this issue
    - Develop future inflow series
    - This will be in a checklist format

- Information sheet: A comprehensive explanation of the hydro operations at the Parr Shoals Project. Including: daily operations, low flows, drought, flood and status on existing units (working condition) (Operation)
  - Addressed in today's presentation
  - Additional group information needs will be addressed as they arise

- Information sheet: A comprehensive explanation of the operations at the Fairfield Pump Storage station. Including: daily operations, low flows, drought, & flood. (Operation)
  - Addressed in today's presentation
  - Additional group information needs will be addressed as they arise

- Future operational plans
  - TBD

- Instream flow compliance records
  - Will be provided after this meeting

- Sediment management plan
  - Is there a sediment management plan needed
  - If not, is there a plan to address this concern if it is determined to be needed at a later date
  - Let WQ TWC address this and what information is needed to look into a management plan

- Low Flow Protocol – LFP
  - To be determined during relicensing

- Develop inflow determination protocol – streamflow gauging process, determine inflow to project at a given time, look into scaling of gauges

Flow Effects of the Parr Hydroelectric Project

Erich Miarka

University of South Carolina

MEERM 2012

Outline

- Brief Description and Background
- Advisors and Internship Site
- Study Area
- Objective of Study
- Methods & IHA
- Results & Implications

Overview

- The Parr Hydroelectric Project is owned and operated by South Carolina Electric and Gas Company (SCE&G)
- License with the Federal Energy Regulatory Commission expires in June 2020
  - SCE&G will likely begin relicensing procedure within next year
- Stakeholders will have a chance to intervene in relicensing process

Internship Site & Advisors

- American Rivers
  - Gerrit Jöbsis: Southeast Regional Director
  - Rebecca Haynes: Associate Director, Southeast Conservation

- University of South Carolina
  - Dr. Allan James: Professor, Department of Geography
  - Dr. John Grego: Associate Professor, Department of Statistics

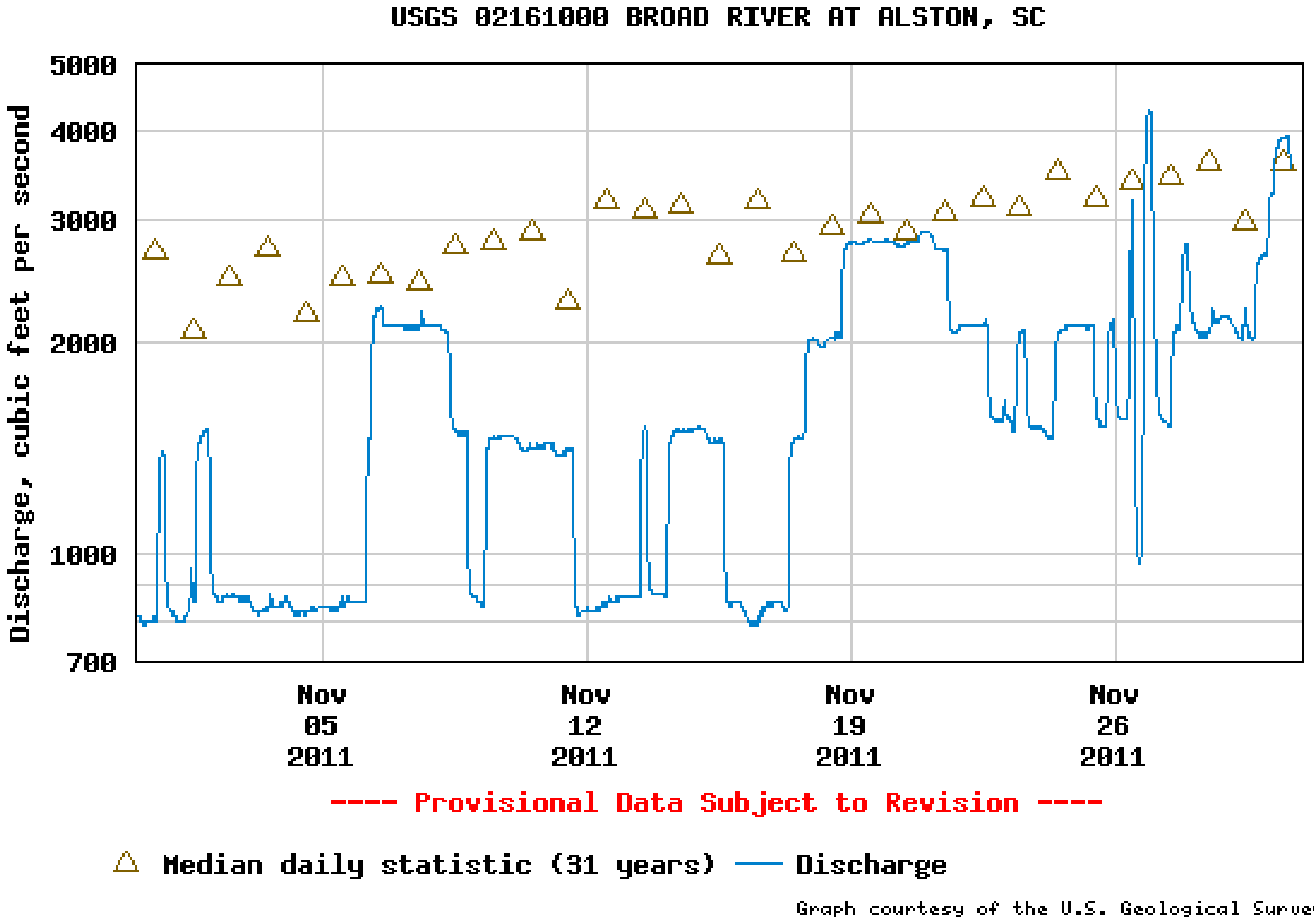

Blair Gage
Monticello
Parr Shoals Reservoir
Fairfield Facility
V.C. Summer Nuclear Complex
Parr Shoals Dam
Alston Gage
N
4.05 mi
Google earth
Imagery Date: 1/29/2012
34°19'11.94" N 81°19'17.22" W elev 425 ft
Eye alt 17.63 mi

Research Question

- What effect is the Parr Hydroelectric Project having on flow?
  - What ability does it have to alter the flow regime it receives?

Critical Steps

- Calculate inflow to the Project
- Analyze flow data below the Parr Shoals Dam
- Determine frequency and severity of flow alteration
  - Pulses in water release
- Results to be used in FERC relicensing procedures for Parr Hydroelectric Project by American Rivers


USGS 02161000 BROAD RIVER AT ALSTON, SC
Discharge, cubic feet per second
5000
4000
3000
2000
1000
700
Nov
05
2011
Nov
12
2011
Nov
19
2011
Nov
26
2011
---- Provisional Data Subject to Revision ----
Median daily statistic (31 years)
Discharge
Graph courtesy of the U.S. Geological Survey

The River System

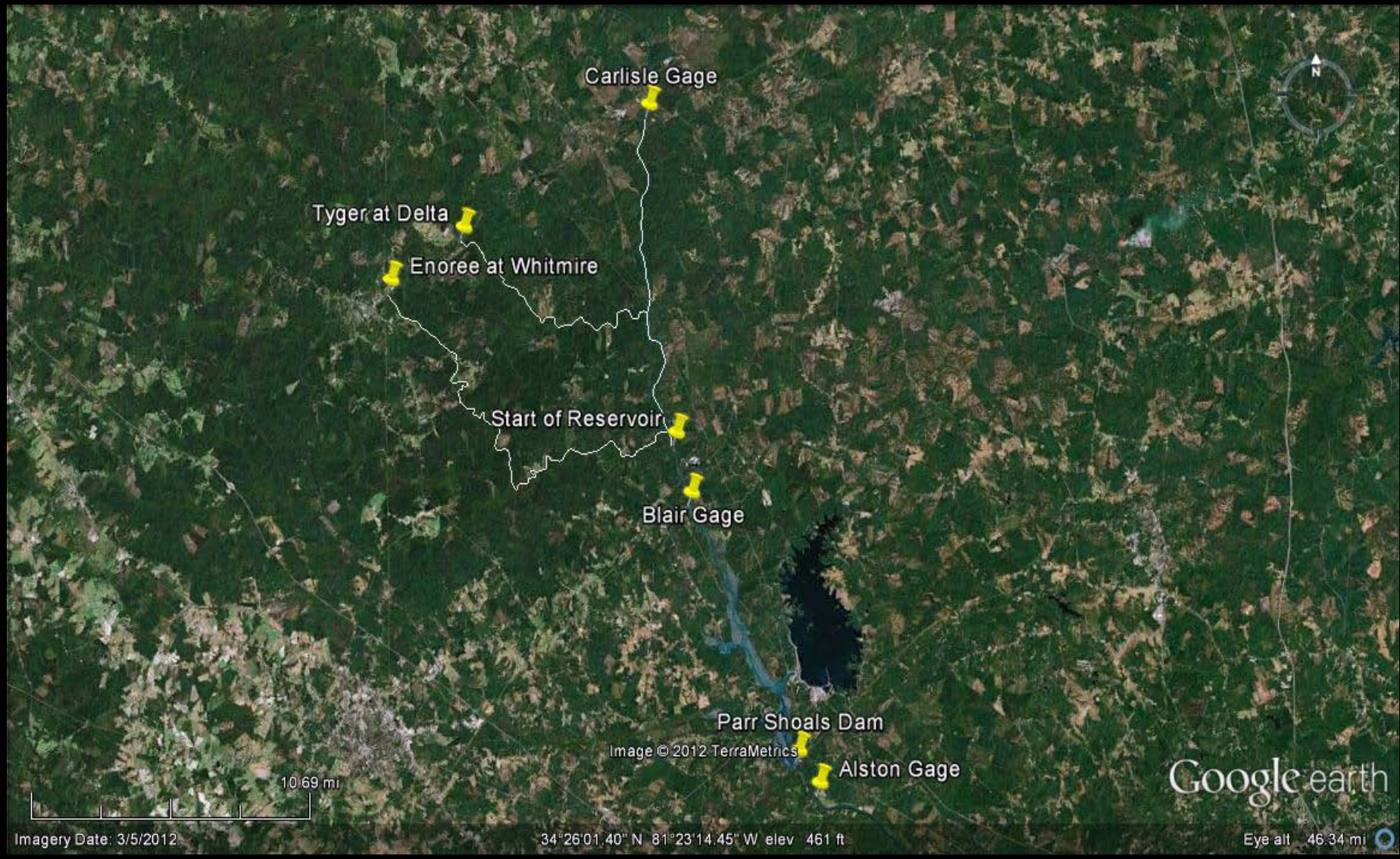
- Source of human recreation
- Home to many species
  - Shortnose sturgeon, Carolina darter
- Nourishes Congaree National Park
  - River flooding sustains the park's ecosystem
  - Largest continuous tract of old growth bottomland hardwood forest in the U.S.

Methods

- Calculate inflow to the Parr Hydroelectric Project
  - Project begins at the start of the Parr Reservoir
- Allot for flow travel time into Project
- Compare to outflow of Project
  - Indicators of Hydrologic Alteration

Inflow

- Three gages above Parr Hydro Project
  - Carlisle on the Broad, Tyger at Delta, and Enoree at Whitmire
  - Hourly flow data available from each site
- Each river shares similar characteristics
  - Piedmont style river
  - Different flow regimes
- Characterize each river's low, medium, and high flows
  - 25^{th}, 50^{th}, and 75^{th} percentiles


Carlisle Gage
Tyger at Delta
Enoree at Whitmire
Start of Reservoir
Blair Gage
Parr Shoals Dam
Alston Gage
Image © 2012 TerraMetrics
10.69 mi
Imagery Date: 3/5/2012
34°26'01.40" N 81°23'14.45" W elev 461 ft
Eye alt 46.34 mi
Google earth

Proration Method

- Gages for tributaries not at mouth of river
- 460 mi^2 along Broad River unaccounted for by gages
  - Need to account for flows into the Broad above project but below gages
- Proration method used to extrapolate flow values to mouth of river (at Broad River)

Proration Method Example

- Enoree gage drains 444 mi^2, entire river drains 731.3 mi^2

(Discharge/444) * 731.3 = Prorated Discharge

- Also done for Tyger River and the 460 mi^2 of area along Broad River (prorated off Carlisle)

Travel Times - Surrogate

- Need to account for flow travel times
  - Each gage above Project is different distance away
- Surrogate river used to calculate a per mile travel time
  - Lower Saluda River
- Different flow periods timed
  - Low, medium, and high flows

River	Flow Level, Per Mile Rate	Distance to Reservoir (miles)	Total Travel Time (hours)
Broad, Carlisle	Low, .300	12.73	3.819
Broad, Carlisle	Medium, .286	12.73	3.646
Broad, Carlisle	High, .232	12.73	2.955
Tyger	Low, .300	15.88	4.764
Tyger	Medium, .286	15.88	5.548
Tyger	High, .232	15.88	3.686
Enoree	Low, .300	20.55	6.165
Enoree	Medium, .286	20.55	5.886
Enoree	High, .232	20.55	4.770

Indicators of Hydrologic Alteration

- Software developed by The Nature Conservancy
- Analyzes daily streamflow data
  - 33 statistical parameters
- Need to “lie” to software
  - Change timestamp from hourly to daily
- 2 parameter groups wanted
  - Pulse characteristics
  - Rate and frequency of water condition changes

Results: Min & Max

- Outflows amplified
  - Maximum flows higher in outflow
  - Minimum flows lower in outflow
- Range of flows increases with flow category
  - Average increase of low flow range: 716 cfs
  - Average increase of medium flow range: 3,454 cfs
  - Average increase of high flow range: 6,005 cfs

Results: Number of Pulses

- Pulses increase with flow
- Low Flow Periods:
  - No noticeable change in pulses
- Medium Flow Periods:
  - 6 low pulses
  - 4 high pulses
- High Flow Periods:
  - 6 low pulses
  - 10 high pulses

Results: Duration of Pulses

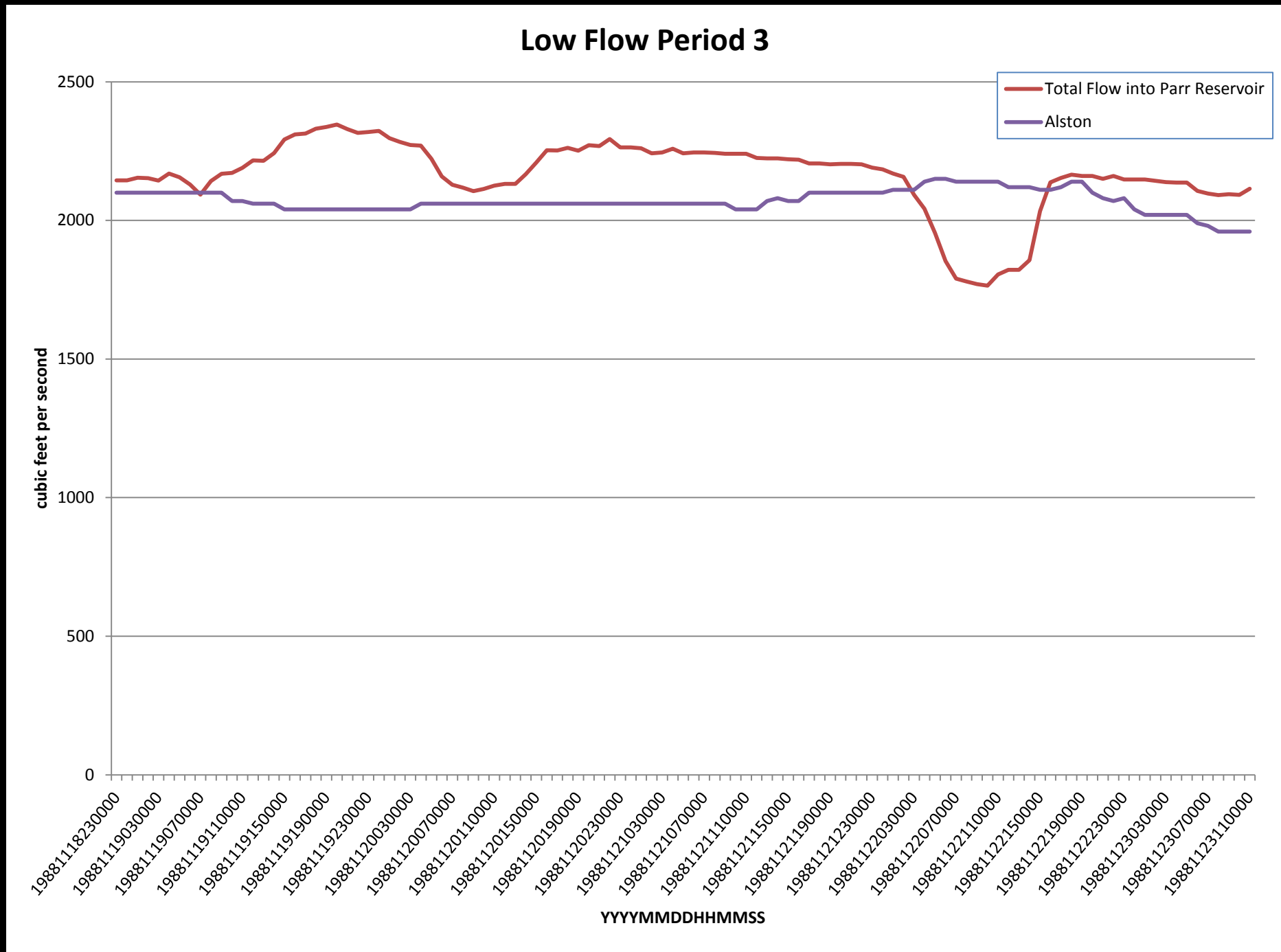
- Pulse duration decreases as flow increases
- Low Flow Periods:
  - No noticeable change in pulses
- Medium Flow Periods:
  - Low pulses: 12.67 hours
  - High pulses: 20.5 hours
- High Flow Periods:
  - Low pulses: 3.67 hours
  - High pulses: 12.83 hours

Results: Flow Reversals

- Low flow periods:
  - Reversals decreased from 25.67 to 12
- Medium flow periods:
  - Reversals decreased from 26.67 to 19.33
- High flow periods:
  - Reversals increased from 18.33 to 23.67
  - Only these three periods increased in reversals

Results: Rise and Fall Rates

- Low flow periods:
  - Slight increase in rise and fall rates
- Medium flow periods:
  - Rise rate increased from 11.32 to 55
  - Fall rate increased from -14.39 to -65
- High flow periods:
  - Rise rate increased from 29.53 to 250
  - Fall rate increased from -27.95 to -210


Low Flow Period 3
Total Flow into Parr Reservoir
Alston
cubic feet per second
2500
2000
1500
1000
500
0
19881118230000
19881119030000
19881119070000
19881119110000
19881119150000
19881119190000
19881119230000
19881120030000
19881120070000
19881120110000
19881120150000
19881120190000
19881120230000
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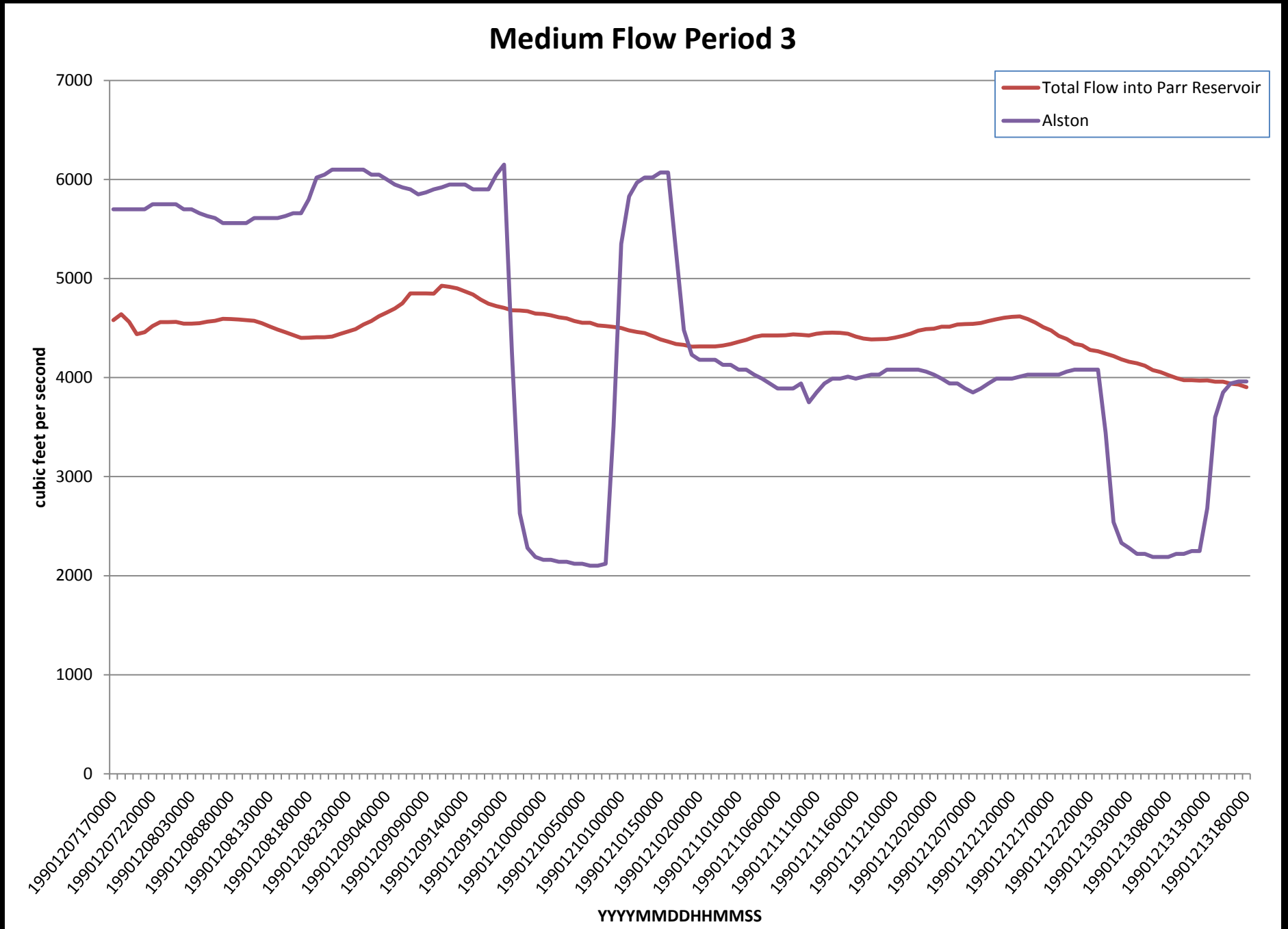
Medium Flow Period 3
Total Flow into Parr Reservoir
Alston
cubic feet per second
7000
6000
5000
4000
3000
2000
1000
0
19901207170000
19901207220000
19901208030000
19901208080000
19901208130000
19901208180000
19901208230000
19901209040000
19901209090000
19901209140000
19901209190000
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19901210050000
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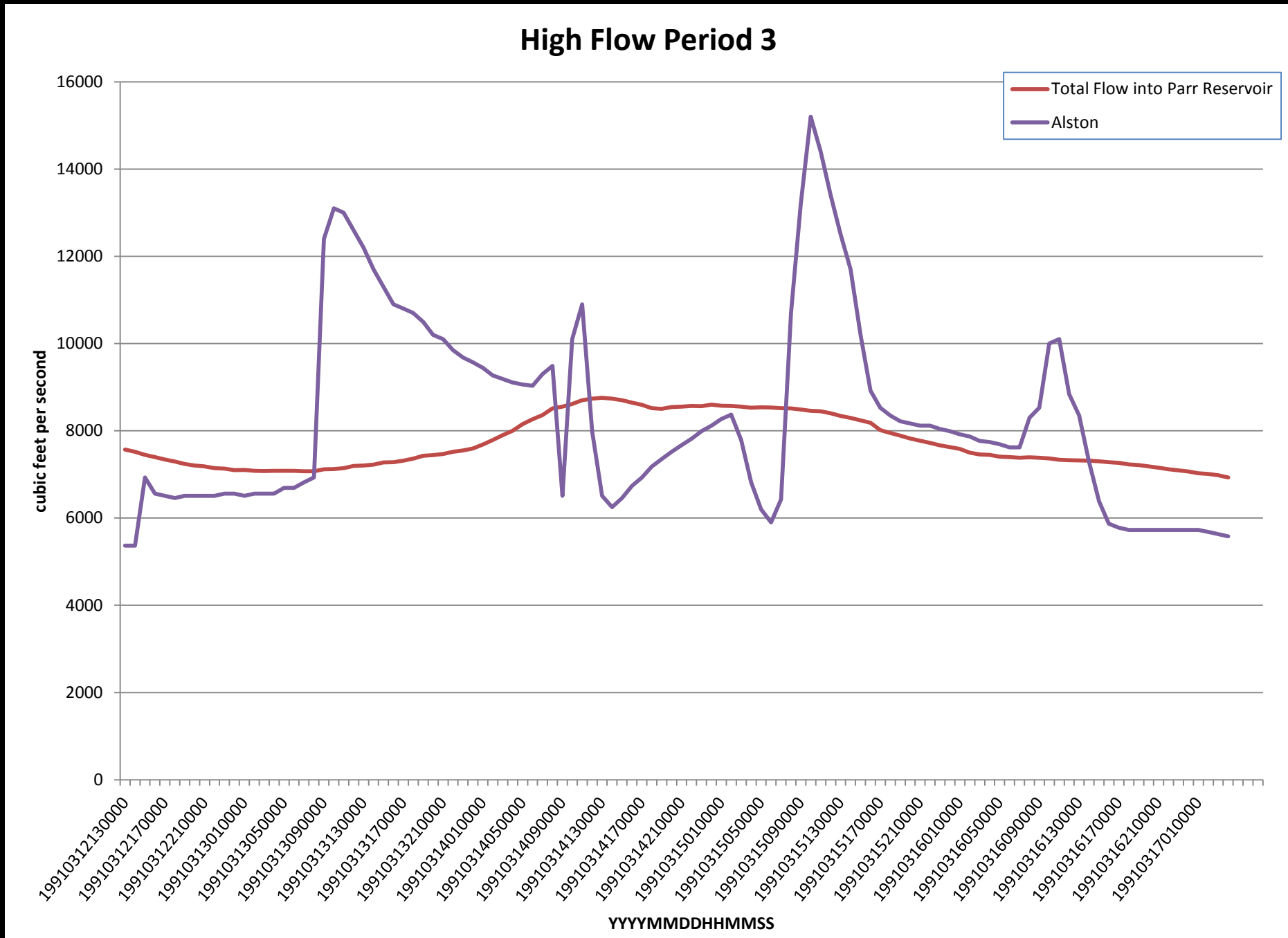
High Flow Period 3
Total Flow into Parr Reservoir
Alston
cubic feet per second
16000
14000
12000
10000
8000
6000
4000
2000
0
19910312130000
19910312170000
19910312210000
19910313010000
19910313050000
19910313090000
19910313130000
19910313170000
19910313210000
19910314010000
19910314050000
19910314090000
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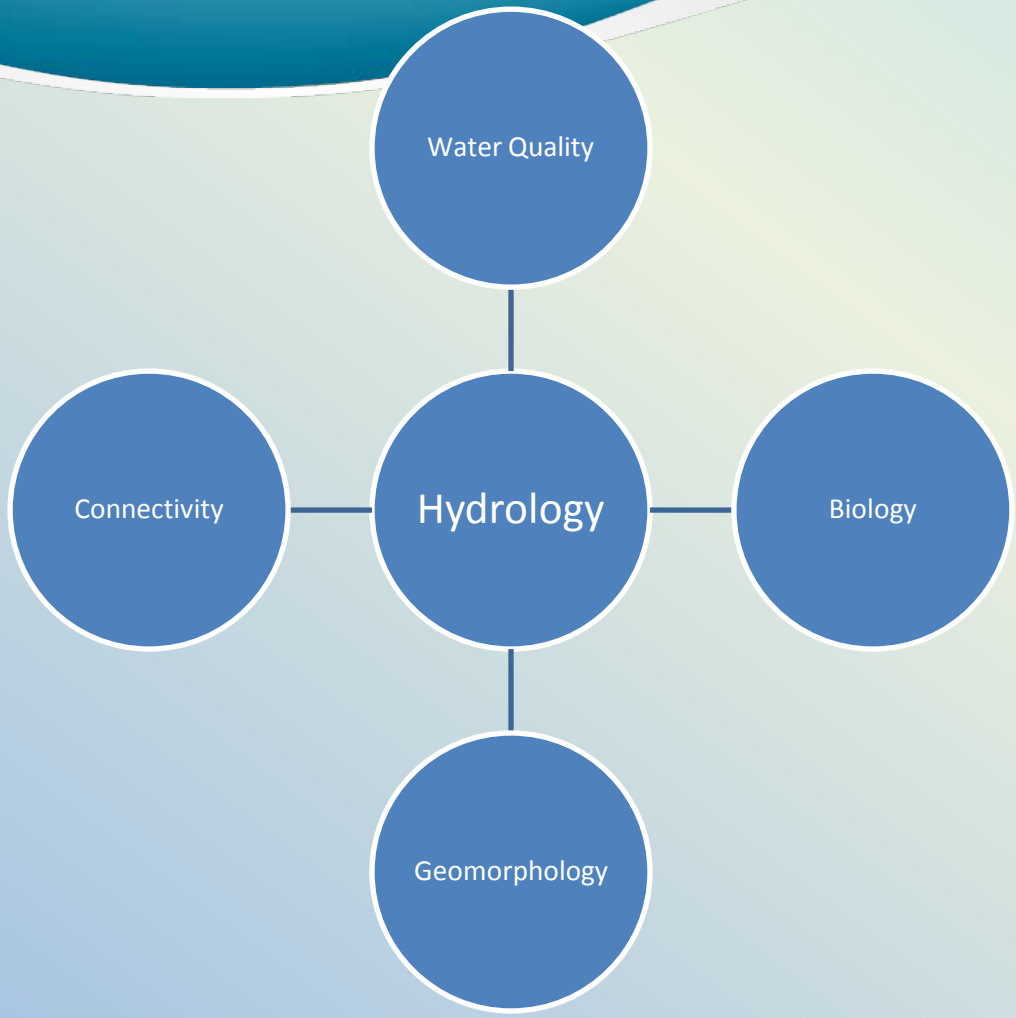
Implications: Riverine Ecology



Annear, Thomas C. *Instream Flows for Riverine Resource Stewardship.* Cheyenne, WY: Instream Flow Council, 2004. Print.

Implications

- Fast rise rates serve as spawning cues to some fish
  - Artificial high pulses may cause inappropriate spawning
- Flashiness can leave natives susceptible to nonnative takeover
- Increased maximum and minimum flows can leave soil too moist or too dry

Further Questions

- How does altered hydrology affect the biological, connectivity, geomorphological, and water quality on the Lower Broad?
- How can the Project be better managed to mimic the natural hydrograph or incoming flows?

Considerations

- Reversals should have a threshold limit before considered a reversal (e.g. ±10%)
  - Too many reversals on inflow, too sensitive
  - Incorporating attenuation could help
- Inflow should account for attenuation of flow from gage sites
  - Reversals and rise/fall rates would be reduced for inflow

- “the natural flow regime of virtually all rivers is inherently variable and that this variability is critical to ecosystem function and native biodiversity.”
  - Poff et al. 1997

Acknowledgements

- Gerrit Jöbsis
- Rebecca Haynes
- Dr. Allan James
- Dr. John Grego
- Sarah Ellisor
- Scott Harder
- Bill Argentieri

Questions?

References

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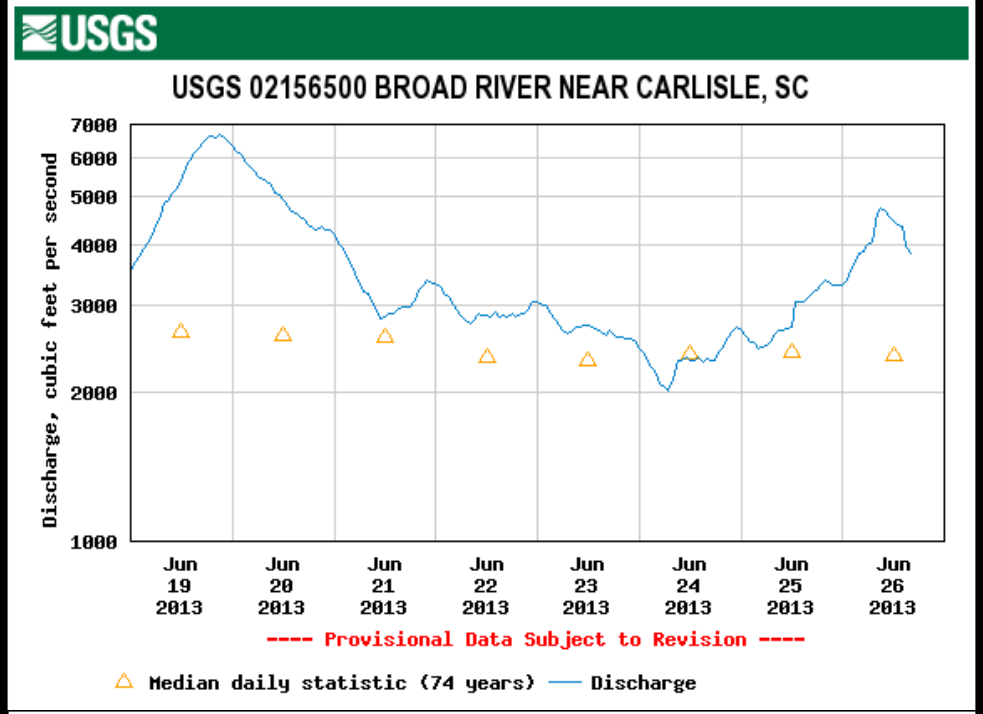
- Richter, Brian D, Jeffrey V Baumgartner, Jennifer Powell, and David P. Braun. "A Method for Assessing Hydrologic Alteration Within Ecosystems." *Conservation Biology.* 10.4 (1996). Print.
- Annear, Thomas C. *Instream Flows for Riverine Resource Stewardship.* Cheyenne, WY: Instream Flow Council, 2004. Print.
- The Nature Conservancy. Indicators of Hydrologic Alteration Manual. April 2009.
- Poff, N L. J D. Allan, Mark B. Bain, and James R. Karr. "The Natural Flow Regime." *Bioscience.* 47.11 (1997): 769. Print.

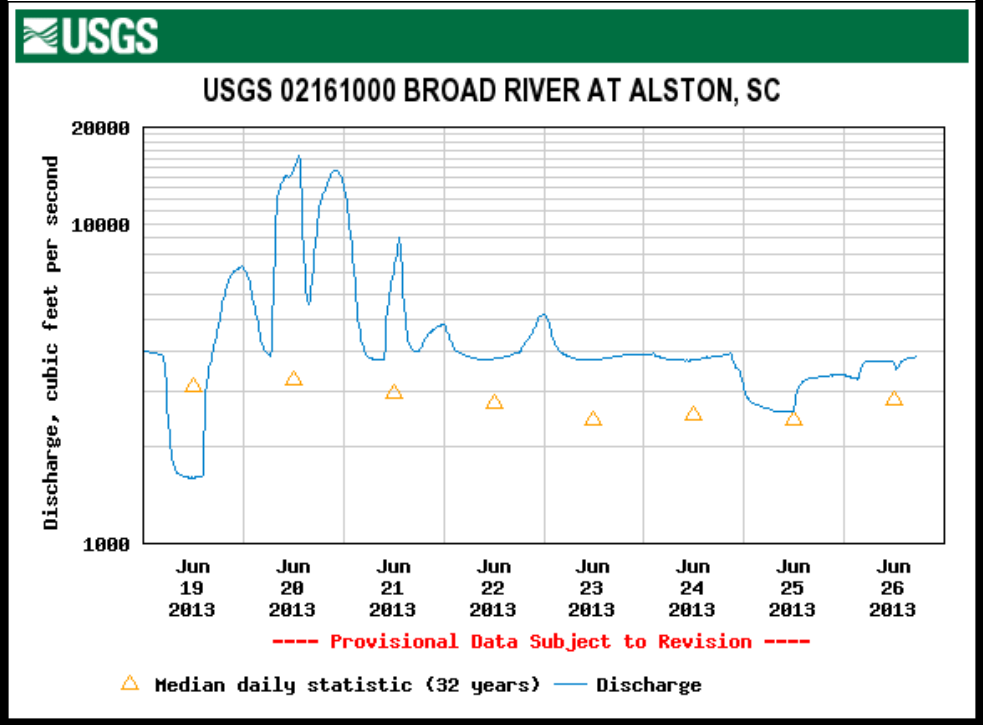
Past 7 days

Carlisle

vs.

Alston



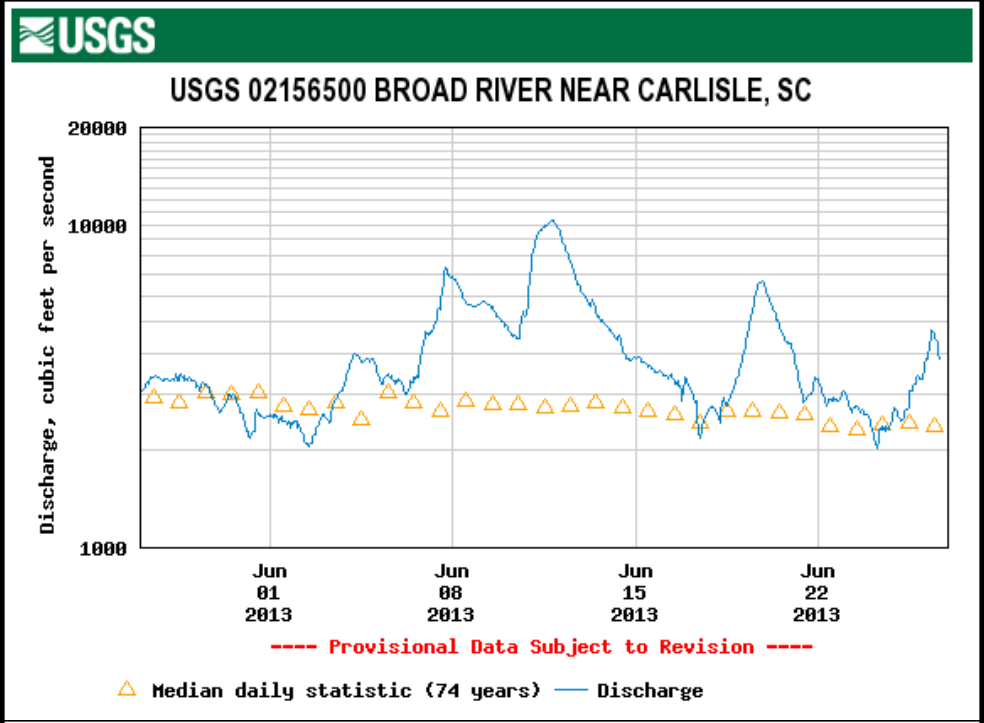


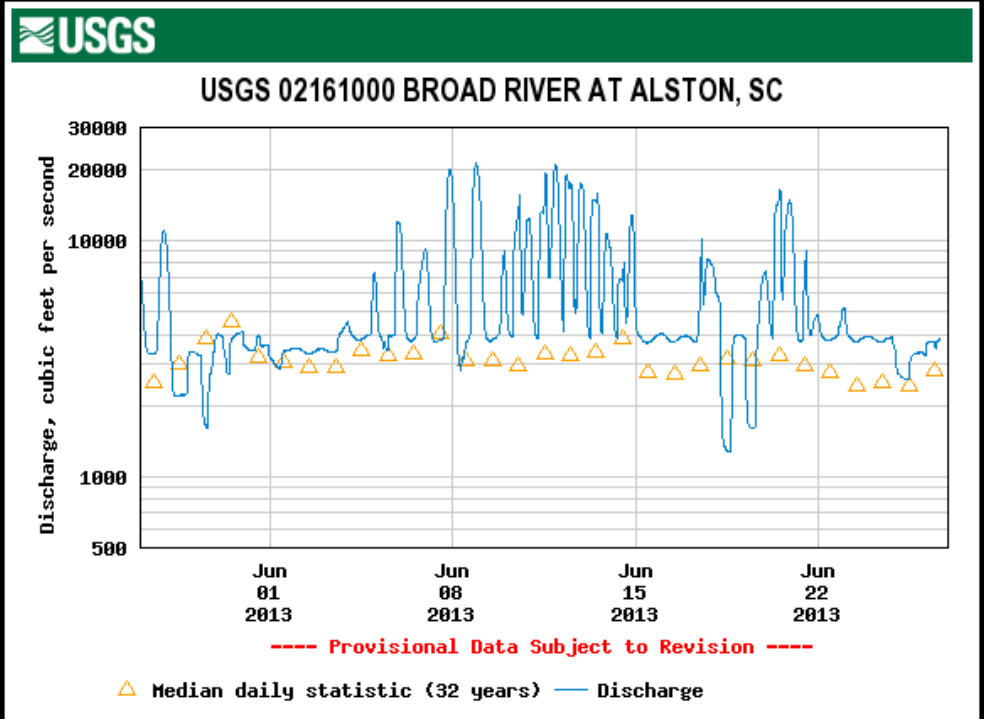
Past 30 days

Carlisle

vs.

Alston





PARR HYDROELECTRIC PROJECT
PARR & FFPS PLANT OVERVIEW
FERC PROJECT No. 1894 - SC

JUNE 27, 2013

SCE&G®
A SCANA COMPANY

PARR
Relicensing Project

TOPICS

- Table of Standard Project Numbers
- Parr Hydro:
  - Plant Overview & Basic Data
  - Drag Rake Description & Operation
  - Spillway and Crest Gates
- Fairfield Pumped Storage:
  - Plant Overview & Basic Data
  - Intake and Tailrace
- Project Operation Overview

Parr Hydroelectric Project P-1894

Table of Standard Project Numbers

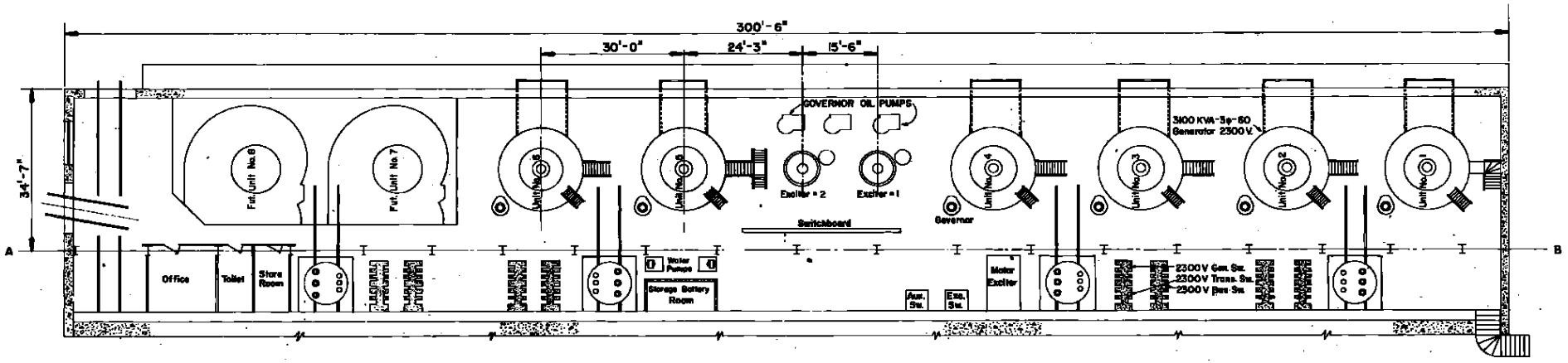
DESCRIPTION	NUMBER OR FACT (PARR SHOALS DEVELOPMENT)	NUMBER OR FACT (FAIRFIELD PUMPED STORAGE DEVELOPMENT)
Project Location	25 mi northwest of City of Columbia; Fairfield and Newberry Counties	27 mi northwest of City of Columbia; Fairfield County
GENERAL		
Project drainage area	4,750 sq. miles	4,750 sq. miles (lower res.) 9,400 acres (upper res.)
Station rated generating capacity	14,880 kW	511,200 kW
Estimated reliable capability	7,000 kW	511,200 kW
Annual gross generation	54,086 MWh (2000 thru 2010)	708,636 MWh (2000 thru 2010)
Discharge at rated capacity	6,000 CFS	50,400 CFS (Generating); 41,800 CFS (Pumping)
Minimum recorded daily average flow	800 CFS (at USGS Alston Gage Site)	0 CFS (into Parr Reservoir)
DAM & RESERVOIR		
Dam Type & Dimensions	Concrete gravity spillway, 37 ft. high, 2000 ft. long, crest el. 257.0 ft. NGVD29	(4) Primary earth embankments, all with crest el. 434.0 ft. NGVD29: Dam A: 85 ft. high, 3,130 ft long Dam B: 160 ft. high, 4,700 ft. long Dam C: 60 ft. high, 2,000 ft. long Dam D: 30 ft. high, 1,300 ft. long (2) Perimeter freeboard embankments on east side of reservoir
Max. Res. Oper. Level (Full Pool) & Area	El. 266.0 ft. NGVD29; 4,400 ac.	El. 425.0 ft. NGVD29; 6,800 ac.
Min. Res. Oper. Level	El. 256.0 ft. NGVD29	El. 420.5 ft. NGVD29
Total storage at full pool	32,000 ac-ft	400,000 ac-ft
Active storage	29,000 ac-ft in 10 ft. operating range	29,000 ac-ft in 4.5 ft. operating range
SPILLWAY		
Spillway Gates Number and Type	(10) Bottom hinged bascule crest gates, each 200 ft. long and 9 ft. high.	None
Discharge Capacity	230,000 CFS (Inflow Design Flood) 427,000 CFS (Probable Maximum Flood)	N/A
POWERHOUSE		
Construction type	Steel framed brick masonry	Reinforced concrete
Dimensions	300 ft. long, 60 ft. wide, 50 ft. high	520 ft. long, 150 ft. wide, 108 ft. high (below grade)
INTAKE STRUCTURE		
Type and Dimensions	Integral with powerhouse	Reinforced concrete, 300 ft. long, 260 ft. wide, 50 ft. high
Head Gates Number and Type	(6) Bottom hinged steel	(4) Vertical lift steel had gates; (8) vertical lift steel tail gates

Parr Hydroelectric Project P-1894

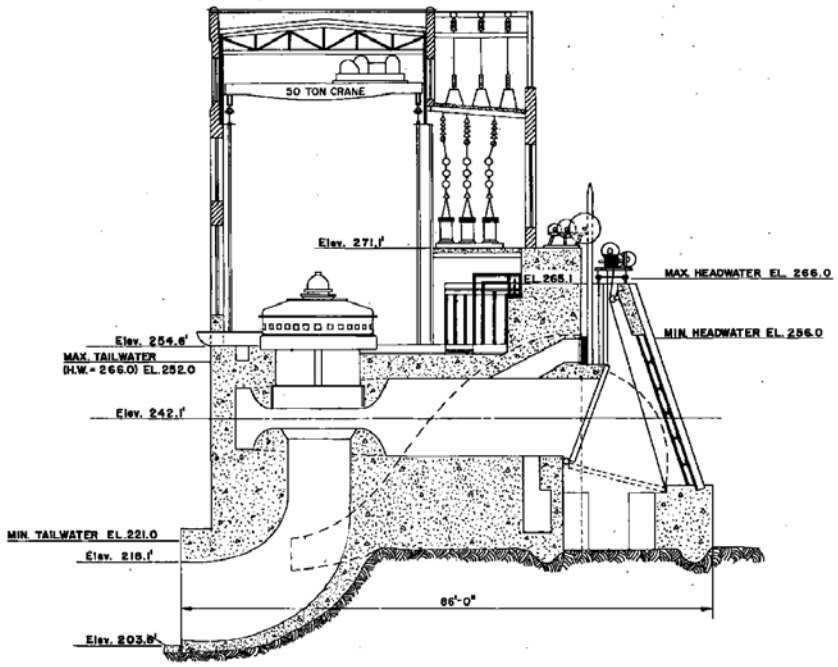
Table of Standard Project Numbers

DESCRIPTION	NUMBER OR FACT (PARR SHOALS DEVELOPMENT)	NUMBER OR FACT (FAIRFIELD PUMPED STORAGE DEVELOPMENT)
PENSTOCKS		
Number, Type and Dimensions	(6) Concrete, integral with powerhouse	(4) Steel, 800 ft. long, 26 ft. diameter (each serves 2 units)
TURBINES		
Number & Manufacturer	(6) Allis Chalmers	(8) Allis Chalmers
Type	Vertical Francis	Vertical Francis Reversible Pump-Turbines
Rated net head/TDH	35 ft.	150 to 167 ft. (Turbine mode); TDH 158 to 173 ft. (Pump mode)
Approximate min. discharge capacity	150 CFS	2,500 CFS
Rated maximum discharge capacity	1,000 CFS	6,300 CFS (generating); 5,225 CFS (avg. pumping)
Draft tube invert elevation	El. 203.6 ft. NGVD29	El. 189.0 ft. NGVD29
HP rating at rated head	3,600	95,375 to 108,570
Synchronous speed (rpm)	100	150
GENERATORS		
Manufacturer	Allis Chalmers	Westinghouse
Type	AC	AC Motor-Generators
Phases	3	3
Voltage	2,300	13,800/13,200 V @ 60° C/80° C
Frequency	60 Hz	60 Hz
KVA rating	3,100	71,000 (generating); 74,570 (pumping, 100,000 HP equiv.)
Power factor	0.8	0.9 (generator); 1.0 (pump)
KW output	2,480	63,900
TRANSFORMERS		
Number & Type	(3) OA/FA	(4) FOA (each serves 2 units)
Voltage (Primary/Secondary)	2.4/13.8-kV	13.8/230-kV
Phases	3	3
KVA Rating @ Temp. Rise	6,000/6,720 KVA (OA), @ 55 °C/65° C rise 7,500/8,400 KVA (FA), @ 55 °C/65° C rise	160/80/80 MVA @ 55° C rise (160 MVA 230 kV primary wye connected, 2-80 MVA 13.8 kV secondaries each connected to 1 motor-generator); 179.2/89.6/89.6 MVA @ 65° C rise

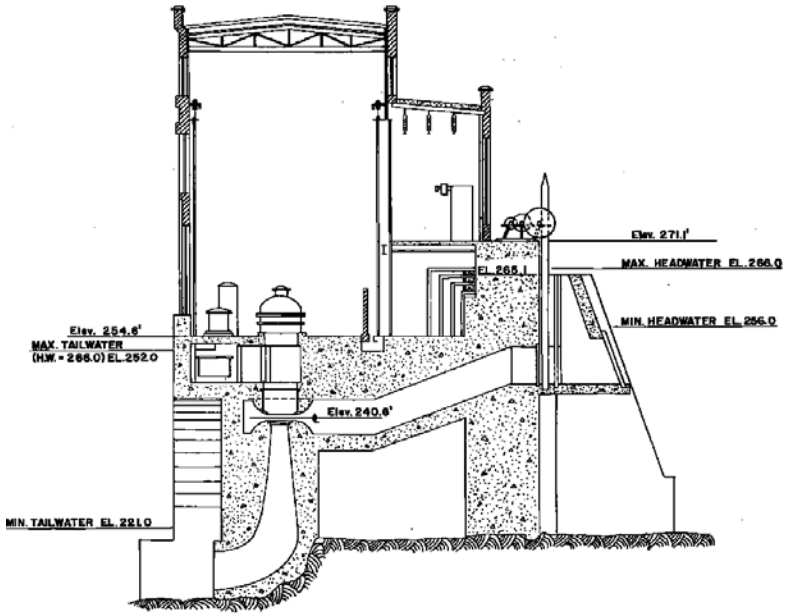
Parr Hydro Plant Overview and Basic Information



PLAN OF GENERATOR FLOOR



SECTION THRU MAIN UNIT



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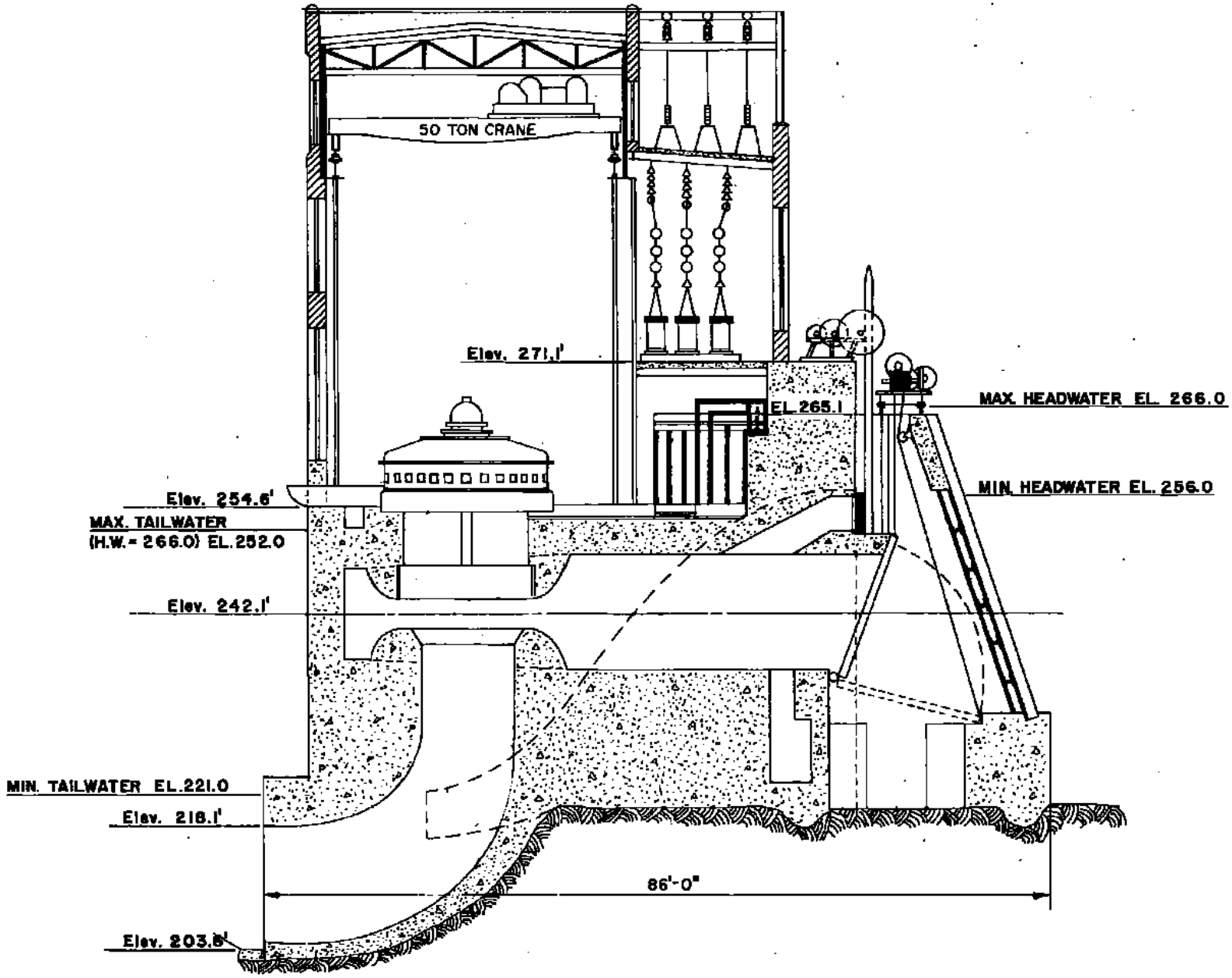

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EXIT


EXIT
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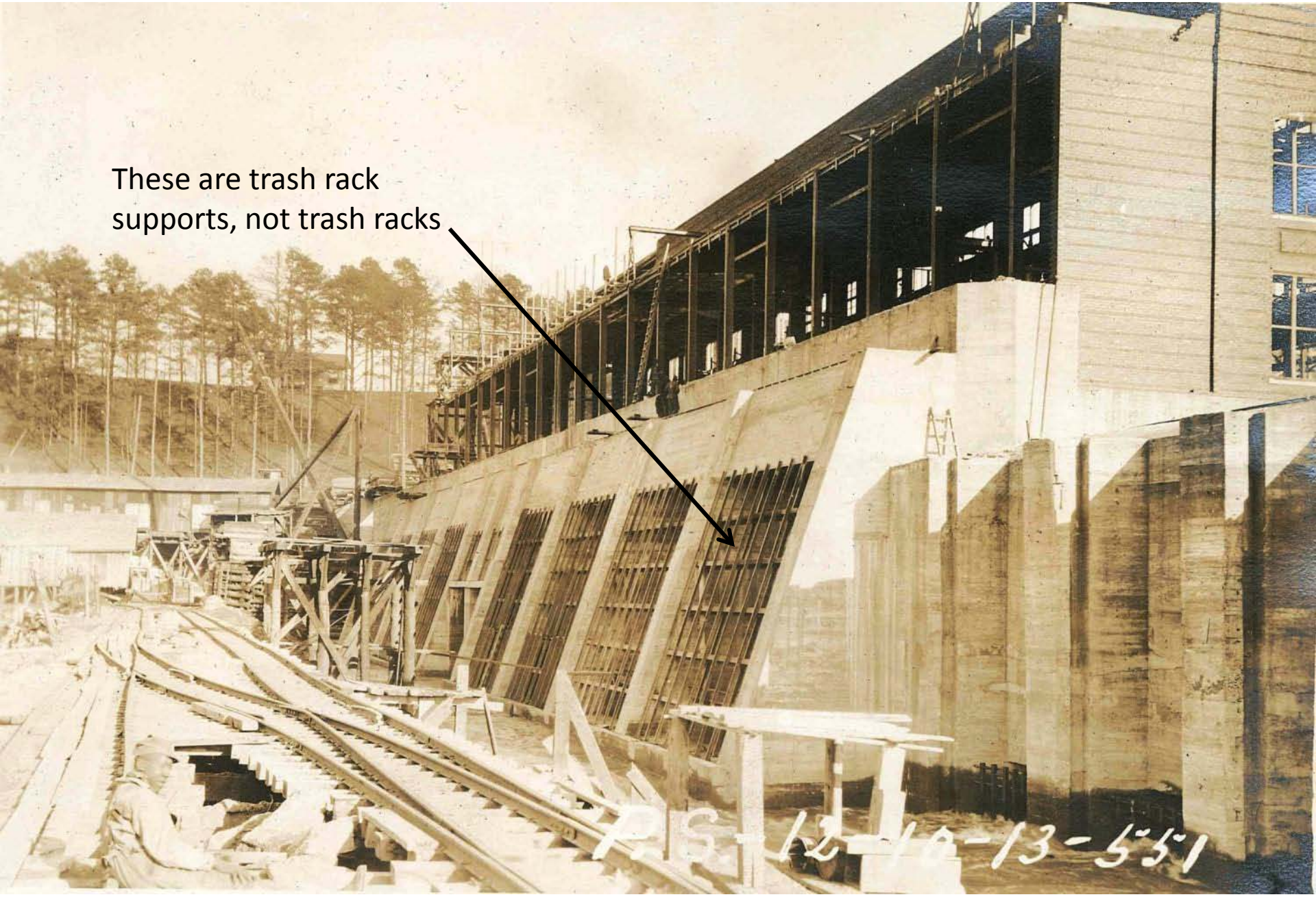
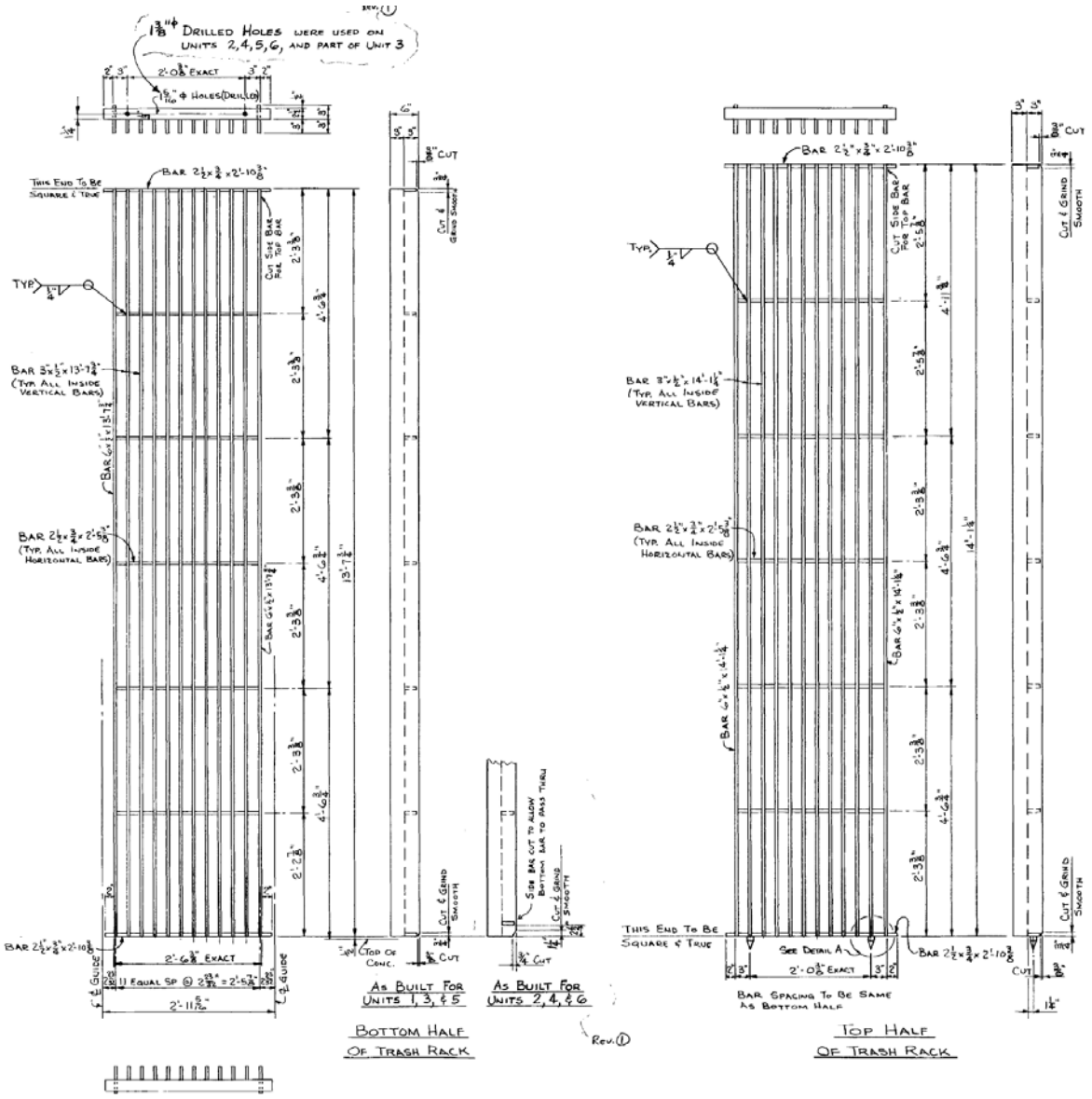
Parr Hydro
Intake and Drag Rake System



1913 Photo of Parr Hydro Intakes

Parr Hydro Trash Racks

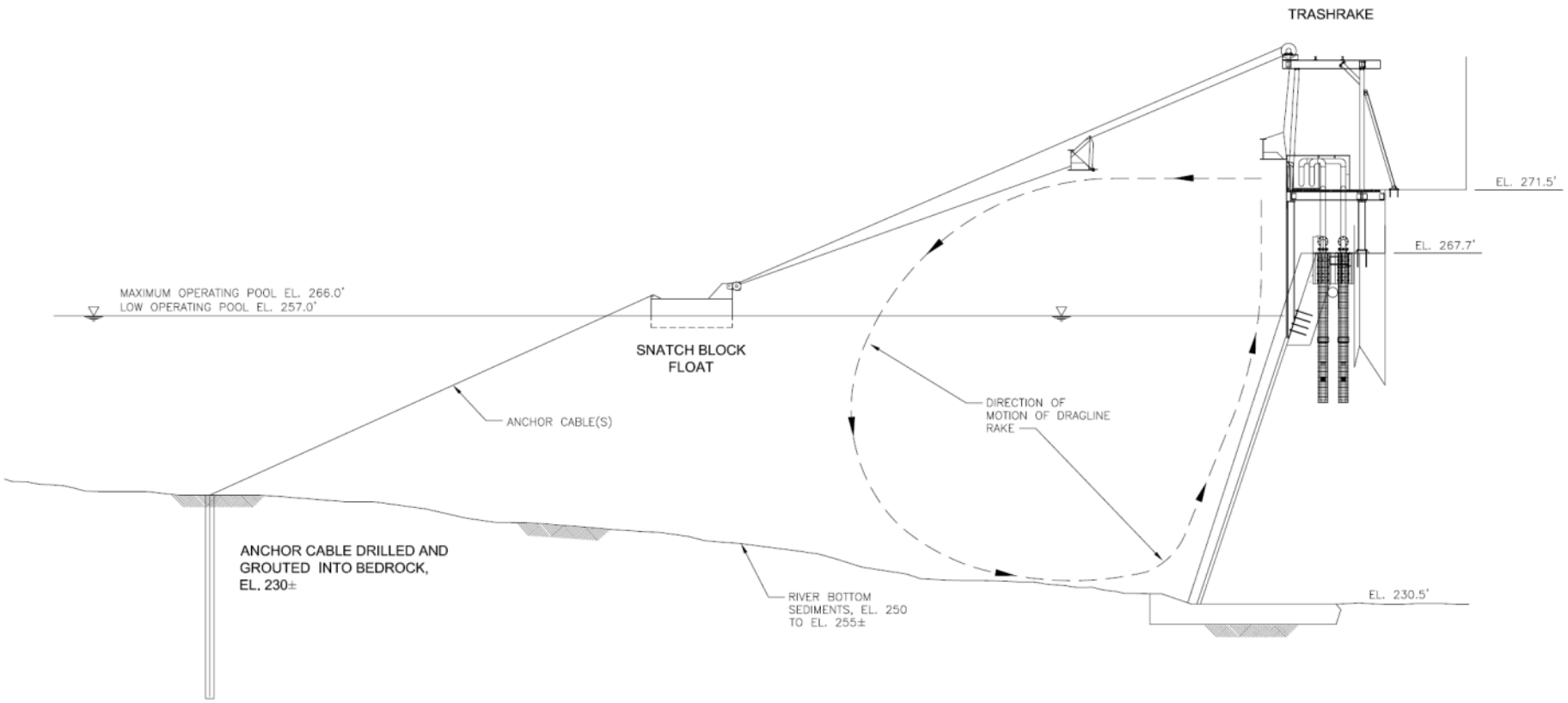
- 8 trash racks, 1 per turbine.
- Each trash rack is 27 ft. wide, 28 ft. tall.
- Vertical bars are ½ in. thick with 2-¼ in. clear between bars.
- Racks are made in 3 ft. wide panels, 9 panels per rack.



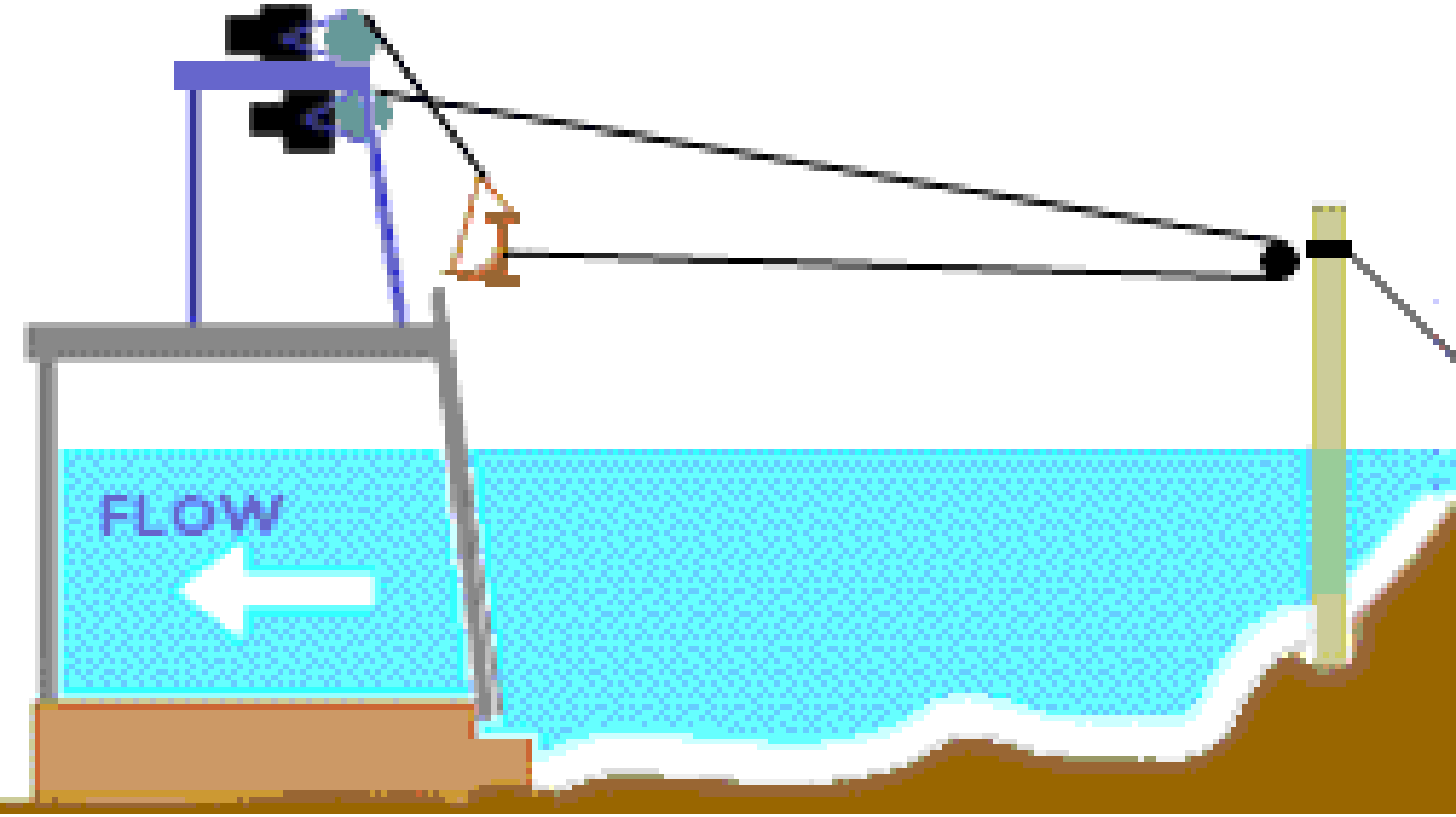
Parr Hydro Trash Rack Panel (9 panels per rack)

Trash Handling Crane (prior to Drag Rake Installation)

Drag Rake System Installed



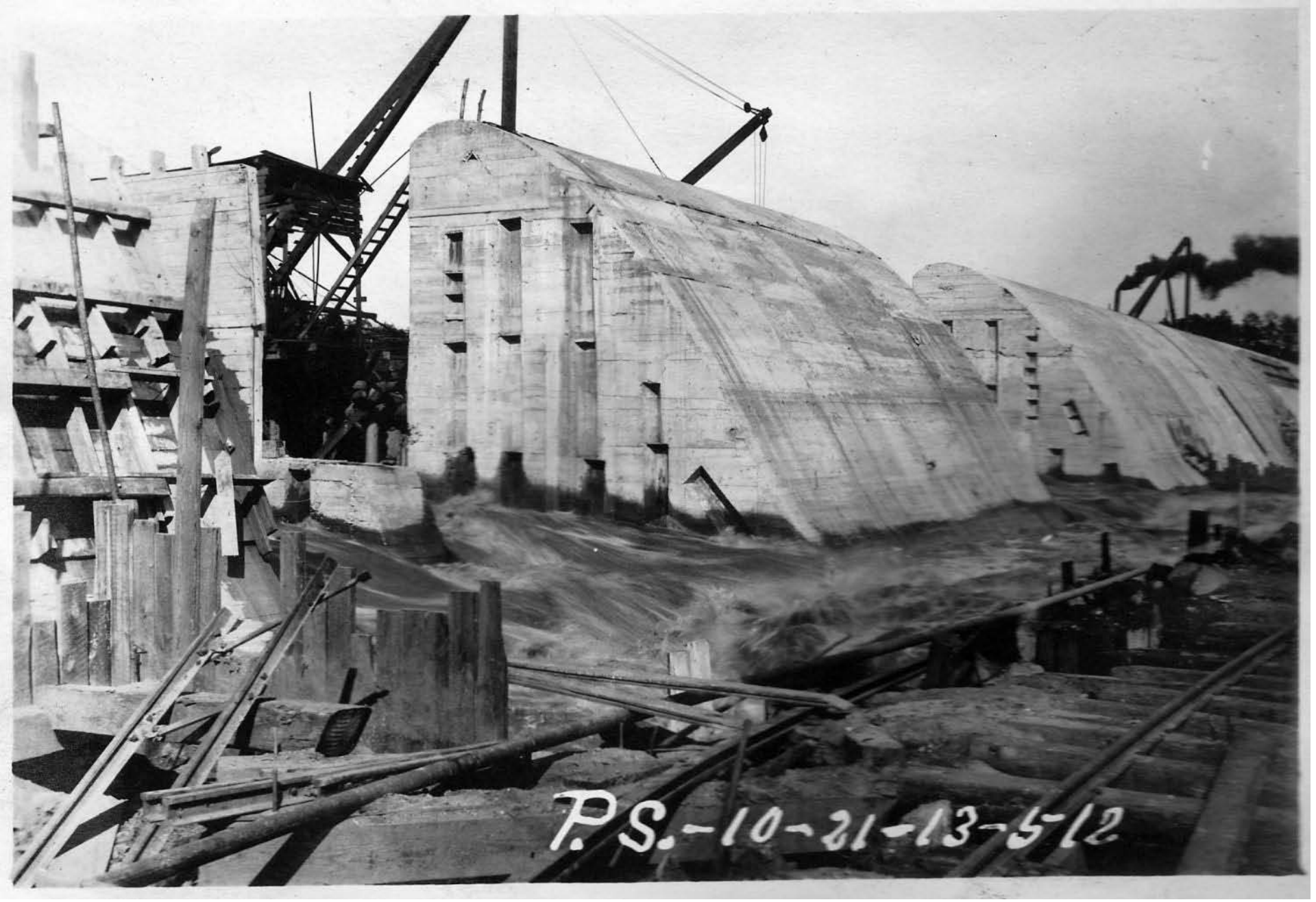
Parr Hydro Drag Rake System



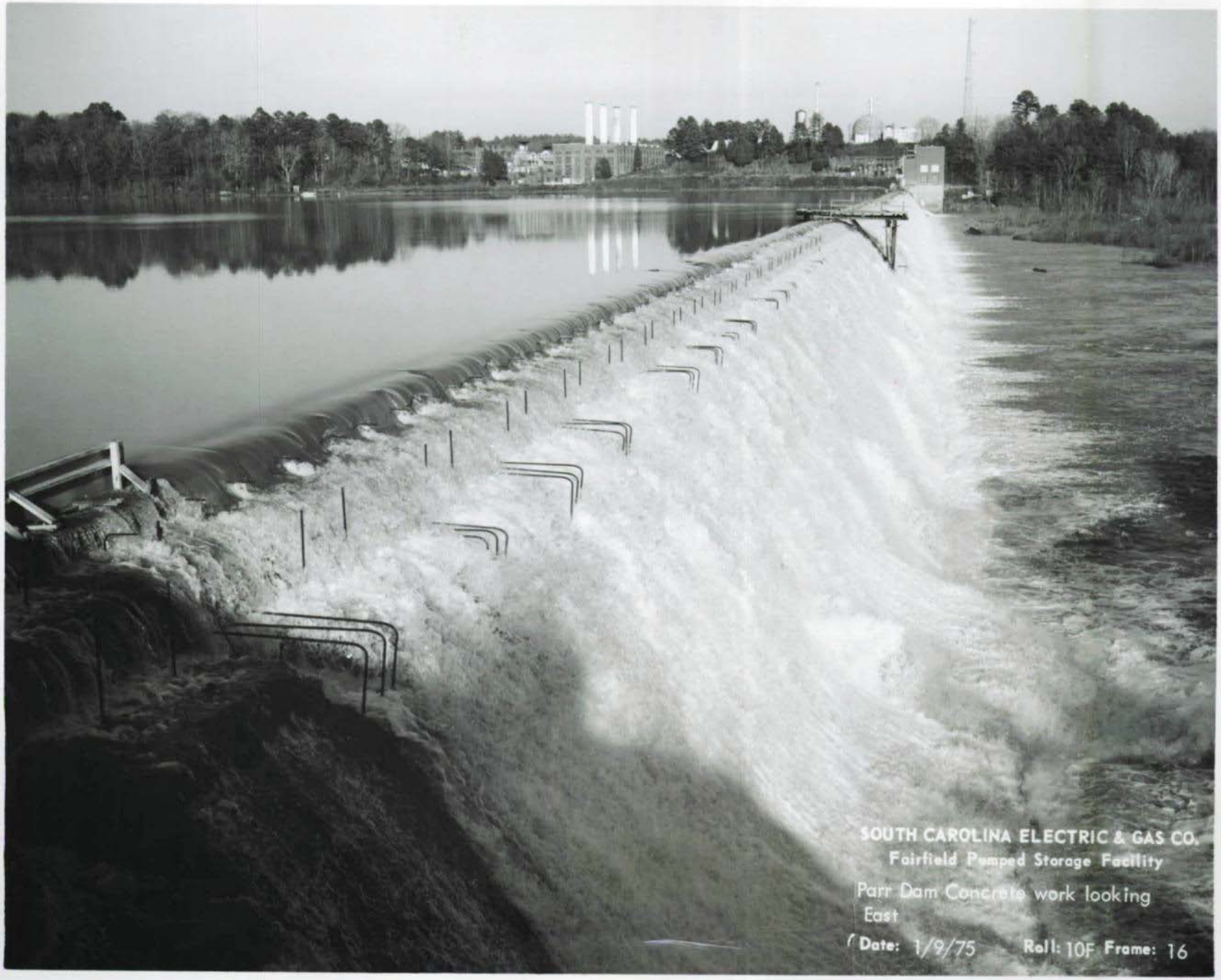
Drag Rake Operation Animation
(Courtesy North Fork Electric Co.)

Intake Deck showing debris and sluice trough

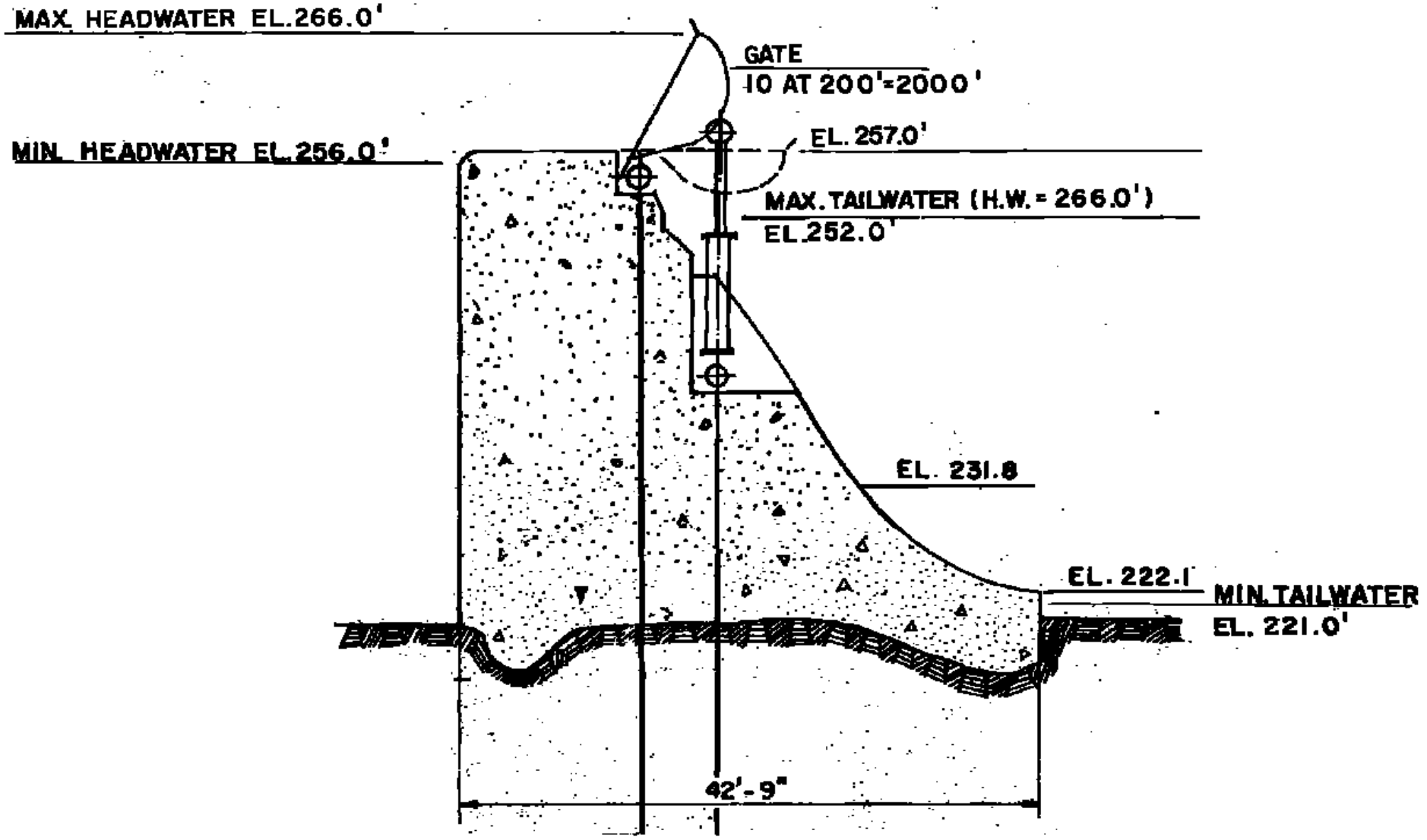
Parr Spillway and Crest Gates



Parr Dam Under Construction - 1913

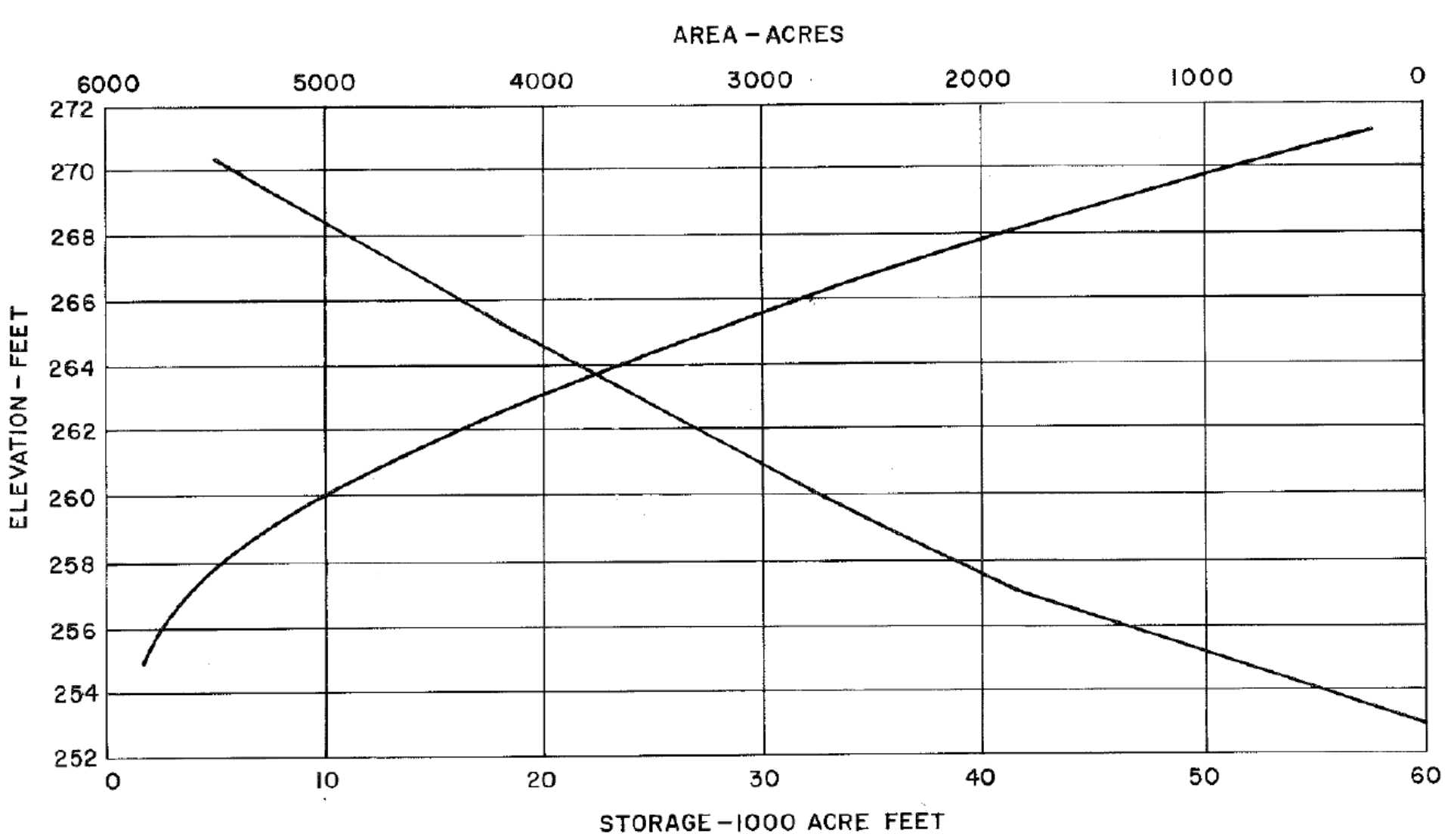

SOUTH CAROLINA ELECTRIC & GAS CO.
Fairfield Pumped Storage Facility
Parr Dam Concrete work looking East
Date: 1/9/75
Roll: 10F Frame: 16

Parr Dam and Crest Gates


MAX. HEADWATER EL. 266.0'
MIN. HEADWATER EL. 256.0'
GATE
10 AT 200'=2000'
EL. 257.0'
MAX. TAILWATER (H.W. = 266.0')
EL. 252.0'
EL. 231.8
EL. 222.1
MIN. TAILWATER
EL. 221.0'
42'-9"

Parr Spillway Information

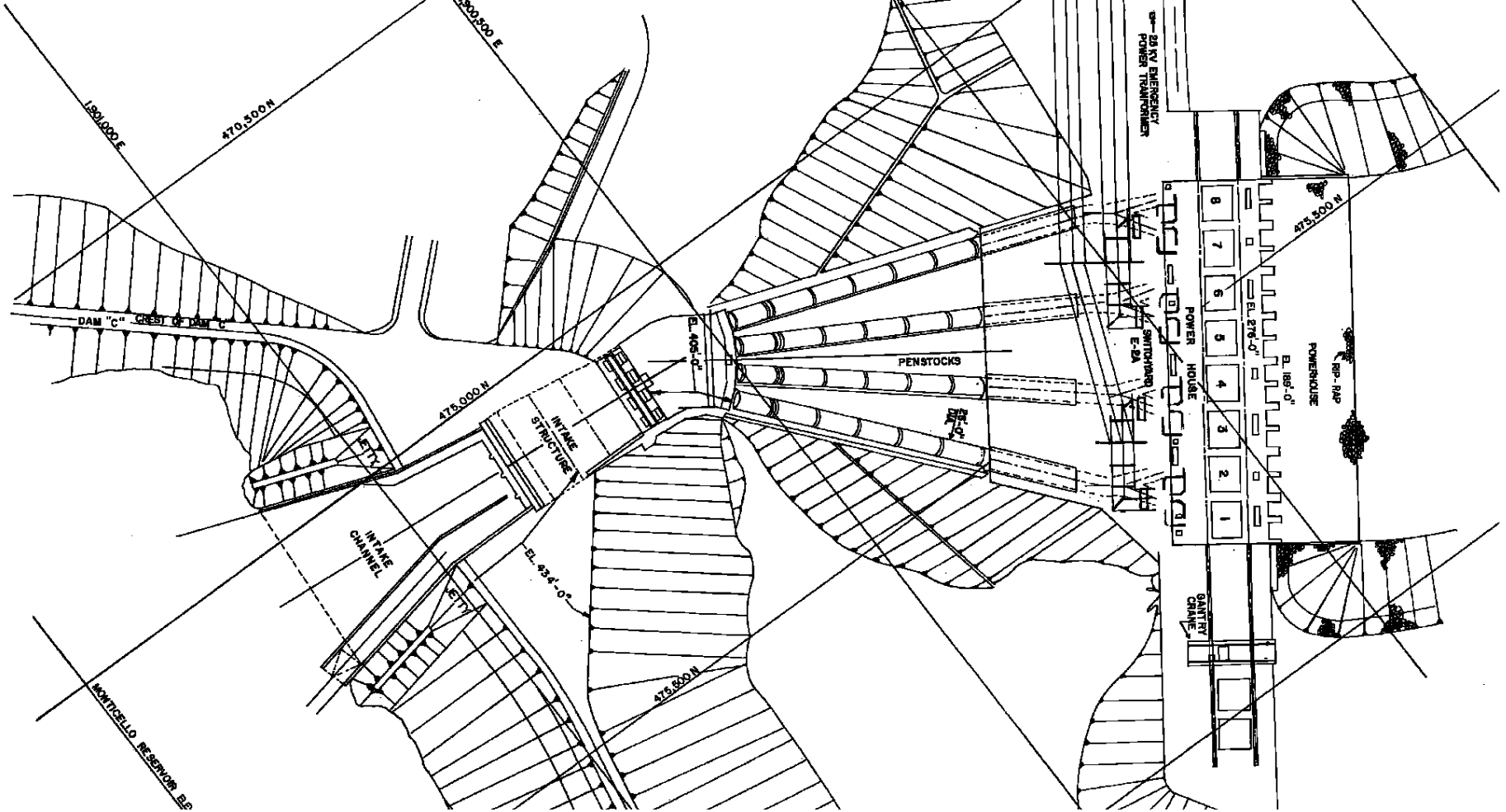
- Crest length = 2,000 feet
- 10 gates at 200 ft. each
- Gates operate in pairs
- Crest elevation = 257.0 ft. NGVD
- Spillway capacity at reservoir el. 266.0 ft. NGVD = 161,500 CFS (all gates down)
- Maximum rated capacity 229,113 CFS at reservoir el. 268.5 ft. NGVD.



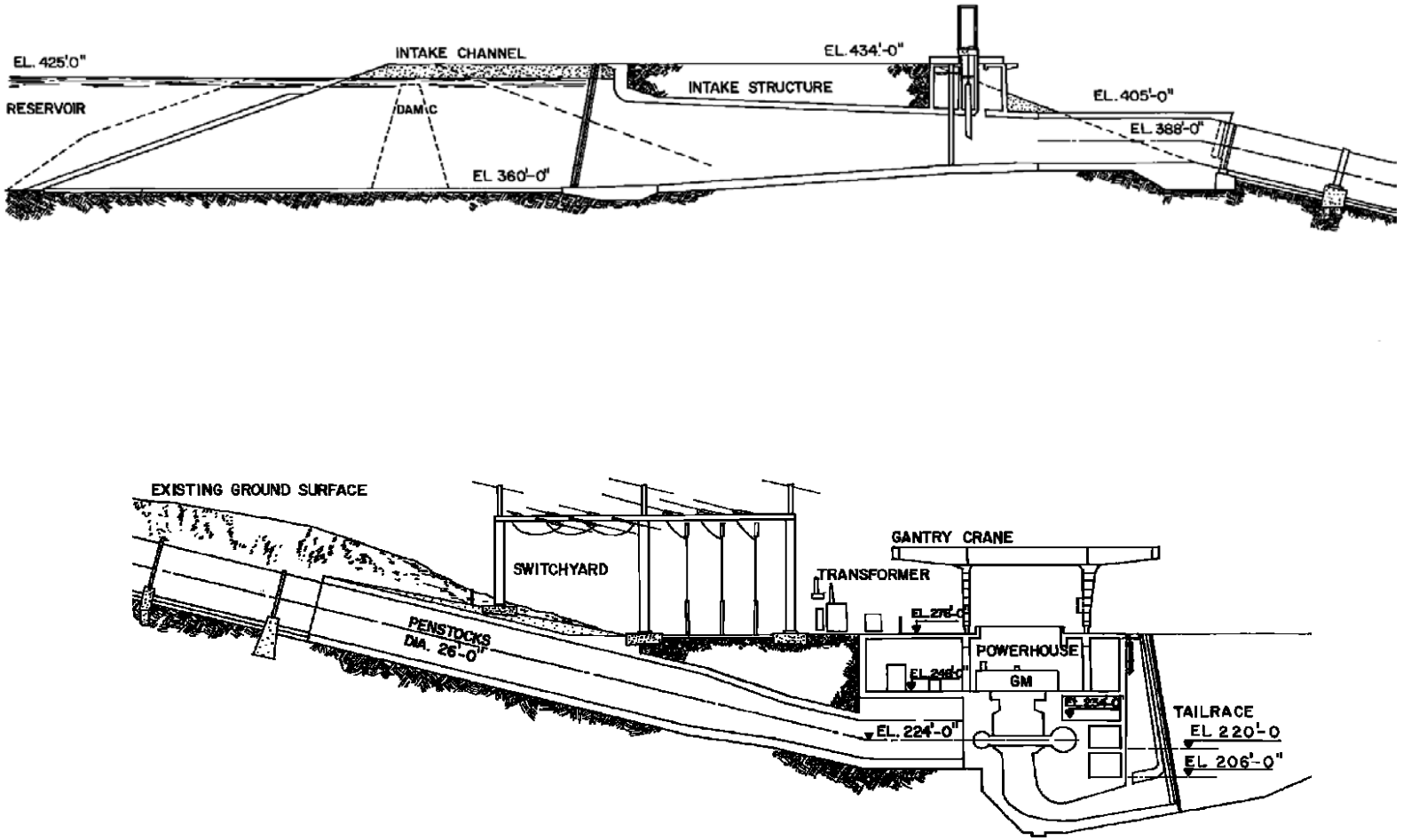
Parr Reservoir Area Capacity Curves

Fairfield Pumped Storage Plant Overview


02/02/2011 16:28



Fairfield Plan View



Fairfield Cross Sections at Intake and Powerhouse

Basic Information

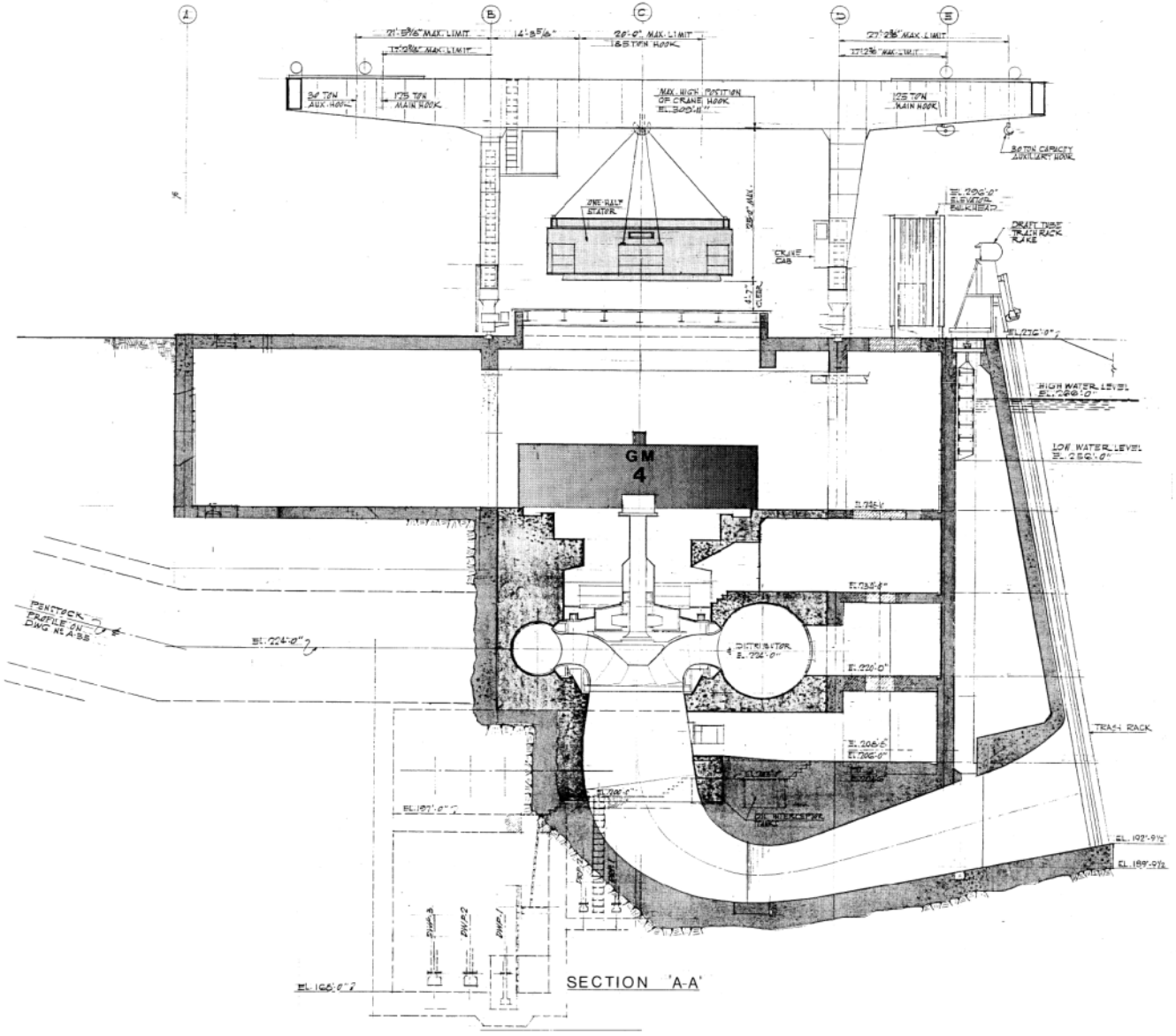
- Intake Structure:
  - 265 ft. long, 132 ft. wide, 74 ft. tall.
  - Intake channel is 300 ft. long, tapers from 260 ft. wide to 132 ft. wide at intake racks.
  - Four trash racks, each 31 ft. wide, 73 ft. tall.
  - Each rack bay serves 2 units (one penstock).
  - Vertical bars are 1 in. wide on 7 in. centers = 6 in. clear spacing (horizontal).

Fairfield Intake Showing Racks


SOUTH CAROLINA ELECTRIC & GAS CO.
Fairfield Pumped Storage Facility
Intake Structure
Date: 9-1-76 Roll: 177 Frame: 20A

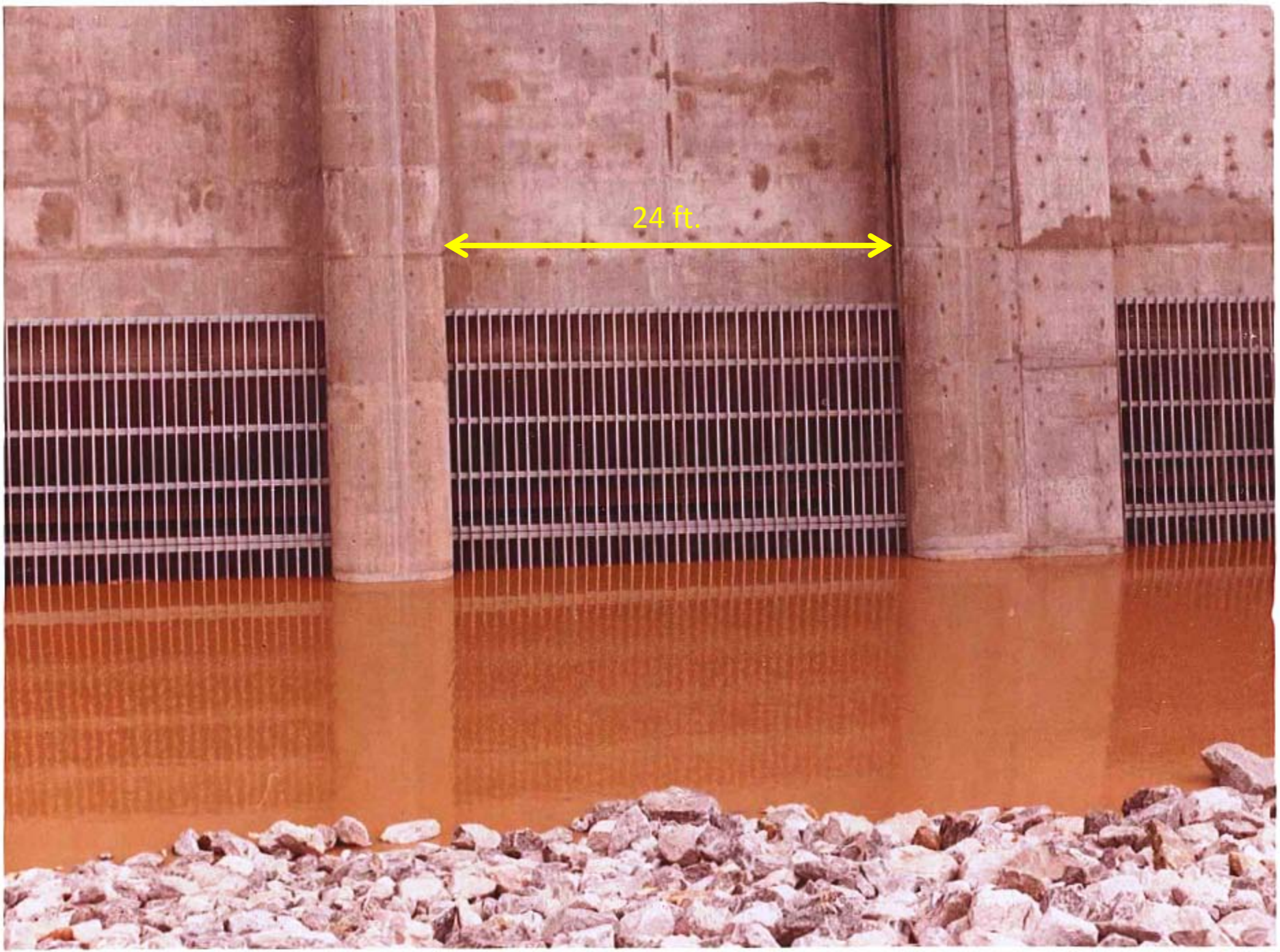
Basic Information

- FFPS Powerhouse:
  - 520 ft. long, 150 ft. wide, 108 ft. tall.
  - Eight 65 ft. wide bays, each with one pump-turbine-motor-generator unit.
  - 16 draft tube racks at tailrace, each rack is 24.5 ft. wide, 23 ft. tall.
  - Vertical bars are 1 in. wide on 7 in. centers = 6 in. clear spacing (horizontal).



Fairfield Cross Section Through Powerhouse

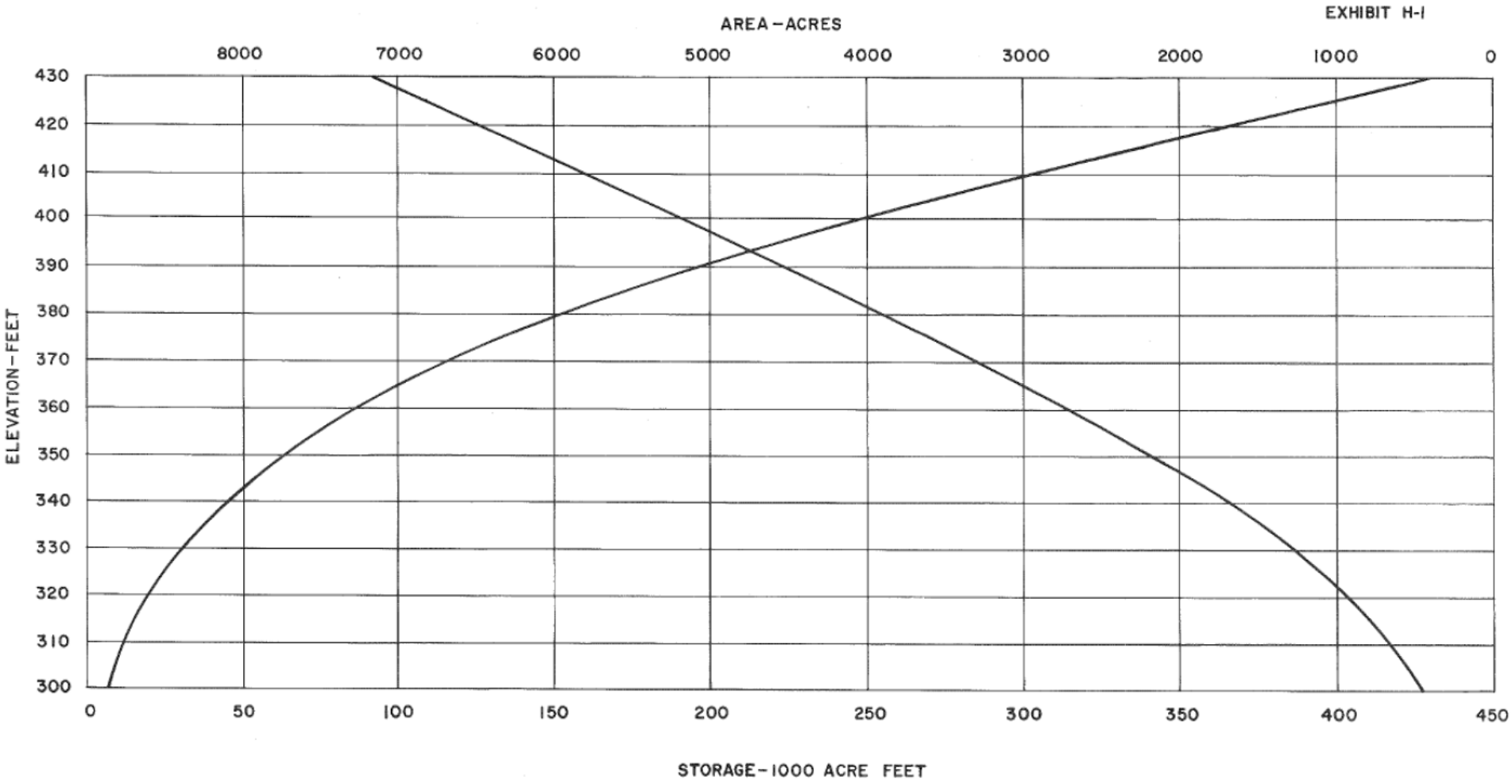

SOUTH CAROLINA ELECTRIC & GAS CO.
Fairfield Pumped Storage Facility
Powerhouse - Facing Northeast
Date: 6-1-76 Roll: 172 Frame: 1A


24 ft.

Initial Filling of Monticello Reservoir

Plant Upgrades Since Construction

- 2000: New stainless steel water wheels, generators rewedged, turbine runners and partial rotor poles replaced on Units 7 and 8.
- 2001: New stainless steel water wheels, generators rewedged, turbine runners and partial rotor poles replaced on Units 3 and 4. Exciters replaced on Units 5 and 6.
- 2002 – 2003: Generators rewedged, turbine runners replaced, and tailrace trash racks replaced on Units 1 and 2. Partial rotor pole replaced on Unit 1. Exciters replaced on Units 3 and 4.
- 2004 – 2005: Exciters replaced on Units 1 and 2. Generators rewedged, turbine runners replaced, partial rotor pole replaced, controls and governors upgraded, and individual servo replaced with a slip ring mechanism on Units 5 and 6.
- Tailrace trash racks and exciters replaced on Units 7 and 8.



Monticello Reservoir Area-Capacity Curves

Operation Overview

Project Operation at Various Flow Ranges

- Inflow ≤ 6,000 CFS:
  - No need for natural flow regulation since Parr Reservoir is capable of storing the entire upper reservoir active storage, and Parr Hydro is capable of discharging the natural river flow.
  - Parr crest gates maintained in fully raised position, no spill occurs.
  - FFPS generation not limited.

Project Operation at Various Flow Ranges

- Inflow Between 6,000 and 40,000 CFS:
  - Some natural flow regulation will occur as crest gates are lowered to maintain Parr Reservoir at allowable elevations.
  - Spill plus Parr generation may exceed natural inflow.
  - Some upper reservoir water will be spilled when FFPS is generating, and will be recaptured from natural river flow during subsequent pump cycle.
  - FFPS generation limited as necessary to maintain total discharge from project ≤ 40,000 CFS.

Project Operation at Various Flow Ranges

- Inflow > 40,000 CFS:
  - No natural flow regulation will occur as all crest gates are lowered fully and FFPS generation is ceased.
  - Parr Hydro will generate with all available units.
  - Parr generation plus spill equals natural inflow.
  - No water released from Monticello Reservoir.

Questions?

Parr Hydroelectric Project Regulation Effects

Raymond R. Ammarell, P.E.

Operations RCG Meeting

June 27, 2013

SCE&G
A SCANA COMPANY

PARR
Relicensing Project

Topics

- Review of existing USGS flow data
- Comparison of inflow vs. outflow correlations
- Broad River flow-duration comparison for inflow and outflow
- Downstream effects – normal and high flows
- License compliance summary

USGS Flow Data

- Four gauges are used to operate Parr Hydro Project:
  - Broad River near Carlisle (02156500)
  - Tyger River near Delta (02160105)
  - Enoree River near Whitmire (02160700)
  - Broad River at Alston (02161000)
- Continuous daily flow record for all 4 gauges from 10/1/1980 to present (approved data to 9/30/2012, 32 years).

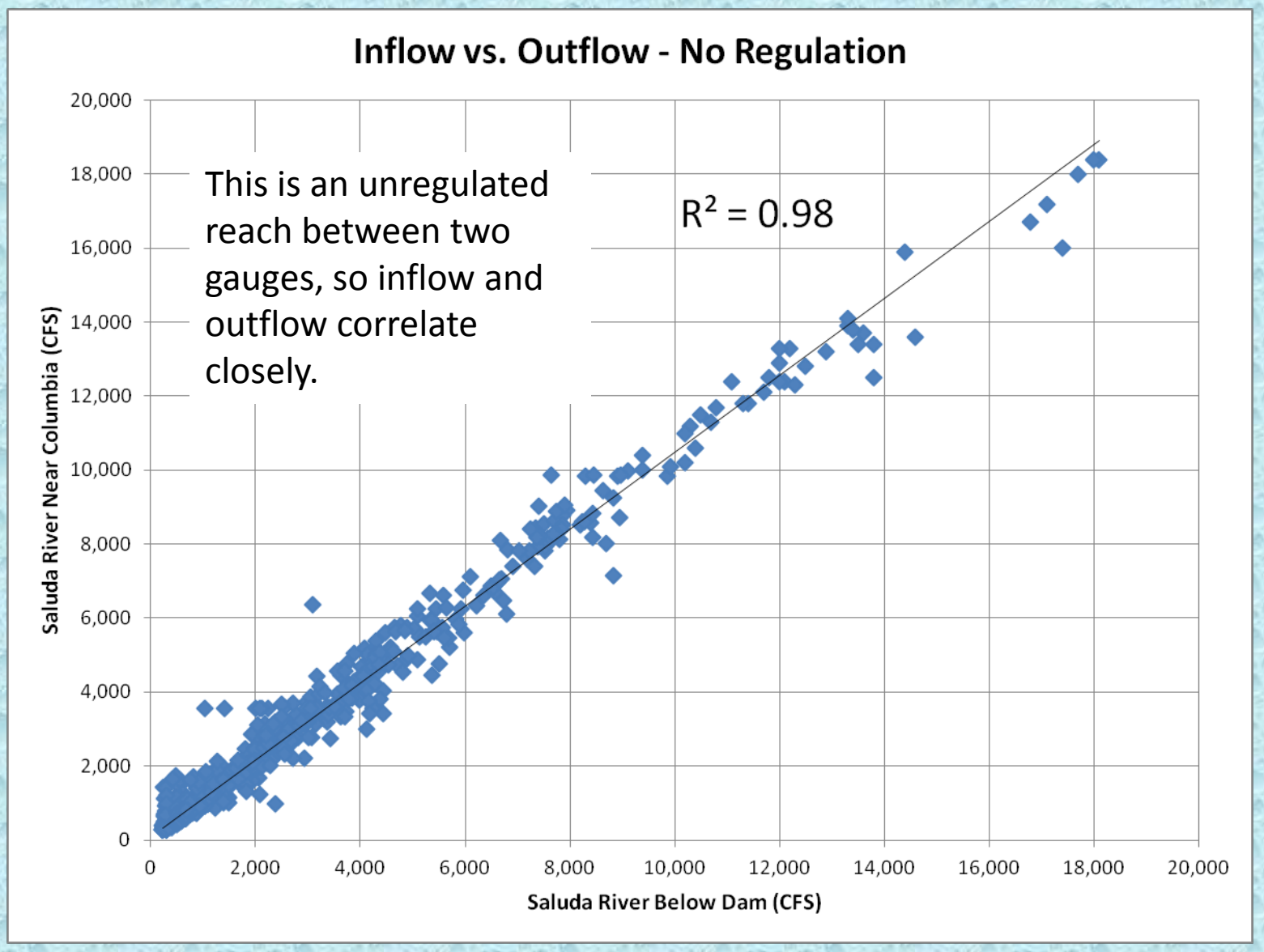
USGS Flow Data

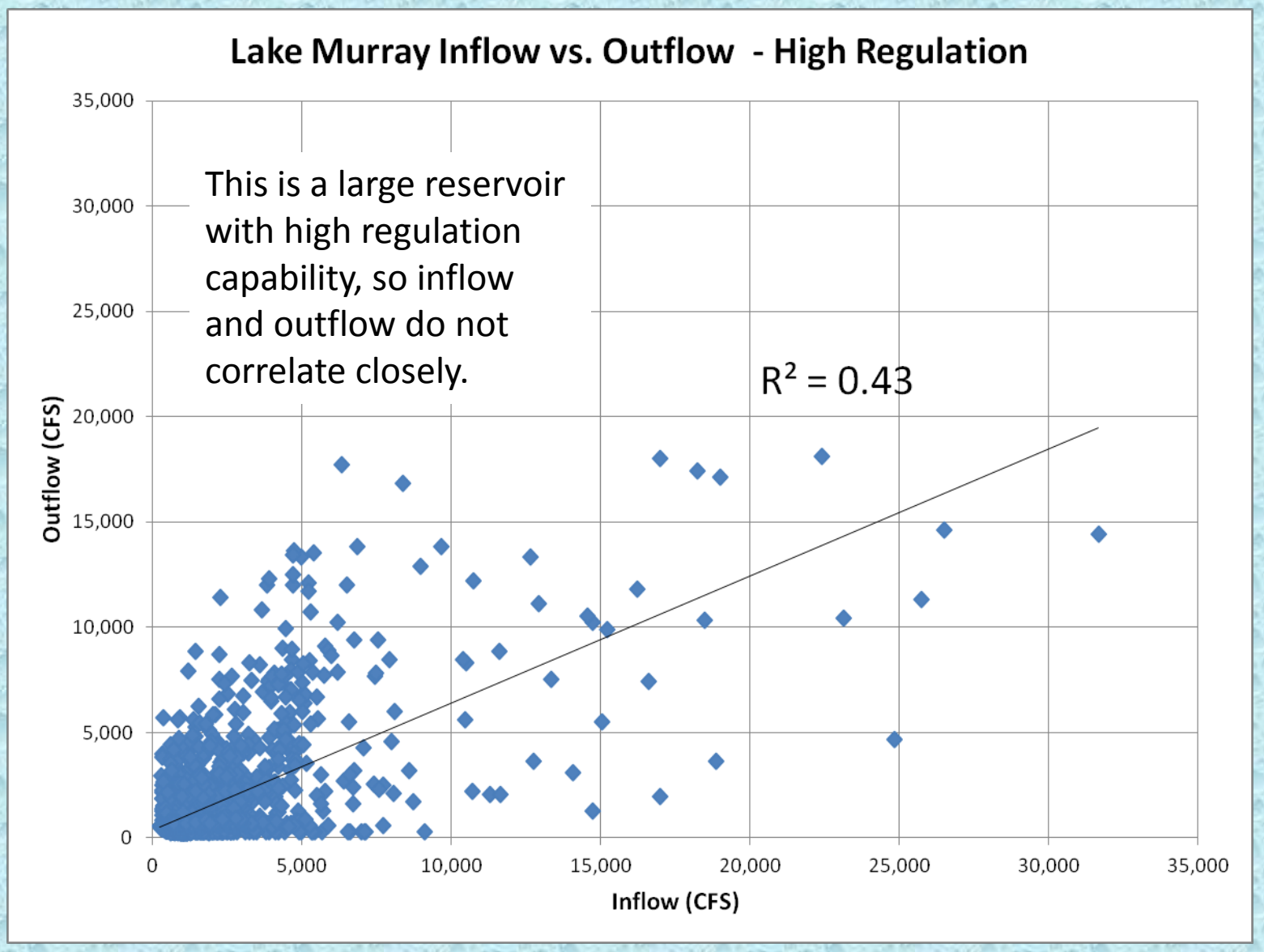
- Daily flow statistics (for 10/1/1980 to 9/30/2012):

	Mean (CFS)	Median (CFS)
Inflow	4,573	3,256
Outflow	5,163	3,440

Inflow-Outflow Correlation

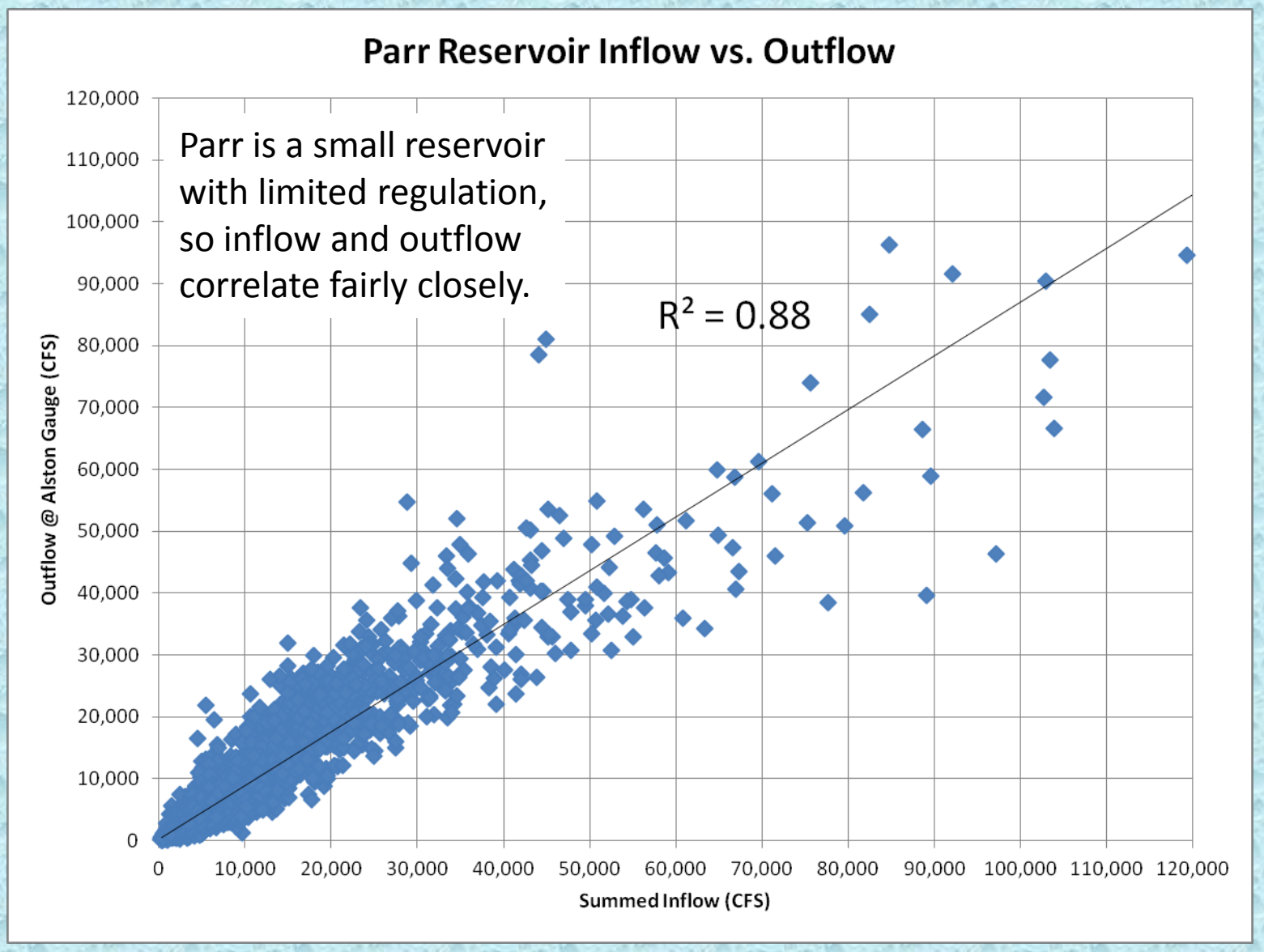
- Plotting inflow vs. outflow provides an indication of the degree of regulation a reservoir provides.
- No regulation = good correlation (r^2 close to 1)
- Much regulation = poor correlation ($r^2 << 1$)
- Example: look at lower Saluda River and Lake Murray.


Inflow vs. Outflow - No Regulation
This is an unregulated reach between two gauges, so inflow and outflow correlate closely.
$R^2 = 0.98$
Saluda River Near Columbia (CFS)
Saluda River Below Dam (CFS)
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000


Lake Murray Inflow vs. Outflow - High Regulation
This is a large reservoir with high regulation capability, so inflow and outflow do not correlate closely.
R² = 0.43
Outflow (CFS)
Inflow (CFS)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000

Inflow-Outflow Correlation

- Now look at Parr Project inflow vs. outflow
- Inflow is sum of three upstream gauges
- Outflow is Alston gauge


Parr Reservoir Inflow vs. Outflow
Parr is a small reservoir with limited regulation, so inflow and outflow correlate fairly closely.
$R^2 = 0.88$
Outflow @ Alston Gauge (CFS)
Summed Inflow (CFS)
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000

Parr Inflow-Outflow Correlation

- Parr project provides a fairly low degree of regulation.
- Daily inflow correlates fairly closely with daily outflow.
- Scatter at higher flows may be due to timing effects as the hydrographs move down the basin.

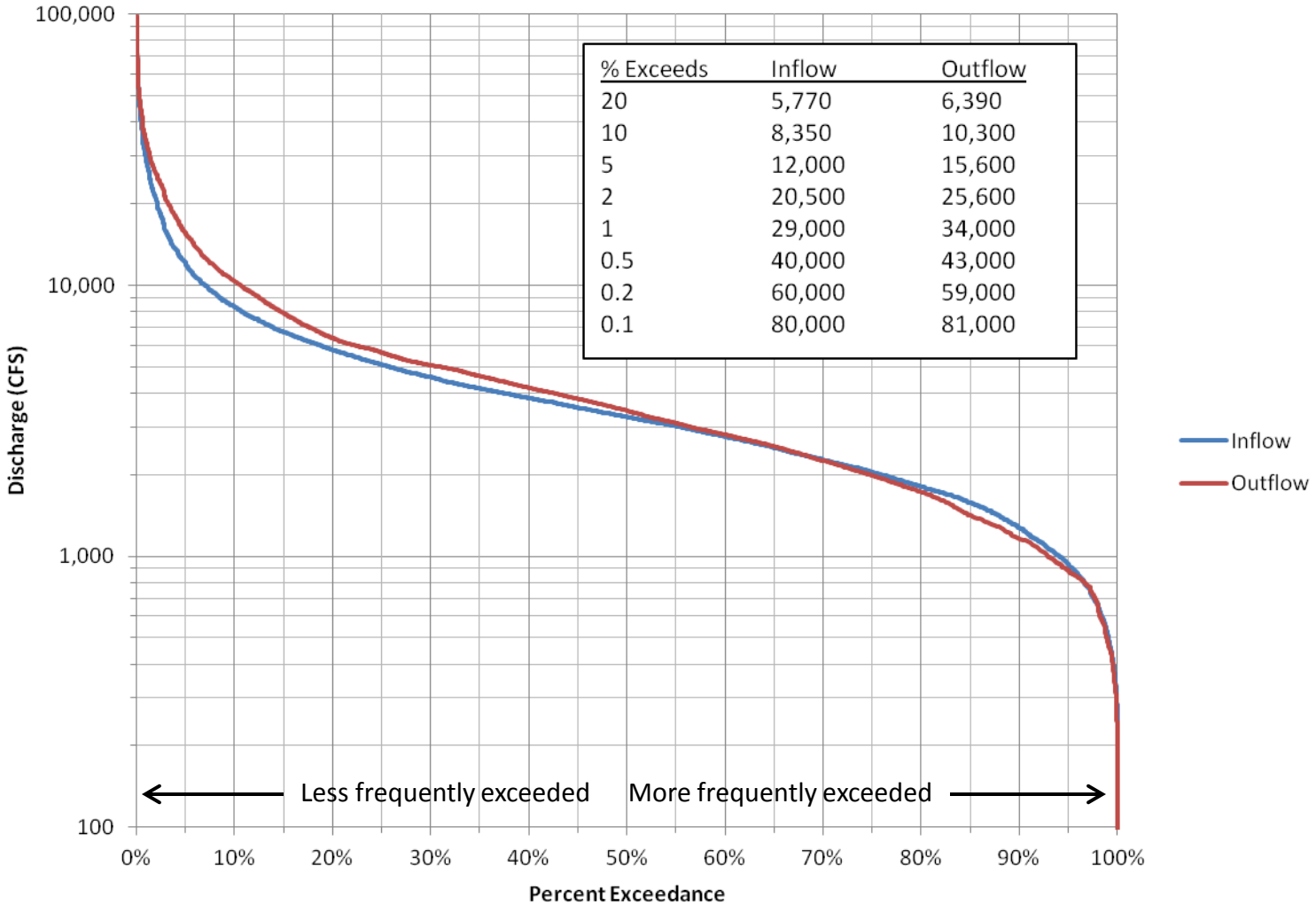
Broad River Flow Frequency

- Compare flow duration curves for inflow and outflow for Parr Project.
- Curve shows how often a given flow has been exceeded during the period of interest.
- Can show effect of regulation if project is increasing or decreasing the frequency of certain ranges of flow.
- Also shows effect of license conditions.

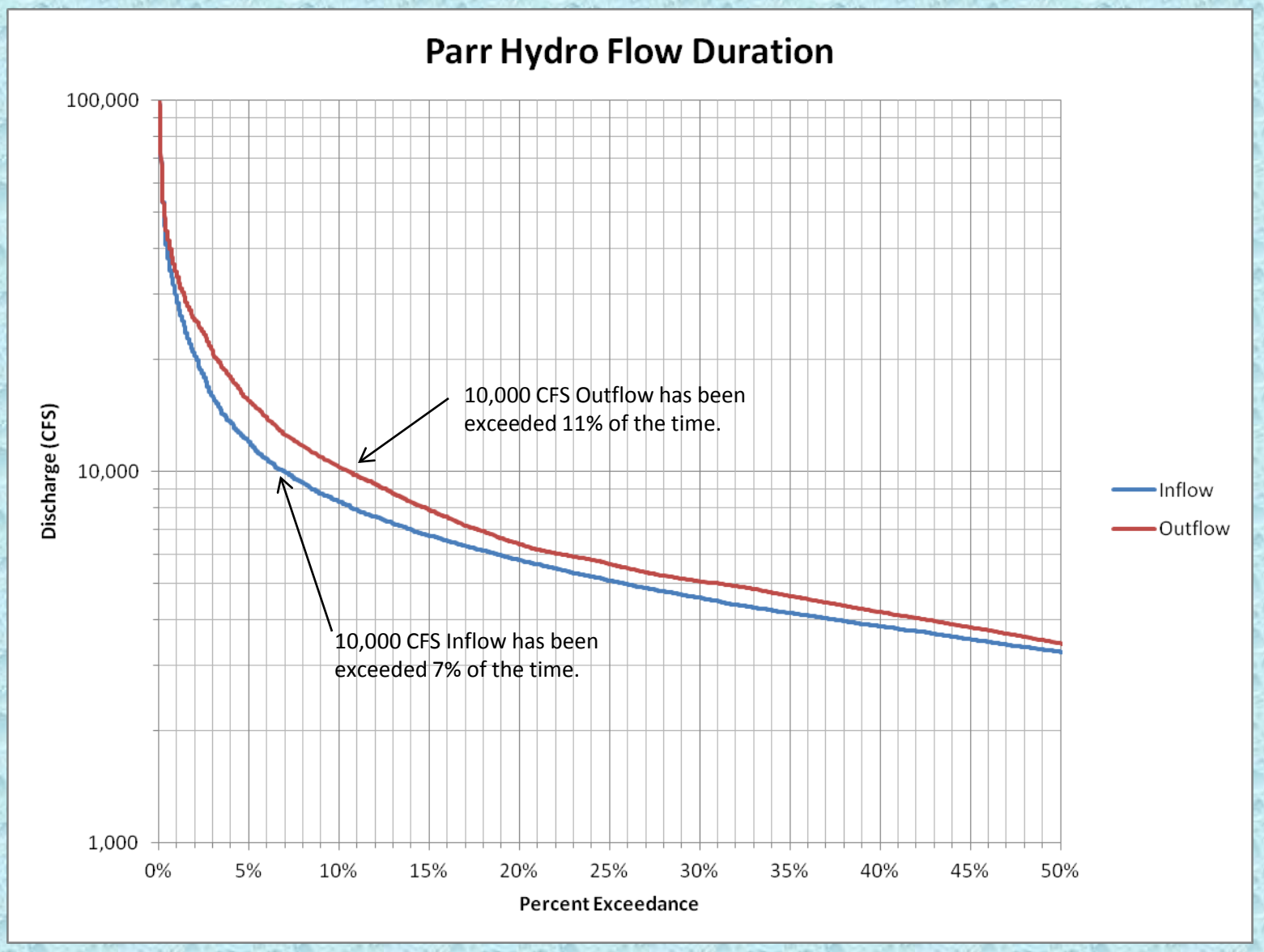
Broad River Flow Frequency

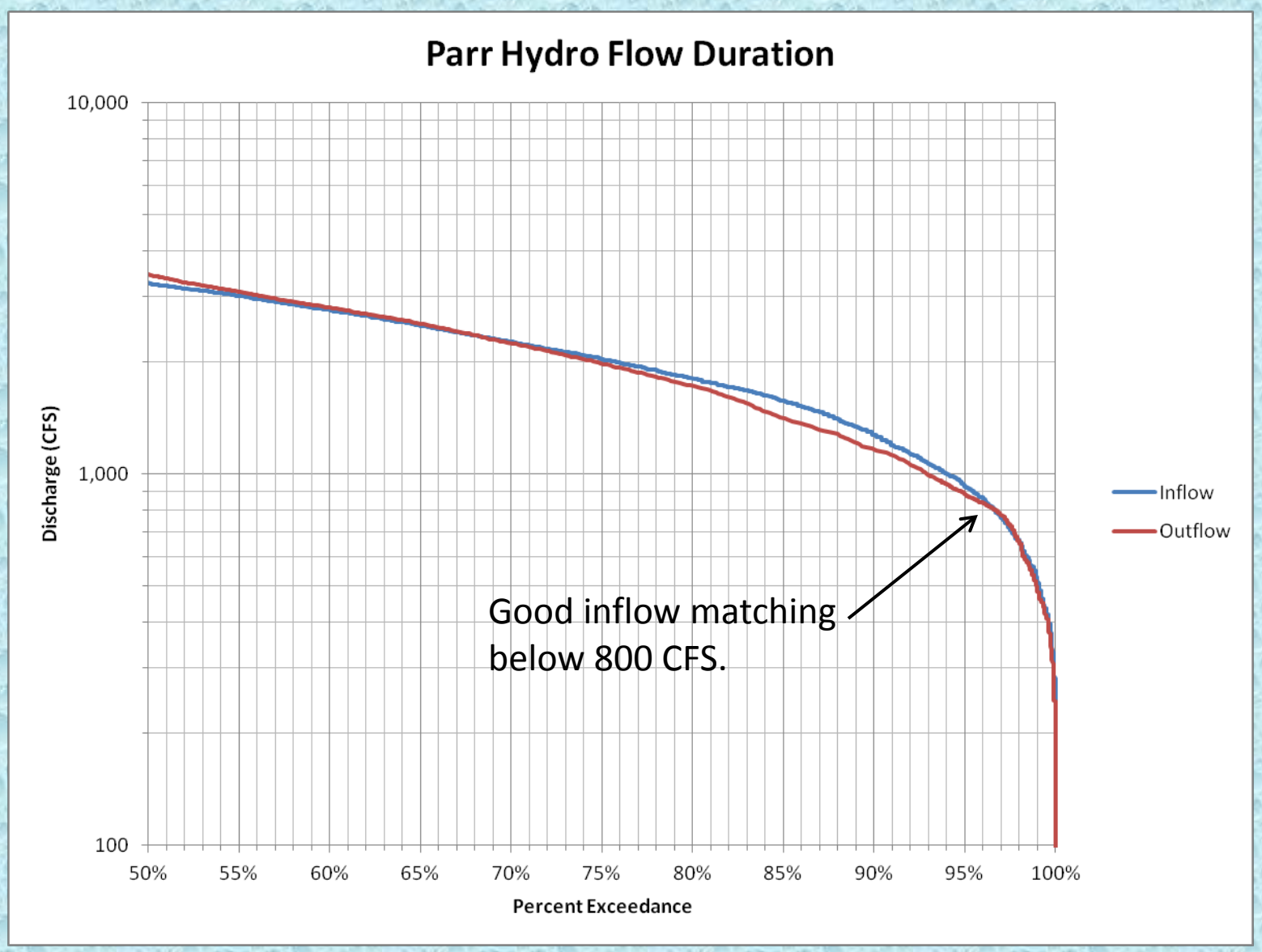
- Current operating constraints:
  - Must pass inflow (minus evaporation) for inflows < 800 CFS (1,000 CFS spring).
  - Plant hydraulic capacity is 6,000 CFS – above this flow some spill will occur.
  - When Fairfield is generating and gates are down, upper reservoir water will be spilled (adds to natural river flow at Alston).
  - Cannot exceed 40,000 CFS downstream with Fairfield operating.

Parr Hydro Flow Duration



% Exceeds	Inflow	Outflow
20	5,770	6,390
10	8,350	10,300
5	12,000	15,600
2	20,500	25,600
1	29,000	34,000
0.5	40,000	43,000
0.2	60,000	59,000
0.1	80,000	81,000


Parr Hydro Flow Duration
100,000
10,000
1,000
Discharge (CFS)
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
Percent Exceedance
10,000 CFS Outflow has been exceeded 11% of the time.
10,000 CFS Inflow has been exceeded 7% of the time.
Inflow
Outflow

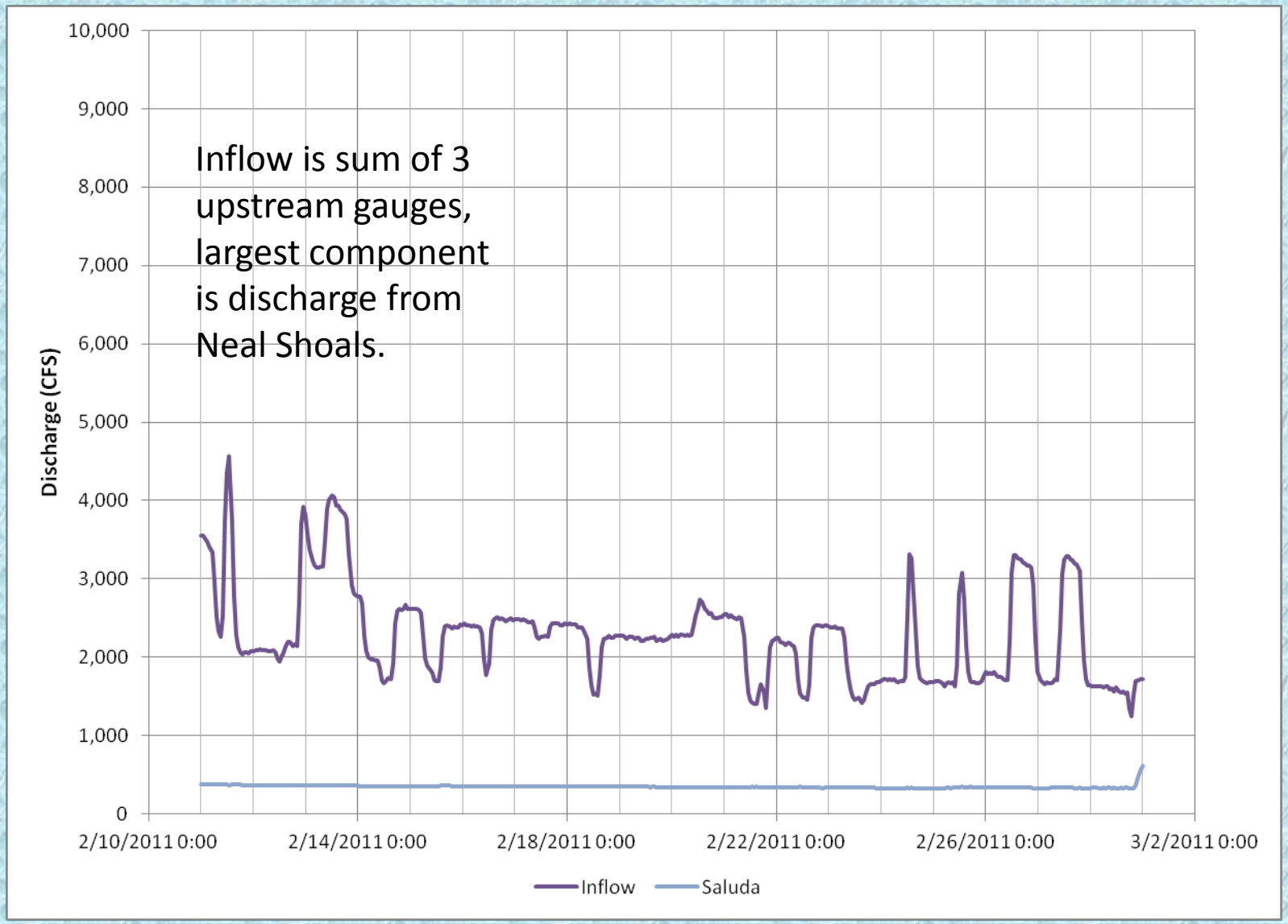

Parr Hydro Flow Duration
10,000
1,000
100
Discharge (CFS)
50%
55%
60%
65%
70%
75%
80%
85%
90%
95%
100%
Percent Exceedance
Inflow
Outflow
Good inflow matching
below 800 CFS.

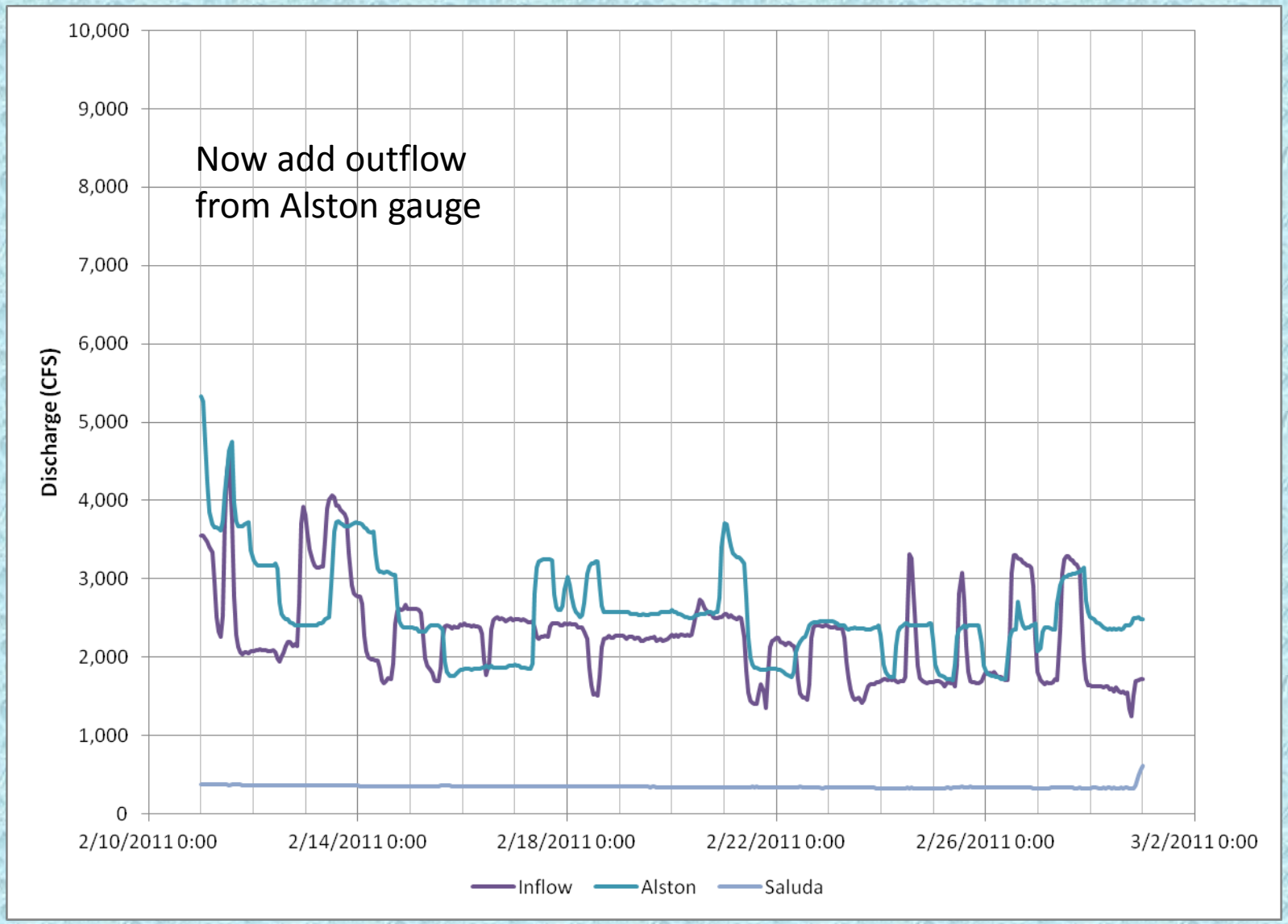
Broad River Flow Frequency

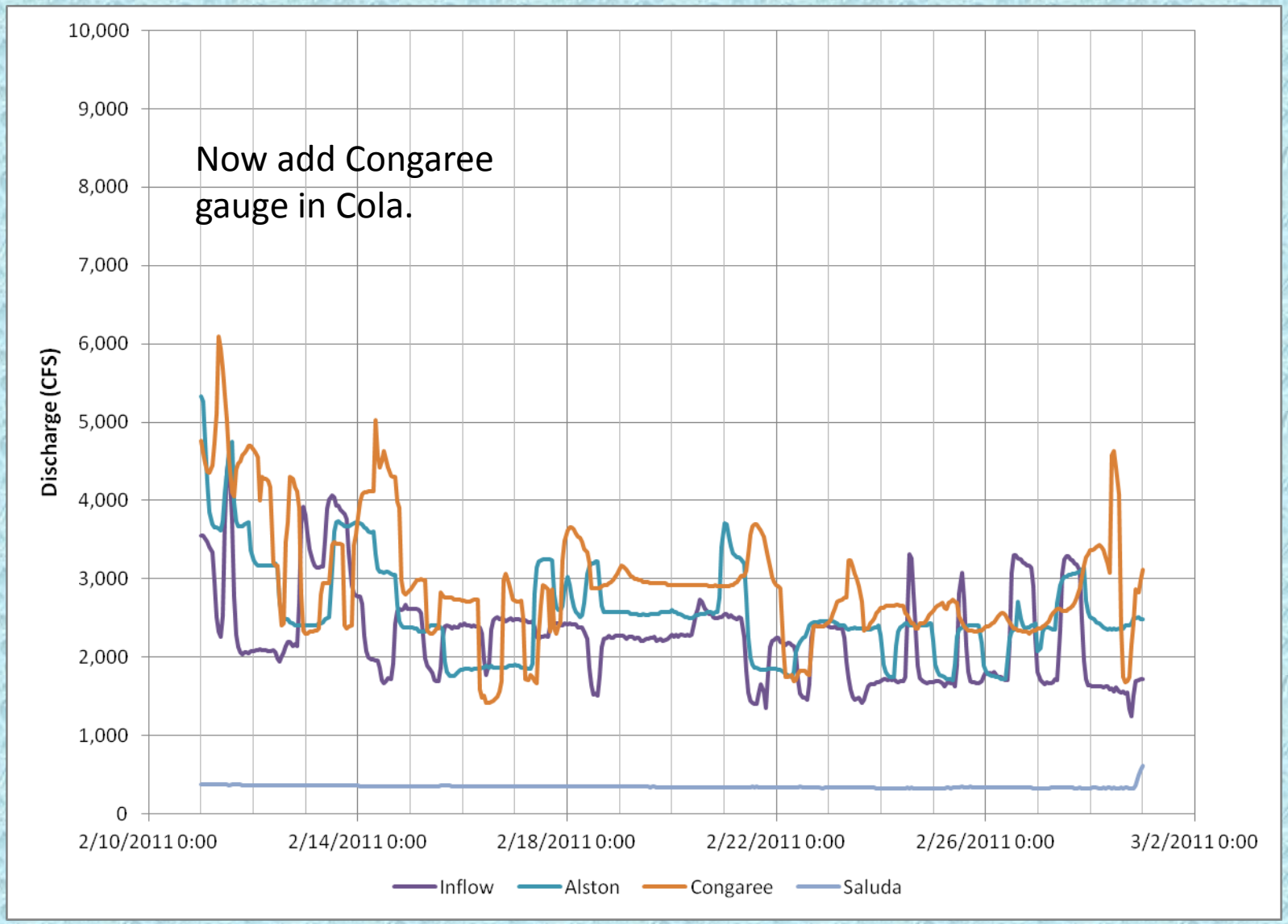
- Conclusions:
  - Good flow frequency matching on a daily basis below 800 CFS.
  - Between 800 and 1,500 CFS, daily outflow appears to be slightly less than daily inflow due to regulation.
  - Between 1,500 and 40,000 CFS, daily outflow appears to be greater than daily inflow.
  - Good flow frequency matching on a daily basis over 40,000 CFS.

Parr Operation Flow Effects During "Normal" Flow Periods

- Look at typical period with inflow < 6,000 CFS.
- Normal Parr Hydro operation with all gates up.
- Compare inflow hydrograph with Alston and Congaree gauges.
- No Saluda Hydro Operation during this period.

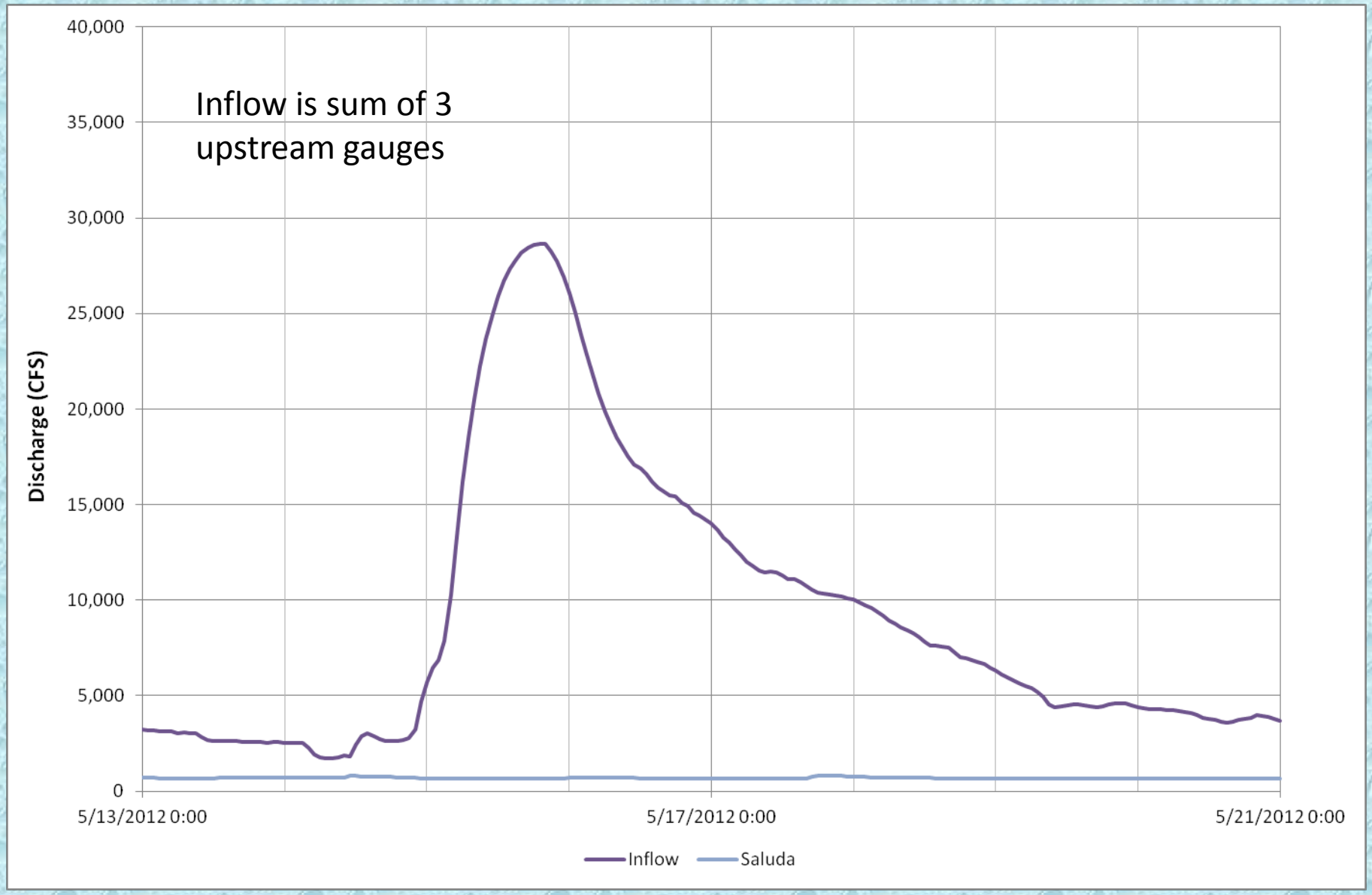

Inflow is sum of 3 upstream gauges, largest component is discharge from Neal Shoals.
Discharge (CFS)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/10/2011 0:00
2/14/2011 0:00
2/18/2011 0:00
2/22/2011 0:00
2/26/2011 0:00
3/2/2011 0:00
Inflow
Saluda

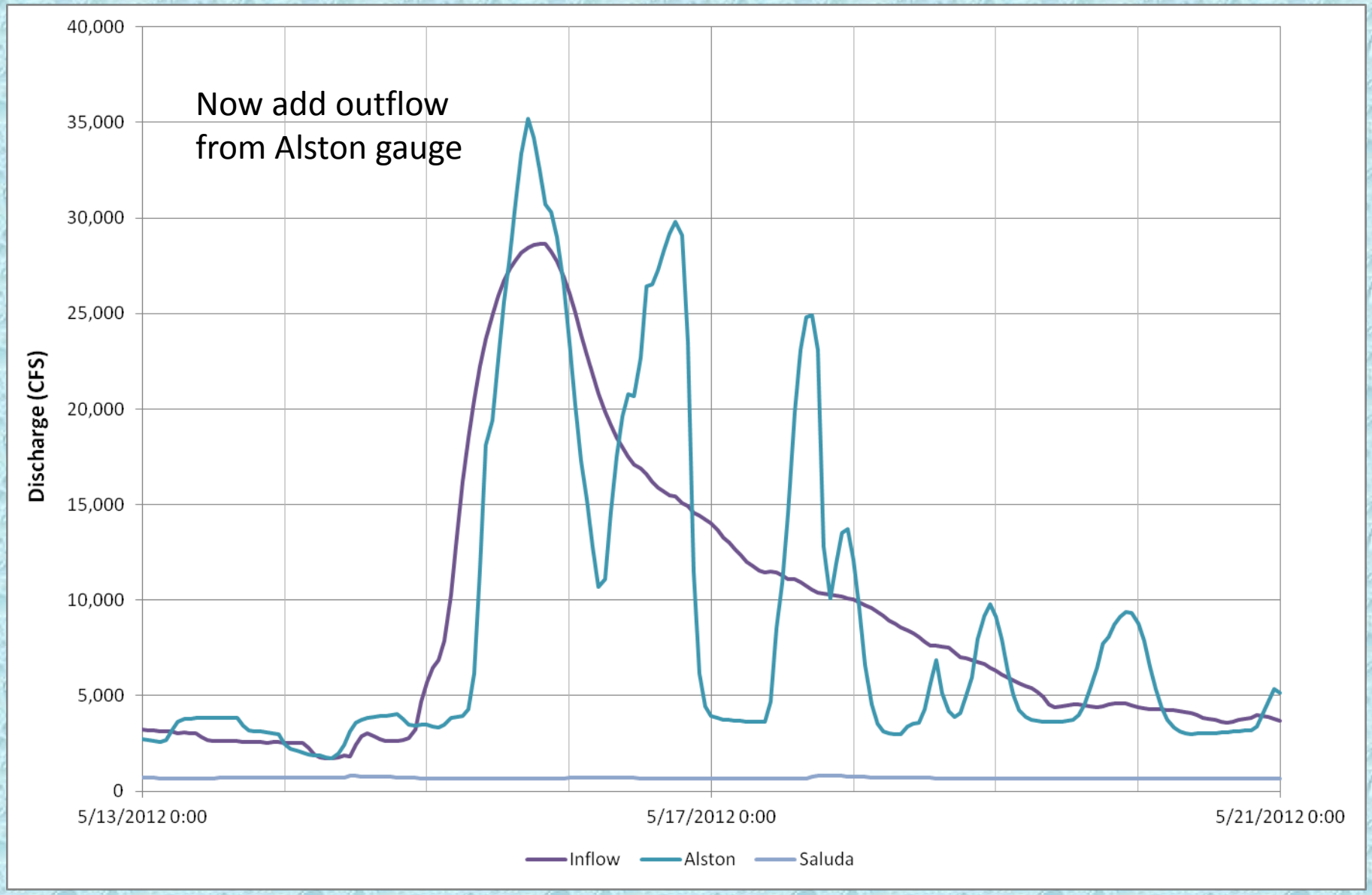

Now add outflow
from Alston gauge
Discharge (CFS)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/10/2011 0:00
2/14/2011 0:00
2/18/2011 0:00
2/22/2011 0:00
2/26/2011 0:00
3/2/2011 0:00
Inflow
Alston
Saluda

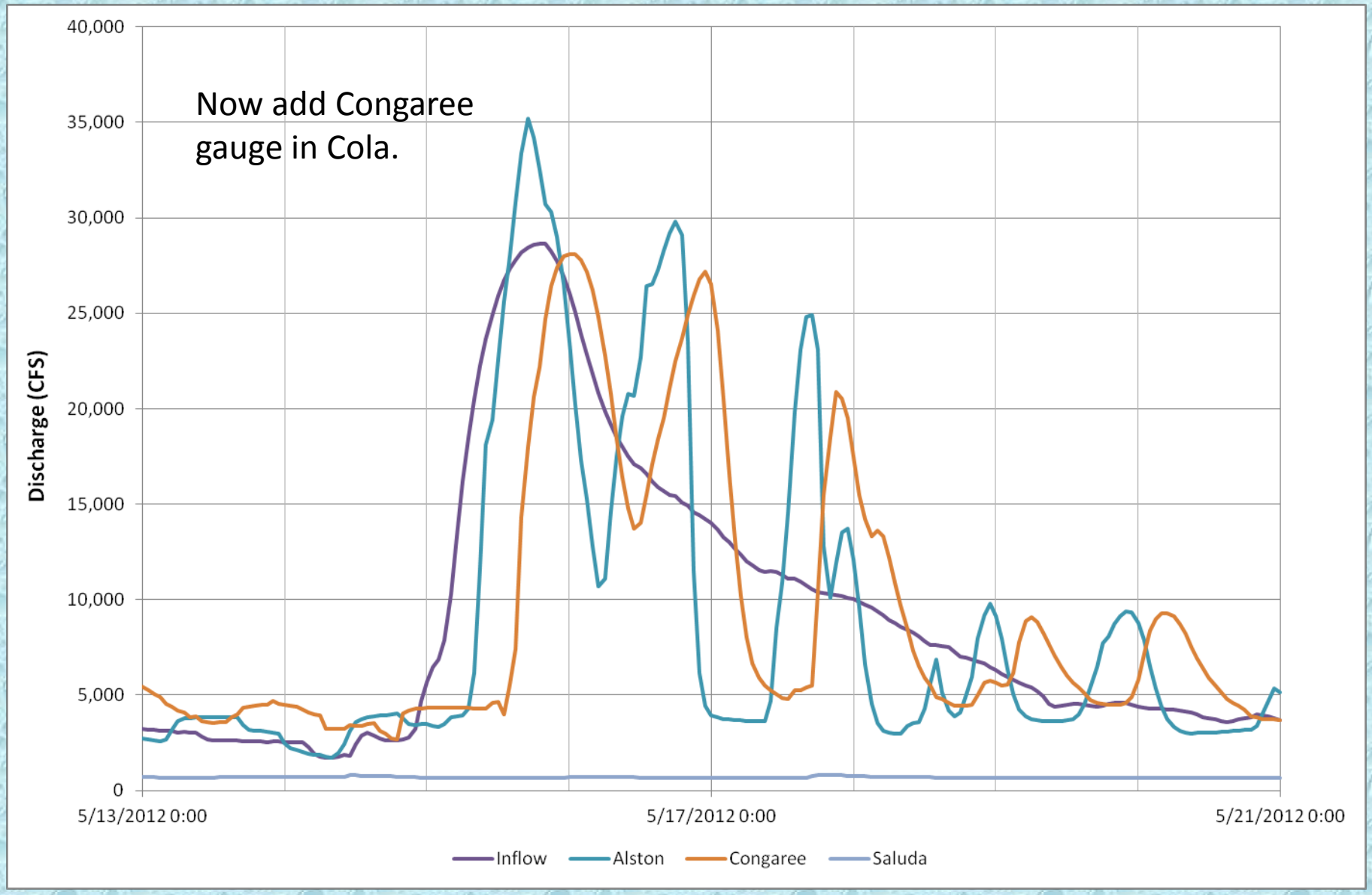

Now add Congaree gauge in Cola.
Discharge (CFS)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/10/2011 0:00
2/14/2011 0:00
2/18/2011 0:00
2/22/2011 0:00
2/26/2011 0:00
3/2/2011 0:00
Inflow
Alston
Congaree
Saluda

Downstream Effects of FFPS Operations During High Flows

- Look at a typical hydrograph from minor flood event – May 2012.
- Peak Inflow of 28,000 CFS
- Peak Outflow of 35,000 CFS
- Illustrates effect of FFPS operation when Parr gates are down.
- Discharge increased during generation and reduced during pumping.
- No Saluda Hydro operation during this event.


Inflow is sum of 3 upstream gauges
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Discharge (CFS)
5/13/2012 0:00
5/17/2012 0:00
5/21/2012 0:00
Inflow
Saluda


Now add outflow
from Alston gauge
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Discharge (CFS)
5/13/2012 0:00
5/17/2012 0:00
5/21/2012 0:00
Inflow
Alston
Saluda


Now add Congaree gauge in Cola.
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Discharge (CFS)
5/13/2012 0:00
5/17/2012 0:00
5/21/2012 0:00
Inflow
Alston
Congaree
Saluda

License Compliance Summary

Parr Hydro Minimum Flow Compliance Summary

Year	Lowest Hourly Project Discharge During Year @ Alston Gauge (CFS)	Number of Days Daily Average Discharge < (Inflow minus Evaporation)	Minimum Recorded Daily Inflow During Year (CFS)
2000	122	18	641
2001	122	17	564
2002	26	43	266
2003	301	1	2401
2004	301	0	1412
2005	437	0	1267
2006	106	8	906
2007	163	14	298
2008	170	2	153
2009	246	0	709
2010	340	0	486
2011	270	6	290
2012	444	0	860

Parr Reservoir Elevation Summary

Year	Minimum Recorded Reservoir Elevation (ft. NGVD)	Maximum Recorded Reservoir Elevation (ft. NGVD)
2000	255.9	266.2
2001	255.6	266.2
2002	255.9	266.4
2003	256.0	266.5
2004	255.9	266.5
2005	256.1	266.5
2006	254.9	266.1
2007	255.7	266.2
2008	256.0	266.6
2009	256.9	266.3
2010	256.1	266.3
2011	256.1	266.2
2012	256.5	266.4

Monticello Reservoir Elevation Summary

Year	Minimum Recorded Reservoir Elevation (ft. NGVD)	Maximum Recorded Reservoir Elevation (ft. NGVD)
2000	420.5	425.0
2001	420.5	425.0
2002	420.0	425.0
2003	420.5	425.0
2004	420.0	425.0
2005	420.5	425.0
2006	420.6	425.0
2007	420.5	425.0
2008	420.5	425.0
2009	420.6	425.0
2010	420.0	425.0
2011	420.5	425.0
2012	420.6	425.0

Questions?

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Instream Flows TWC Meeting

July 31, 2013

Final KDM 08-20-13

ATTENDEES:

Bill Marshall (SCDNR)
Ron Ahle (SCDNR)
Gerrit Jobsis (American Rivers)
Shane Boring (Kleinschmidt)
Alan Stuart (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Vivianne Vejdani (SCDNR)
Frank Henning (Congaree National Park)
Chad Altman (SCDHEC)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA) via conf. call
Steve Summer (SCANA)
Brandon Kulik (Kleinschmidt) via conf. call
Dick Christie (SCDNR)
Tom McCoy (USFWS)
Byron Hamstead (USFWS)
Rusty Wenerick (SCDHEC)
Fritz Rohde (NOAA)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

After introductions, Alan opens the meeting by reviewing the agenda. He then turns the meeting over to Brandon and Shane to give an overview of the IFIM recon trip that was held June 18th and 19th. Brandon reviews the notes from the trip, which were provided to the group via email on July 10th, giving a description of each of the ten study sites. Study site 7 was noted by Ron to be a very unique stretch of the river and a very important study area. He said this area has a defined drop with an obvious glide that is highly utilized by fish. Ron says this area of the river is unique because of the size of the drop, but it is also quite representative of the river overall, due to the types of habitats it provides. The group agreed that Site 7 should be evaluated using the DNR's navigation criteria and that other sites should also be considered.

Brandon and Ron then discussed the pool that was located at study site 7 and whether this area was going to be included in the study. Brandon says while pools don't really influence flow decision-making, this area should be documented. Frank H asked if the pool areas need to be studied from a sediment standpoint, to determine if there is enough flow to flush sediment out of the pool, and prevent sediment trapping. Ron and Shane both agree that this shouldn't be an issue, as there is plenty of flow to keep the sediment moving. Ron says the pools will be mapped during the mesohabitat study, and agrees with Brandon that transects aren't needed here.

Brandon then describes how a 2D model works, which is a possible option for study site 9. 2D modeling uses a honeycomb type of data gathering, which fit together to form a picture. This gives a different view of a site versus a straight transect. The group decided that a 2D model should be used at study site 10, at Bookman Island. Gerrit asks how the analysis for the 2D modeling will be

conducted, with the flows being at the selected levels. Brandon says that field data will be collected at Bookman and then used to see what flow range makes the most sense for modeling. Alan asks if the entire Bookman Island complex will be used for modeling at Huffman Island, or will just a piece of the complex be used. Brandon says the entire Bookman Island complex will be used. He adds that the two island complexes will not be mathematically linked, but instead an empirical examination will be used to determine similarities between the two (i.e., a field verification, similar to what was done for the Saluda Project) of flow recommendations, to ensure that recommendations developed are based on work at Bookman are applicable to Huffman Island.

Gerrit mentions the importance of determining how the channels at Bookman are linked, and how some of the smaller channels may be isolated during periods of lower flow. Brandon assures Gerrit that the 2D modeling will include the small cross-channels around the islands, so that these areas may be studied as well. Gerrit says he wants to make sure the study plan captures not only the analysis using HSI curves, but also how various flows affect these small channels. He would like to have a site visit to examine Huffman and Bookman Islands during several different flows to ground truth 2D modeling results.

With this, Alan notes that there seems to be concurrence within the group on the study approach, and asks Brandon if he has enough information to develop a study plan. Brandon says he does and will begin developing a study plan to bring back to the group for review.

The group then begins discussing the HSI curves that Brandon sent to the group to review. Brandon proposes that we use the Hightower curves for the American shad. Alan mentions that these curves are the ones sent to the group by Prescott Brownell a month earlier.

Ron then questions some of the guild classifications for the various fish species. He disagrees with some of the guild assignments and Alan and Dick suggest we work through the information until everyone can agree. The group discusses the difference between shallow versus deep and fast versus slow. The group also discusses the addition of other species at various life stages to the list. Ron suggests listing all life stages for the smallmouth bass in the study plan. Ron disagrees with the curve that corresponds to the smallmouth bass spawning, saying that spawning tends to decrease in waters deeper than approximately 4.5 feet. Brandon agrees, recommending the curve be changed to a stair step, with spawning increasing after reaching a depth of approximately 0.5 feet. Shane agrees to do some research on smallmouth bass spawning and work with Brandon to develop a modified curve for this species for discussion within the TWC.

The group discussed brassy jumprock curves and the need to change the guild for adults to Deep Fast and the guild for juveniles to Shallow Fast.

Gerrit recommends that striped bass spawning lifestage be included in the study. Ron agrees. The group discussed applicable curves from the Pee Dee IFIM study and Crance. Gerrit recommended that we bring in DNR striped bass expert Dr. Jim Bulak to help determine/develop appropriate curves.

The group discussed the importance of adding snail bullhead juvenile lifestage to the study and the need to review bullhead and catfish lifestage curves.

Gerrit and Ron ask for clarification regarding the channel index scale. Brandon explains the scale where 0 corresponds to detritus, 1 to fines, 2 to small gravel, 3 to large gravel, 4 to small cobble, 5 to large cobble, 6 to small boulder, 7 to large boulder, 8 to smooth bedrock, and 9 to irregular bedrock. Shane adds that a table from Wentworth will be included in the study plan that describes these substrates. Gerrit observes that the curves use different channel indices and recommends that all curves use the same channel index.

The group then focuses on modifying the guilds and habitat suitability criteria that Brandon provided. These modifications are included at the end of these notes. Gerrit mentions that the original studies should be referenced in the study plan and not just the broader study in which they were last used, such as the Pee Dee River IFIM.

The group discusses the range of operational flows that modeled as part of the IFIM study, as well as what calibration flows would be needed to model that range. Alan mentions that a range of 250 cfs to 2100 cfs was modeled during the IFIM study for the Saluda Relicensing Project. Brandon suggests putting some level loggers out in the river ahead of the study. Gerrit suggests that a dual flow analysis should be evaluated, to determine Project effects. The group decides on the following calibration flows to allow for modeling of the full range of operational flows: low flow of 400 cfs, with a medium flow of 2000 cfs and a high flow of 10,000 cfs.

After lunch, the group discusses the mesohabitat definitions that Shane provided. Tom says he likes the measurements that are included in the Bettinger definitions and the extra details that are included in the Catawba Wateree definitions. He would like to combine these two with the Saluda definitions. Ron says he doesn't want hard lines to be set for each definition with regards to depth as depths change depending on river flow. He would like to see the depths to be used as guides, but not exact measurements. Brandon suggests adding general depths and flows to the definitions for each habitat. Brandon points out that many of these habitats have already been identified on the river by the group during the IFIM recon trip. The group just needs to agree on the wording for each definition. The group discusses the differences between a glide versus a run, deciding that the slope upstream or downstream is a determining factor. The group works to modify the Saluda definitions and these modifications are included at the end of these notes.

SCE&G and Kleinschmidt personnel will begin to develop the study plans for the IFIM study and Mesohabitat Assessment and will have a draft ready for TWC review and approval by the beginning of October. The group plans to meet or have a conference call before the mesohabitat assessment is started. Any action items stemming from this meeting are included below.

ACTION ITEMS:

- Shane will research the smallmouth bass spawning and will work with Brandon develop a new HSI curve for review within the TWC.
- Shane will refine the mesohabitat definitions and distribute to the group for approval.

DRAFT MEMORANDUM

TO: Parr-Fairfield Hydro: Instream Flow/Aquatic Habitat TWC

FROM: Brandon Kulik

DATE: July 9, 2013

RE: **PROPOSED HABITAT SUITABILITY CRITERIA**

On May 7, 2013, the Instream Flow/Aquatic Habitat Technical Working Committee (TWC) agreed upon species and lifestages for which habitat suitability should be evaluated on the Broad River below the Parr-Fairfield Project as a part of AN IFIM study (Table 1)..

Table 1: Evaluation species elected by the TWC

- Smallmouth Bass
- American Shad
- Brassy Jumprock
- Whitefin Shiner
- Robust Redhorse
- Santee Chub
- Striped Bass
- Piedmont Darter
- Snail Bullhead
- Redbreast Sunfish
- Channel Catfish

The purpose of this memo is to recommend potential Habitat Suitability Criteria (HSC) for use in this study that are applicable to the above species. Smallmouth bass and redbreast sunfish criteria were sourced from the Saluda study, as the TWC has already vetted these curves. Although the Saluda study had employed TWC-approved American shad HSC, these criteria have recently been refined, based on the research of Joe Hightower in North Carolina (Hightower, *et. al*, 2012) and provided to us by NOAA Fisheries. We propose that the TWC consider using these updated criteria.

The remaining species do not have well developed, individual HSC. However, the Pee Dee IFIM study addressed habitat suitability for these species by classifying each of them into applicable guilds. This information was provided to the Saluda IFIM TWC during study scoping (Gerrit Jobsis, October 16, 2006). Based this information (Table 2), we classified the remaining Parr-Fairfield evaluation species and lifestages into proposed guild categories (Table 3)

Attachment A displays the coordinates for the resulting HSC proposed for use, based on the source material identified in Table 3.

Table 2. Guild classification for individual species and lifestages, from Pee Dee River IFIM study (2004)

Species and Habitat Guild Assignment Table for the Pee Dee River Instream Flow Study. Revision 2 - July 9, 2004.

Scientific Name	Common Name	Habitat Types and Guilds[1, 2, 3]			
		Shallow Slow	Shallow Fast	Deep Slow	Deep Fast
Petromyzontidae	**Lampreys**				
Petromyzon marinus	sea lamprey		A		
Acipenseridae	**Sturgeons**				
Acipenser oxyrinchus	Atlantic sturgeon				S
Acipenser brevirostrum	shortnose sturgeon				S
Lepisostedidae	**Gars**				
Lepisosteus osseus	longnose gar	A, J		A, J, S	
Amidae	**Bowfin**				
Amia calva	bowfin			A, S	
Anguillidae	**Freshwater eels**				
Anguilla rotstrata	American eel	J		A, J	J
Clupeidae	**Herrings**				
Dorosoma cepidanum	gizzard shad	A, J		A, J, S	
Dorosoma petenense	threadfin shad	A, J		A, J, S	
Alosa mediocris	hickory shad			J, S	
Alosa sapidissima	American shad			J	J, S
Alosa aestivalis	blueback herring			J, S	
Cyprinidae	**Carps and Minnows**				
Cyprinus carpio	common carp	J, S		A, J, S	
Notemigonus crysoleucas	golden shiner	A, J, S		A, J, S	
Hybognathus regius	Eastern silvery minnow	J, S		A, J, S	
Nocomis leptocephalus	bluehead chub		A, S		
Cyprinella analostana	satinfin shiner	A, J, S		A, J, S	
Cyprinella nivea	whitefin shiner	A, J	S	A	
Cyprinella pyrrhomelas	fieryblack shiner	A, J	S	A	
Notropis altipinnis	highfin shiner	J, S		A	
Notropis amoenus	comely shiner	A, J	S	A, J	
Notropis hudsonius	spottail shiner	A, J	S	A, J	
Notropis petersoni	coastal shiner	A, J	S	A	
Notropis scepticus	sandbar shiner	A, J	S	A	
Catostomidae	**Suckers**				
Catostomus commersoni	white sucker	J	S	A, J	A
Minytrema melanops	spotted sucker	J	S	A	
Scartomyzon spp.	brassy jumprock	J	S	A	A
Moxostoma macrolepidotum	shorthead redhorse	J	S	A	A[4]
Moxostoma anisurum	silver redhorse	J	S	A, J	
Moxostoma robustum	robust redhorse		S	A, J	
Moxostoma sp.	Carolina redhorse		S	A, J	
Carpiodes cyprinus	quillback		S	A	S
Erimyzon oblongus	creek chubsucker	S?		A, J, S?	
Carpiodes velifer	highfin carpsucker		S	A	S
Ictiobus bubalus	smallmouth buffalo	J	A	A, S	A
Ictiobus cyprinellus	bigmouth buffalo			A	

Table 2.
Continued

Scientific Name	Common Name	Habitat Types and Guilds[1,2,3]			
		Shallow Slow	Shallow Fast	Deep Slow	Deep Fast
Ictaluridae	**Bullhead catfishes**				
Ictalurus punctatus	channel catfish			A, J	J
Ictalurus furcatus	blue catfish			A, S	A
Ameiurus catus	white catfish			A	A, J
Ameiurus brunneus	snail bullhead			A	
Ameiurus nebulosus	brown bullhead			A	
Ameiurus platycephalus	flat bullhead			A	
Pylodictus olivaris	flathead catfish	J		A, J, S	
Esocidae	**Pikes**				
Esox americanus americanu	redfin pickerel			A, J, S	
Esox niger	chain pickerel			A, J, S	
Umbridae	**Mudminnows**				
Umbra pygmaea	Eastern mudminnow			A, J, S	
Poeciliidae	**Livebearers**				
Gambusia holbrooki	Eastern mosquitofish			A, J, S	
Aphredoderidae	**Pirate perches**				
Aphredoderus sayanus	pirate perch			A	
Atherinidae	**Silversides**				
Labidesthes sicculus	brook silverside			A	
Percichthyidae	**Temperate basses**				
Morone americana	white perch	J	S	A, J	S
Morone chrysops	white bass	J	S	A, J	S
Morone saxatilis	striped bass				A, S
Centrarchidae	**Sunfishes**				
Lepomis auritus	redbreast sunfish	J, S		A, J, S	
Lepomis cyanellus	green sunfish			A, J, S	
Lepomis gibbosus	pumpkinseed	J, S		A, J, S	
Lepomis macrochirus	bluegill	J, S		A, J, S	
Lepomis microlophus	redear sunfish			A, J, S	
Lepomis punctatus	spotted sunfish			A, J, S	
Micropterus salmoides	largemouth bass	J, S		A, J, S	
Pomoxis nigromaculatus	black crappie			A, J, S	
Percidae	**Perches**				
Etheostoma olmstedi	tessellated darter	A, J	S	A	
Percina crassus	Piedmont darter		A, S		
Perca flavescens	yellow perch			A, J, S	

[1]Habitat types based on predominant habitat types present in the Pee Dee River derived from the aerial videography study.

[2]Life stages: A = adult, J = juvenile, including young-of-year, and S = spawning.

[3]Classification of species and life stages into habitat types based on Becker (1983), Hamilton and Nelson (1984), Aadland et al. (1991), Jenkins and Burkhead (1994), Rhode et al. (1994), Leonard and Dilts (2003), and Progress Energy (2003).

[4]Foraging adults based on Jenkins and Berkhead (1994).

Table 3. Proposed HSC source data for Parr-Fairfield IFIM study

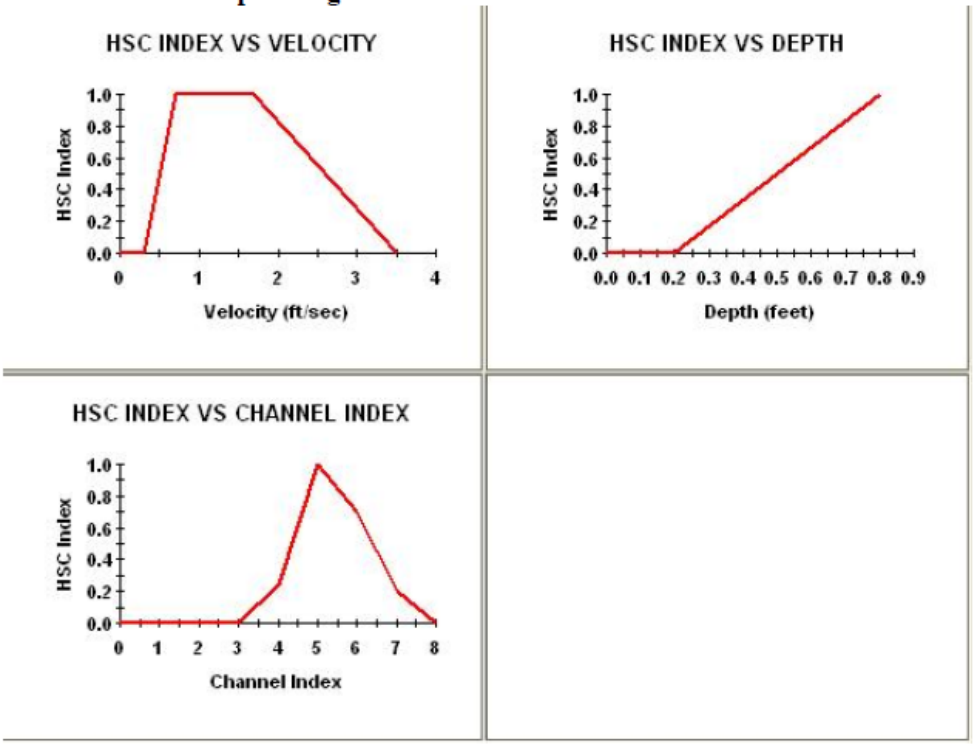
species criteria	lifestage	source	guild
Smallmouth Bass	All (spawning, fry, juvenile &adult)	Saluda	N/A
American Shad	spawning	Hightower, *et al.*, 2012	N/A
Brassy Jumprock	adult	Pee Dee River IFIM	deep ~~slow~~fast
Brassy Jumprock	juvenile	Pee Dee River IFIM	shallow ~~slow~~fast
Brassy Jumprock	spawning	Pee Dee River IFIM	shallow fast
Whitefin Shiner	adult	Pee Dee River IFIM	shallow slow; deep slow
Whitefin Shiner	juvenile	Pee Dee River IFIM	shallow slow
Whitefin Shiner	spawning	Pee Dee River IFIM	shallow fast
Robust Redhorse	adult	Pee Dee River IFIM	~~deep slow~~Stand alone species (Bud Freeman HSI)
Robust Redhorse	juvenile	Pee Dee River IFIM	Stand alone species ~~deep slow~~
Robust Redhorse	spawning	Pee Dee River IFIM	Stand alone species ~~shallow fast~~
Santee Chub	adult	Pee Dee River IFIM	shallow fast
Striped Bass	Adult	Pee Dee River IFIM	Deep slow, deep fast
Striped Bass	Spawning		N/A (Crance, Bulak)
Piedmont Darter	adult	Pee Dee River IFIM	shallow fast
Piedmont Darter	spawning	Pee Dee River IFIM	shallow fast
Snail Bullhead	Adult	Pee Dee River IFIM	deep slow
Snail Bullhead	Juvenile		shallow fast
Redbreast Sunfish	Adult	Saluda	N/A or deep slow?
Redbreast Sunfish	Spawning		Shallow slow?
Channel Catfish	adult	Pee Dee River IFIM	deep slow
Channel Catfish	juvenile	Pee Dee River IFIM	deep slow; deep fast

LITERATURE CITED

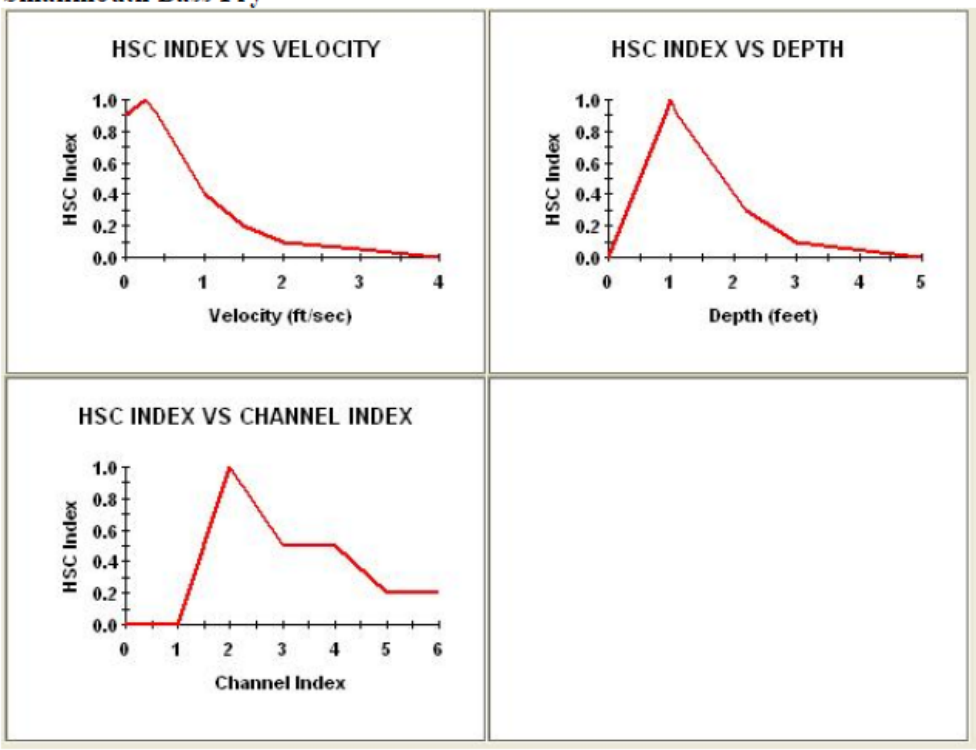
Hightower JE, Harris JE, Raabe JK, Brownell P, Drew CA. 2012. A Bayesian spawning habitat suitability model for American shad in southeastern United States rivers. Journal of Fish and Wildlife Management 3(2):184–198; e1944-687X. doi: 10.3996/082011-JFWM-047

Attachment A
Habitat Suitability Criteria

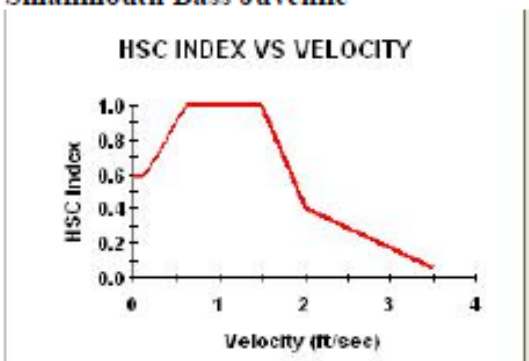
Smallmouth Bass Spawning

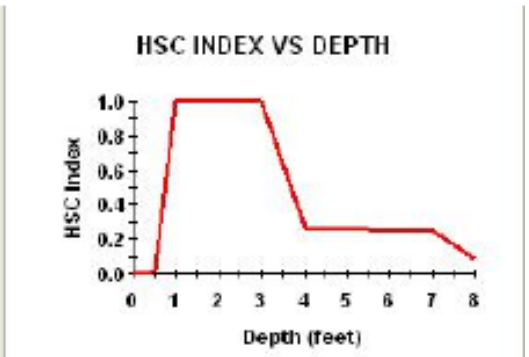


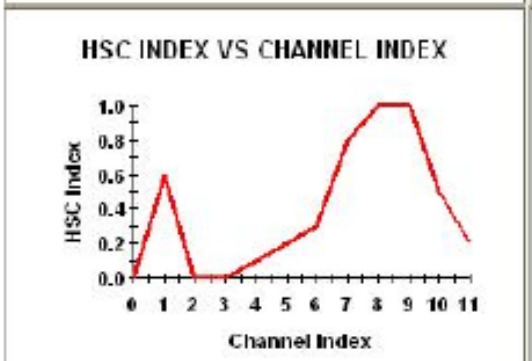
Smallmouth Bass Fry



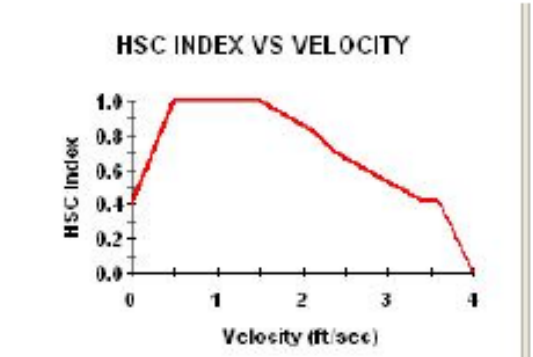
Smallmouth Bass Juvenile

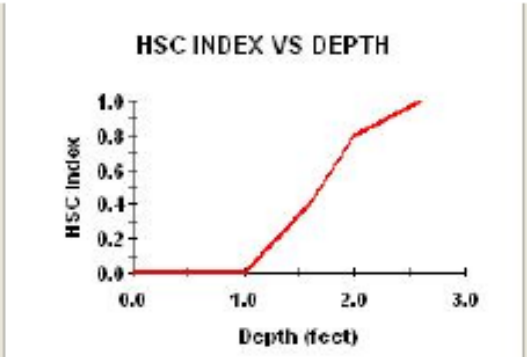


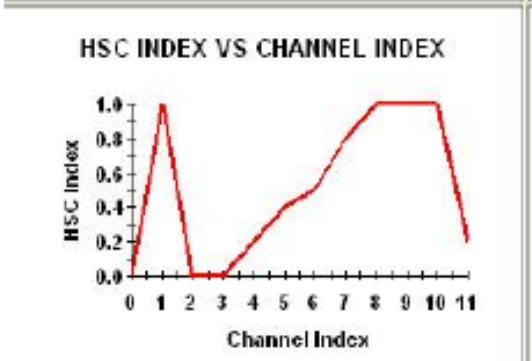




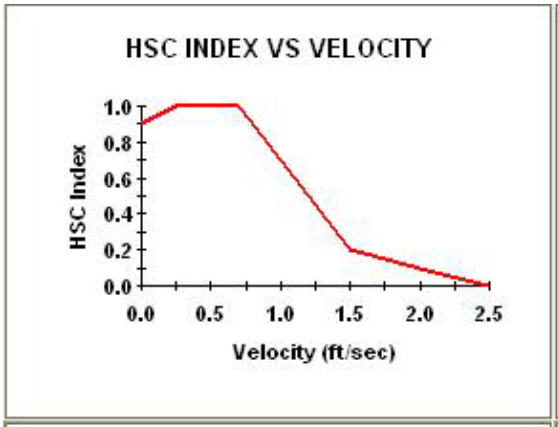
Smallmouth Bass Adult

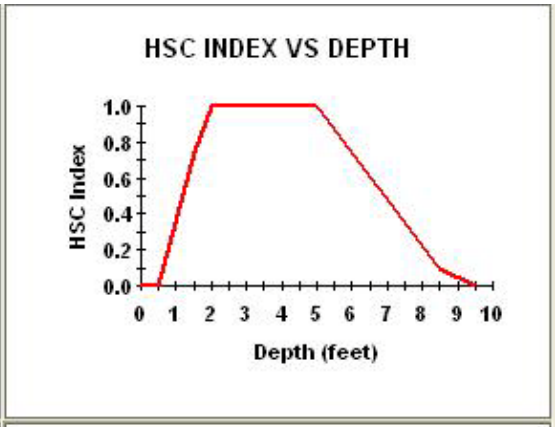


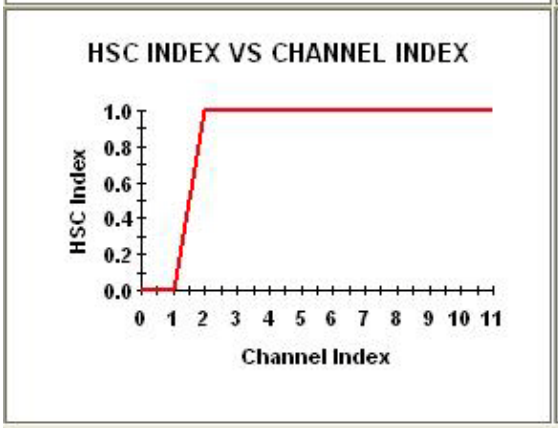




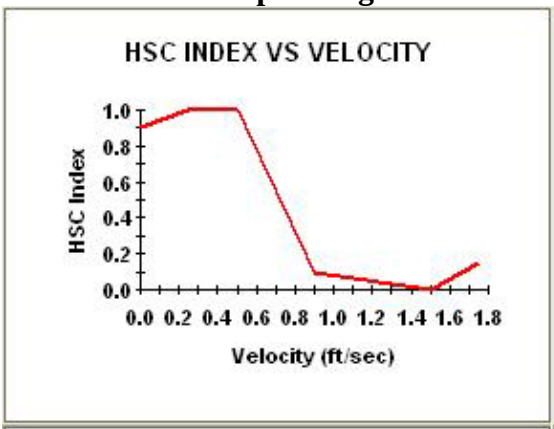
redbreast sunfish adult

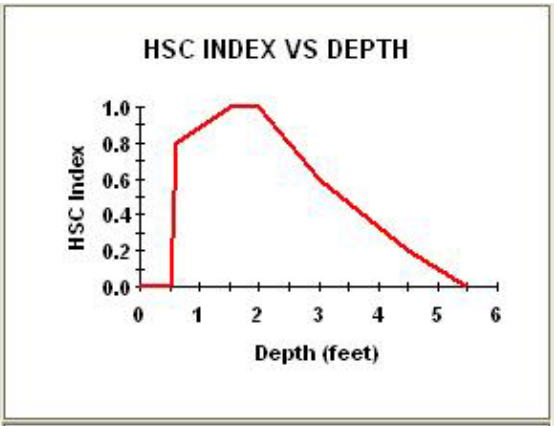


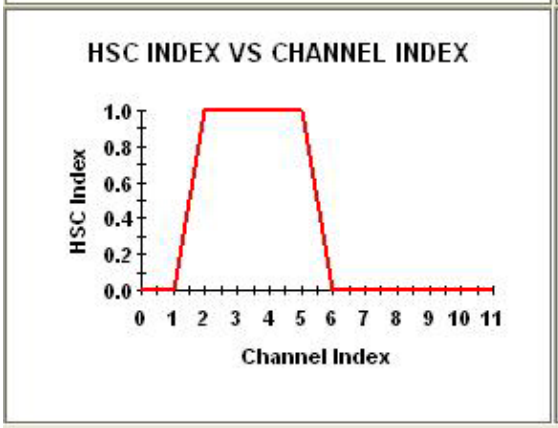




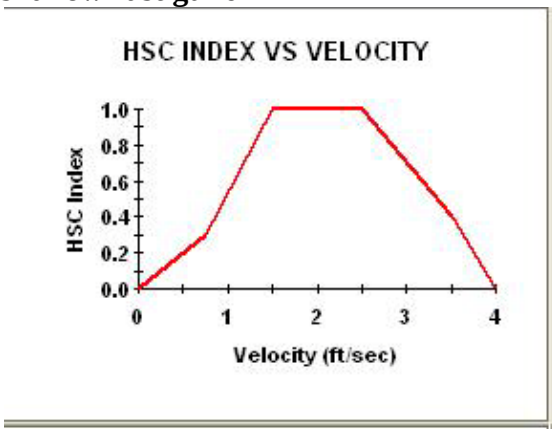
redbreast sunfish spawning

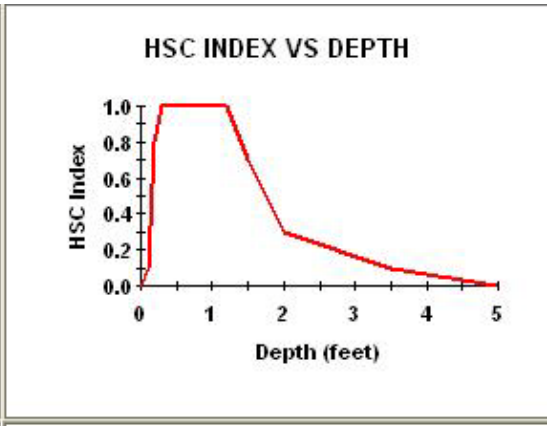


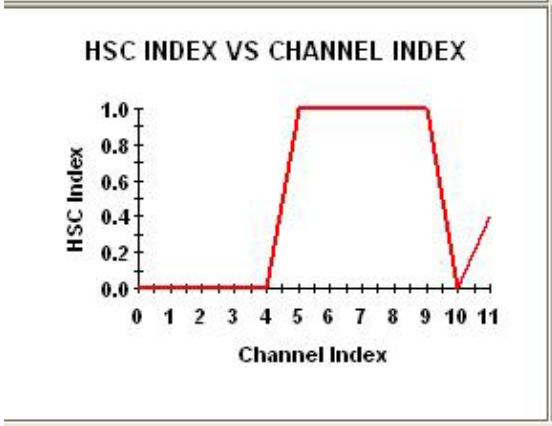




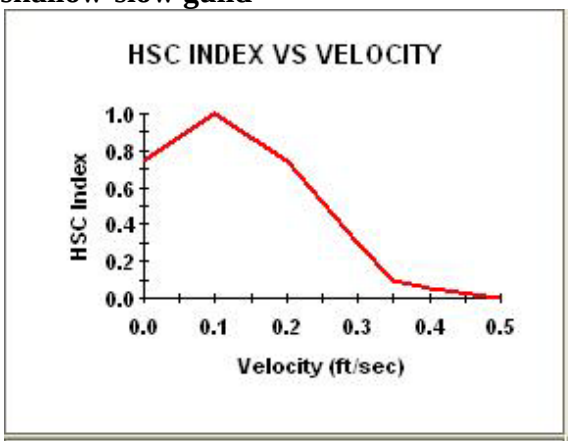
shallow-fast guild

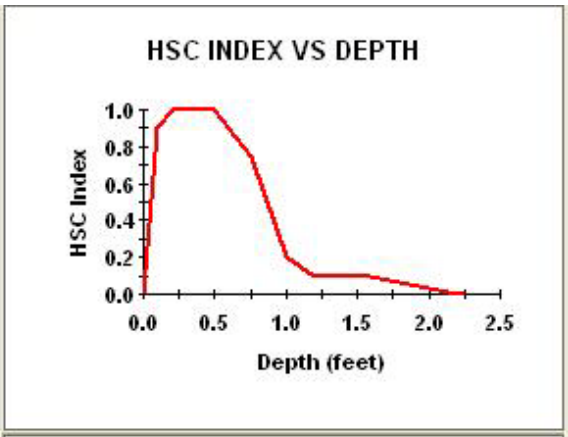


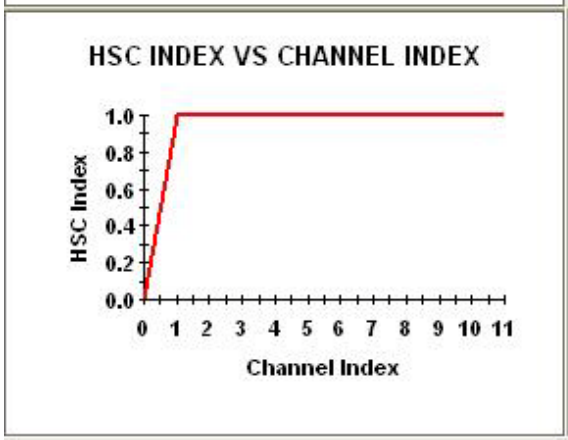




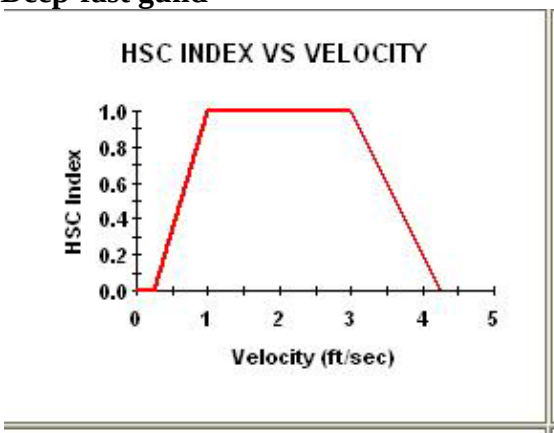
shallow-slow guild

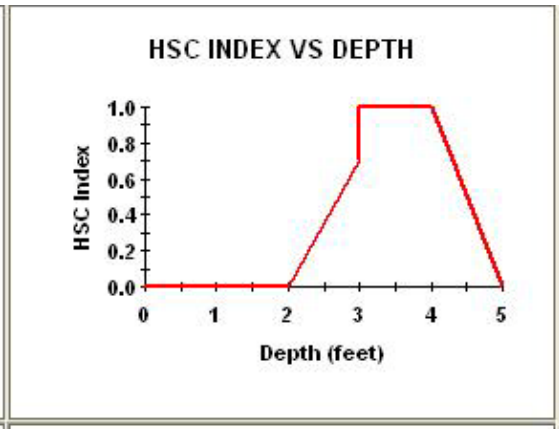


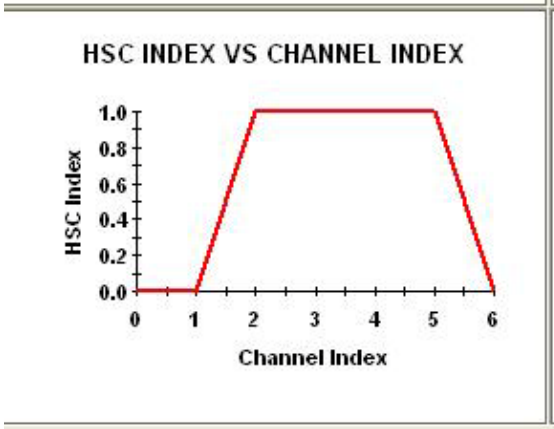




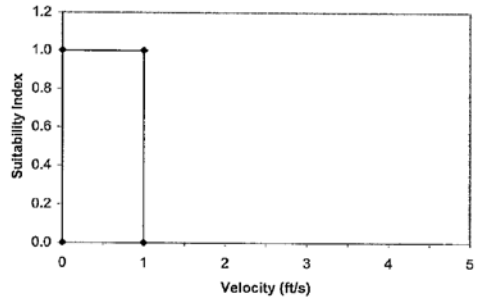
Deep-fast guild



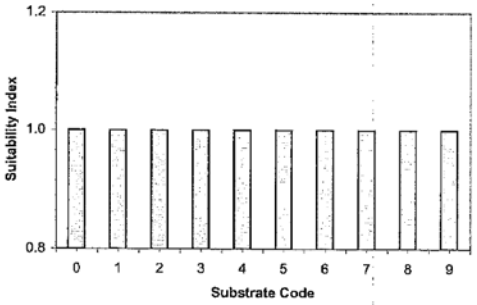




Deep Slow Guild, No Cover
Generic guild habitat suitability

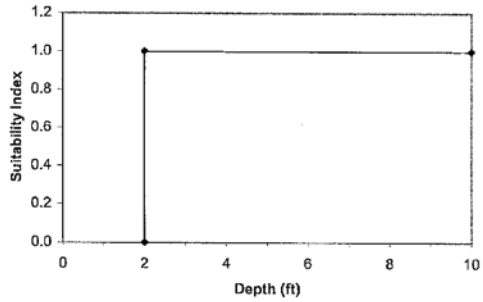


(Provided by P. Leonard in 10/11/03 memo)

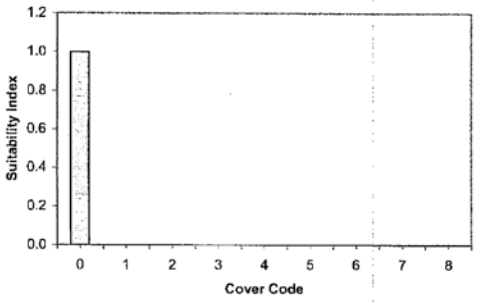


Substrate Codes	
0	Detritus
1	Fines
2	Sm Gravel
3	Lg Gravel
4	Sm Cobble
5	Lg Cobble
6	Sm Boulder
7	Lg Boulder
8	Smooth Bedrock
9	Irregular Bedrock

(Provided by P. Leonard in 10/11/03 memo)



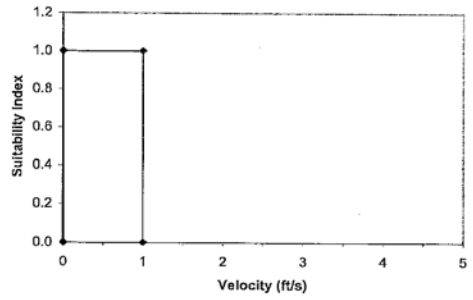
(Provided by P. Leonard in 10/11/03 memo)



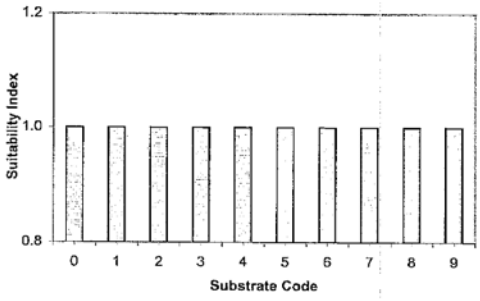
Cover Codes	
0	None
1	Boulder
2	Ledge
3	Undercut
4	Overhang
5	Log
6	Log Complex
7	Alt Veg
8	Rt Veg

(Developed by Pee Dee Instream Flow Subgroup, June 2004)

Deep Slow Guild, Cover
Generic guild habitat suitability

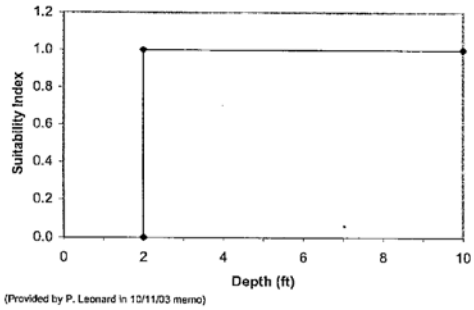


(Provided by P. Leonard in 10/11/03 memo)

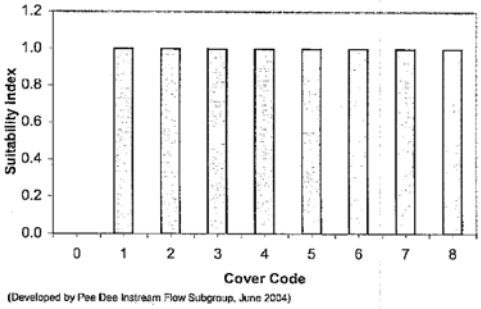


Substrate Codes	
0	Detritus
1	Fines
2	Sm Gravel
3	Lg Gravel
4	Sm Cobble
5	Lg Cobble
6	Sm Boulder
7	Lg Boulder
8	Smooth Bedrock
9	Irregular Bedrock

(Provided by P. Leonard in 10/11/03 memo)



(Provided by P. Leonard in 10/11/03 memo)



Cover Codes	
0	None
1	Boulder
2	Ledge
3	Undercut
4	Overhang
5	Log
6	Log Complex
7	Alt Veg
8	Rt Veg

(Developed by Pee Dee Instream Flow Subgroup, June 2004)

AMERICAN SHAD spawning (*Hightower, et al., 2012)***.**

Kleinschmidt

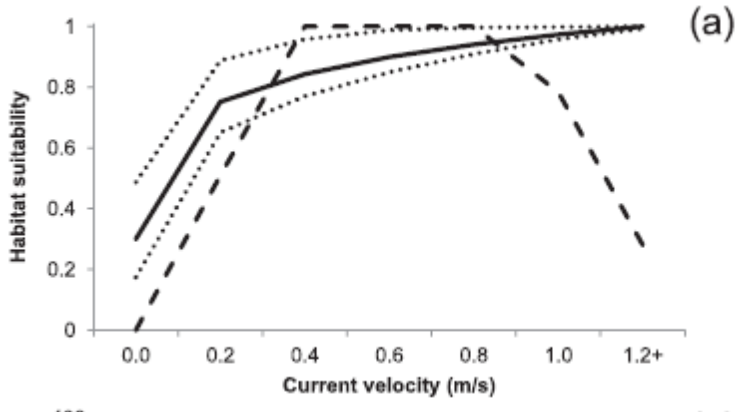


Figure 5. (**a**) Estimated American shad *Alosa sapidissima* spawning-habitat suitability for current velocity (median, with dotted lines indicating 95% CI) in southeastern U.S. rivers, based on a resource selection function fitted to (**b**) data on habitat use vs. availability, by 0.2-m/s velocity bin. The dashed line shows the suitability curve developed by Stier and Crance (1985).

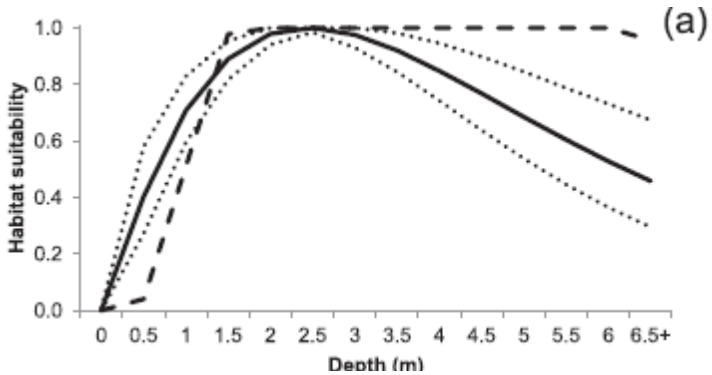


Figure 6. (**a**) Estimated American shad *Alosa sapidissima* spawning-habitat suitability for water depth in m (median, with dotted lines indicating 95% CI) in southeastern U.S. rivers, based on a resource selection function fitted to (**b**) data on habitat use vs. availability, by 0.5-m depth bin. The dashed line shows the suitability curve developed by Stier and Crance (1985).

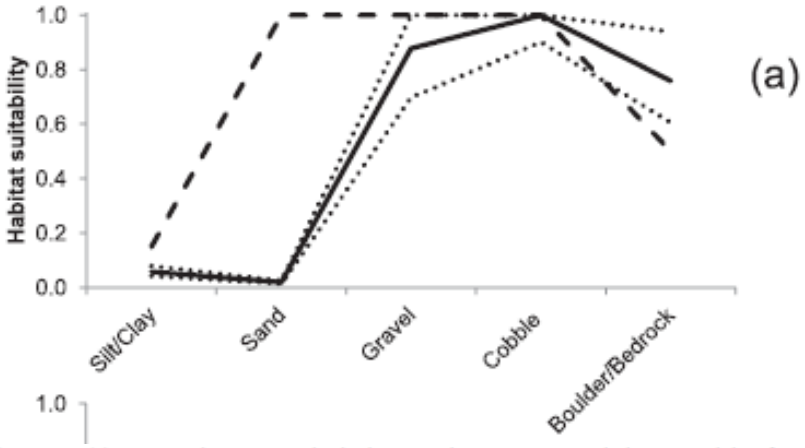


Figure 7. (**a**) Estimated American shad *Alosa sapidissima* spawning-habitat suitability for substrate (median, with dotted lines indicating 95% CI) in southeastern U.S. rivers, based on a resource selection function fitted to (**b** and **c**) data on habitat use vs. availability, by substrate category. The dashed line shows the suitability curve developed by Stier and Crance (1985), using averages for combined categories (silt/clay, boulder/bedrock).

Mesohabitiat Classifications

Bettinger et al 2003

Habitat Type	Description
Riffle	Riffle Relatively shallow (<0.5m), swift flowing section of river where water surface is broken.
Glide	Relatively shallow (<1m); with visible flow but mostly laminar in nature; minimal observable turbulence; relatively featureless bottom
Run	Deep (>1m), swift flowing sections with turbulent flow; surface generally not broken
Pool	Deep (>1m) slow moving sections.
Shoals	Shoal area; which may contain a variety of habitat complexes.

Saluda Hydro IFIM Study

Habitat Type	Description
Riffle	Shallow, with moderate velocity, turbulent, high gradient, moderate to large substrates (cobble/gravel). Typically > 1% gradient.
Glide	Moderately shallow, well-defined non-turbulent laminar flow, transition from low to moderate velocity, lacking a definite ~~well-defined~~ thalweg, typically flat stream geometry, typically finer substrates, transitional from pool.
Run	Moderately deep ~~to deep~~, well-defined non-turbulent laminar flow, range from low to moderate velocity, well-defined thalweg, typically concave stream geometry, varying substrates, gently downstream slope (<1%).
Pool	Deep, low to no velocity, well-defined hydraulic control at outlet.
Rapid/Shoal	Shallow, with moderate to high velocity, turbulent, with chutes and eddies, high gradient, large substrates or bedrock. Typically >2% gradient.
Backwater	Varying depth, no or minimal velocity, off the primary channel flow ~~long backwatered reaches.~~

Habitat Type	Description
Glide	Depending on the strength of the shoal and the bed profile directly upstream of the control, a glide or a pool will be created. A glide is generally defined by slower velocities and a relatively uniform bed profile, but a rough bed profile is not uncommon. Glides will either progress into a more concave bed profile just upstream of the shoal (creating a pool), or maintain their uniform hydraulic and bed features until direct contact with the shoal. Substrates can be large or small but, except at very high flows, do not create turbulence. Due to the slower velocities and increased depths, finer substrates will typically begin to settle in glides.
Run	Immediately downstream of the shoal, there is typically a transition area prior to the water entering the next pool or glide. This unit consists of relatively fast moving, turbulent water and a gradually descending bed profile. When mapping habitat in higher discharges (deeper flow), these areas can be visually identified by an upwelling of water just on the downstream edge of the shoal. This "roiling" effect is created by the sudden drop in water off of the shoal due to the lack of any backwater effect. Substrate composition varies from fine sediments to cobble and boulders. As the water begins to collect and back up further downstream, velocities slow, depths increase, and the transition into a glide or pool occurs.
Pool	If the bed profile upstream of the shoal is more concave or possesses significant undulations, a pool will be formed. Pools are visually represented by the slowest velocities of the four main habitat types and the most extreme depths. Steep banks and narrow channels relative to the rest of the reach can often be associated with pools. The stronger or more defined the downstream control (shoal), the more defined the pool. Substrate composition in pools generally consists of a layer (thick or thin) of finer substrates over boulder or bedrock.
Shoal	Shoals are relatively shallow, submerged ridges that occur with a consistent frequency down the longitudinal profile of the river. Shoals act as downstream controls to pools and glides and create the hydraulic conditions necessary to form runs immediately downstream. Substrate composition in shoals is typically bedrock, boulders, and coarse substrates. The "strength" of each hydraulic control dictates the magnitude to which it influences the upstream habitat types. Each shoal will create a unique situation upstream in which pools, glides or both may be identified.

AFS Aquatic Habitat Assessment Methods (Bain and Stevenson, 1999)

Habitat Type (macrohabitats)	Description
Glide	Nonturbulent, low-moderate velocity; gravel, cobble, sand substrate; slop 0-1%. Wide channel lacking a definite thalweg; usually at the transition between a pool and riffle; no major flow obstructions; lacks features associated with pools; moderately shallow (10-30 cm)
Run	Nonturbulent, swift velocities; gravel, cobble, boulder substrate; low slope. Occurs over a defined thalweg flat plane with a uniform channel form; no major flow obstructions; moderately shallow; deeper than riffles.
Pool	Formed from lateral construction of channel or sharp drop in water surface profile. Features: bend in channel, large-scale obstructions (e.g. boulder, log). Concave in shape; direction of flow varies widely; depth greater than riffle or runs.
Riffle	Moderate turbulence; little to no whitewater; high turbulence at points of channel construction. Moderate velocity (20-50 cm/s). Gravel, pebble, cobble substrates (totally or partially submerged). Slope <4%. Channel profile usually straight to convex.
Rapid	Considerable turbulence and whitewater. High velocity (>50 cm/s). Course, exposed, cobble, gravel substrate. Slope of 4-7%. Steps and pocket pools common; planar longitudinal profile.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Fisheries TWC Meeting

August 22, 2013

Final KDM 09-18-13

ATTENDEES:

Bill Marshall (SCDNR)
Milton Quattlebaum (SCANA)
Gerrit Jobsis (American Rivers)
Shane Boring (Kleinschmidt)
Dick Christie (SCDNR)
Kelly Miller (Kleinschmidt)
Byron Hamstead (USFWS)
Vivianne Vejdani (SCDNR)
Bill Argentieri (SCE&G)
Hal Beard (SCDNR)
Steve Summer (SCANA)
Alan Stuart (Kleinschmidt)
Pace Wilber (NOAA)
Tom McCoy (USFWS)
Chad Altman (SCDHEC)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alan opens the meeting by reviewing the agenda and asking if everyone had a chance to review the Fisheries Report that was distributed prior to the meeting. Everyone had reviewed the report, so Alan opens the floor for comments. Ron Ahle with SCDNR was not able to attend the meeting, but sent in his edits and comments via email. Kelly will distribute these comments to the entire Fisheries TWC.

Dick reiterates Ron's point that information on the fish passage at Columbia Dam, including species composition, should be added to the report. He asks if Jason Bettinger has studied the downstream area also, and if so, says this information should be added to the report as well. Tom and Byron ask if the tributaries were studied, because they believe some fish species that should have been identified in the report were missing, such as the Carolina Darter. Shane says he will check on this and add information to the report as needed. Tom also mentions that the pie charts in the report are a bit confusing and the map on Page 2 is difficult to read. Shane says that he will try to rework this if possible. Shane tells the group that a paragraph will be added to the report that mentions target species and restoration efforts for these species.

The group discusses Ron's comment on white perch and how it relates to the report. Hal says the report states that a change of fish population in the lake was due to the presence of white perch, which Ron and Hal believe is unsubstantiated. Alan says this sentence can be removed from the report, since it was not the intent of the statement to claim that white perch have replaced other species.

Alan asks about the validity of Ron's statement that the smallmouth bass population in the river was supported by the hatchery. Hal says this statement is partially true, as the smallmouth bass

population was supported by the hatchery, but that this was discontinued about two years ago. Hal says the fish have done well throughout the Broad River and are surviving on their own now.

Shane will also include a sentence in the report describing how the abundant fish community provides host fish for mussels.

Alan asks the group if, after the discussed edits have been made, this report adequately describes the fish community for the project. Everyone says yes. Alan says we will make the edits, give the group until September 6th to make any further comments, and then finalize the report.

The group then begins discussion on the proposed study plans. Alan asks the group if they see a need in a separate Robust Redhorse study, since the species will also be included in the IFIM study. Gerrit says he would like to see a separate study, to determine if and where spawning is occurring. Hal mentions that a lot of effort has been put into restoring the Robust Redhorse and that a study would be helpful to determine the results of this effort. Dick says they don't have much information on the species yet and Milton says he will find out what information has been collected so far. He also says he will talk with the Robust Redhorse committee to find out what has been studied and what still needs to be studied. Alan asks if the group wants to just collect eggs by doing drift net sampling, or collect and document spawning females. Dick and Tom suggest the group talk with the Robust Redhorse committee and Ron Ahle to help determine the details of the study. Dick says he will call Scott Lamprecht and put him in touch with Shane to discuss the study. It is also mentioned that the mesohabitat study that will be conducted this fall will yield some information that might help in developing the Robust Redhorse study.

The group then focuses on the study plan for the American Shad. Alan asks if SCDNR is collecting juveniles to see if they are natural or from stocking efforts. Dick says we need to talk to Ron about this study, since a lot of the interest is coming from him. Shane will talk with Ron to develop a study plan for discussion at the next Fisheries TWC meeting. Dick says that if this study moves forward, funding might be made available through the Accord.

Alan moves the group toward discussing the eel abundance study. He asks the group what they would like to see in the study. Dick says he would like to see a study similar to the one conducted at Saluda. The group agrees to tweak the plan from Saluda for this study. Gerrit asks if this study needs to be coupled with a study on fish passage. Dick says there is definitely going to be some interest in eel passage at Parr. Dick asks if there is a location at the project where traps can be placed that operators will have easy access. Milton says he would have access to the traps. Dick says if a long term eel study were put into place, it would be ideal if operators could check the traps. Alan asks what the timing of the study should be. Tom says he will look it up and get back with everyone. Pace mentions that at Roanoke Rapids the eels peak during the spring and fall, with the spring peak being much larger than the fall peak. The group looks at Jason Bettinger's presentation of his eel study from 2012. Based on his results, the groups notices that electrofishing should be included in the study, along with the eel ramps. Dick mentions that there isn't much passage and that there had been discussion on stopping eel studies until the passage issue had been addressed. He says the studies associated with the Accord have been pushed out further until there is better passage for the eels. (Note: According to Al Crosby and Bill Post with SCDNR, 7,094 American eels have passed at St. Stephens as of August 21, 2013.)

The group then begins to discuss the Zone of Influence study, which Gerrit suggests be called the Reservoir Fluctuation Study. This study will just include Parr Reservoir, upstream of the dam. Alan says he thought that existing LIDAR data could be used to map out the acreages of affected areas. Gerrit says we need to have a bathymetry component to the study. Currently the group does not know of any bathymetry data on Parr Reservoir. Dick asks if we used LIDAR to do the study on Lake Murray and Alan answers yes. Dick then asks why the study doesn't include Lake Monticello also. He believes it needs to be included but that the sub-impoundment doesn't, since it doesn't fluctuate very much. Alan asks if there is any bathymetry data on Lake Monticello and Steve answers no. The group looks at a contour map of Lake Monticello and determines it has 10 foot contours, which may not be enough. Gerrit asks how fine the fluctuations should be measured. He believes the maximum increment should be one foot, but it could be finer. Bill M says if the purpose of the study is just to inventory the zone, one foot should be plenty. But if the purpose of the study is to determine the fluctuations affect on spawning, a finer increment may be needed. Alan says that from an operations standpoint, sometimes keeping the water level within a 6 inch band is not possible. Alan speaks with Jennifer Austin and determines that LIDAR data from Newberry and Fairfield counties does exist from 2008. Bill A says he would like to use this existing data to do this study. Gerrit mentions that this information can also be included with the recreation study, since one aspect of the recreation study was to examine the fluctuations and determine how they affected recreation.

Alan then turns the discussion to the entrainment and mortality study. Alan says that SCE&G plans to perform a desktop entrainment study at Parr. Pace asks what a desktop entrainment study is. Alan explains that Kleinschmidt has compiled a database of entrainment studies at FERC projects throughout the country. Projects that are similar to Parr are chosen to use as a basis for the desktop study. An entrainment rate is developed, broken up by seasonal components and sometimes species or families. An entrainment estimate is determined. Then turbine types are matched with projects where mortality studies have been completed. Mortality estimates are developed based on fish shape or family. Gerrit mentions that since this project has a pumpback component, this needs to be considered in the study. He says we need to discuss how to estimate American shad passage for the future, which may be something to examine post-license. Alan mentions that desktop entrainment and mortality studies have been done at Columbia and Lockhart, so the database for comparison to Parr is well developed. Alan asks if everyone agrees to a conventional desktop entrainment/mortality study for Parr Development. Everyone says yes.

For the study conducted at Fairfield, Alan says that mortality studies are examined, then adjusted for the lower efficiency of the pumpback. Alan explains that when the system is pumping, the mortality rates are higher, due to the lower efficiency of the units. A study plan for the Fairfield entrainment/mortality study will be created to include in the PAD, which will contain two phases. The first phase will be a white paper and the second phase will describe the actual development of the entrainment rates and mortality study. Pace asks if phase one and two can both be completed soon. Alan explains that there is information still being gathered that might be crucial to phase two that won't be available until later.

Gerrit expresses concern over the likelihood of fish being pumped into Lake Monticello versus travelling upriver. He says that a large effort has been made to create passage for fish and he doesn't want to see that effort go to waste. Fish may be likely to pass downstream only to be entrained at Fairfield. Alan says that after the entrainment/mortality study, the group will determine what can be done to mitigate any project effects. The group discusses whether Section 18 applies to

Fairfield. Alan says a section may be added to the study plan that discusses a mitigation or effectiveness evaluation to reduce entrainment of diadromous fish. Pace says that a mitigation alternatives study for resident and diadromous fish can be developed together and just tweaked for the different types of fish. It can be implemented if need be, or shelved for use in the future. Mitigation alternatives will be determined by the TWC and a statement about this will be added to the study plan.

At the end of the meeting, Tom shared information he received from Mark Cantrell regarding American eels. The optimum temperature for sampling eels is 15-18^{o}C, during the months of March and April.

Kleinschmidt and SCE&G will begin to develop the study plans discussed at the meeting and will distribute to the group for comments. The TWC will then meet again to discuss the study plans. Action items stemming from this meeting are included below.

ACTION ITEMS:

- Shane will incorporate edits to the Fisheries Report and send out for further comments and finalization. Kelly will distribute the final Fisheries report to the entire TWC.
- Kelly will distribute Ron's comments on the Fisheries Report to the entire Fisheries TWC.
- Shane will talk with Scott Lamprecht and Ron Ahle to discuss Robust Redhorse and American Shad and develop study plans.
- Tom will talk with Mark Cantrell and find out when the peak season for sampling American eels is and report back to the group. – Completed by end of meeting
- Milton will talk with the Robust Redhorse committee to find out what has been studied, the data collected and what still needs to be studied.

August 22, 2013

Fisheries Report:
Add section on species composition from Columbia Fish Passage.
Add Broad River Survey by Jason Bettinger – funded by Broad River Mitigation Program
Confusing the way pie charts were laid out
Page 2 map could not be viewed very clearly
Page 19 statement on documentation of some species – State vs federal listed
All comments should be received by September 6.

Robust Redhorse Spawning Study:
Draft after Robust Redhorse Committee Meeting on October 1 – 3, 2013 and possible mesohabitat survey the fall of 2013
Shane to talk with Scott Lamprecht regarding this issue

American shad Spawning Study:
Need more information
Shane to discuss with Ron regarding his interest

American Eel Abundance Study:
Look for elvers at dam
Look for areas of potential eel passage
Include Electrofishing in vicinity of dam as part of sampling methods
When is best time to sample for eels? Tom M
15 – 18 degree C – optimal temperature
March through April optimal time

Zone of Influence (Reservoir Fluctuation) Study:
Littoral habitat of Parr Reservoir and Monticello Reservoir
Existing LIDAR data – acreages of effected area
Bathymetry of reservoir down to elevation 256/257'
Look at Old USGS quad maps showing contour lines for Monticello Reservoir
Study not needed for sub-impoundment
Potential spawning habitat analysis – 1 foot increments tentatively for now
Potential tie with affects of fluctuation on recreation – study requested in recreation TWC
Quantify impact of fluctuation

Entrainment Mortality Study:
Parr Hydro Development
Conventional Desktop entrainment study – compiled various data from around the country and though literature search
Order of magnitude result
Resident species are evaluated

Fairfield Pumped Storage Development
Desktop numbers and mortality results
Threadfin shad & BBH

Turbine strikes
Maybe include a correction factor for less efficiency operation of pumpback vs conventional turbines
Two phase process:
First step – compile available data to determine next step – white paper
Second step – development entrainment rates and mortality study results
Develop mitigation alternatives for residence species
Include future options for diadromous species or cover this under Section 18

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality TWC Meeting

September 10, 2013

Final KDM 10-09-13

ATTENDEES:

Bill Marshall (SCDNR)
Ron Ahle (SCDNR)
Rusty Wenerick (SCDHEC)
Alison Jakupca (Kleinschmidt)
Henry Mealing (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Dan Dieter (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Ray Ammarell (SCE&G)
Fritz Rohde (NOAA) via conference call
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
John Knight (SCE&G)
Byron Hamstead (USFWS)
Tom McCoy (USFWS)
David Eargle (SCDHEC)
Kerry Castle (SCDNR)
Dick Christie (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alison opens the meeting with introductions and then leads the group in a discussion on the Baseline Water Quality Report. Byron asks if there are any monitoring sites further upstream than the SCDHEC B-047 monitoring site, which was included in the report. He explains he would like data from that area to compare against downstream data. Byron believes that current baseline data from this area is needed to use as a control. The next monitoring station is the USGS gage at Carlisle. Henry mentions that we can add more data into the report however we will not be able to find a monitoring site that is not impacted, since Neal Shoals is located above the Parr Fairfield Project. However, a site above the Project would represent conditions in the free-flowing part of the river before it becomes impounded. The group agrees that data from the Carlisle gage will be added to the report.

Byron also asks for more analysis to be completed on the existing data that is exhibited in the baseline report. He agrees to write a list of what he would like to see and submit that to Kelly to include in the report. Kelly will also work with Steve to determine if any more data has been collected by SCE&G. Kerry offers to send turbidity data collected by SCDNR to add in the report. Rusty adds that he would like to see any additional data collected above, within and below the Project regarding metals, since there is a historical Copper reading at a discontinued SCDHEC monitoring site located downstream of the Project. Steve says he will check to see what SCE&G metals data is available and will pass that along to Kelly. Rusty adds that there are also issues with phosphorus and pH at some of the SCDHEC stations at the Project. Rusty refers to the map he shared at the February 28th meeting, which was included as an appendix to the meeting notes. He says that the phosphorus is most likely coming from the watershed however he would like to see the

phosphorus levels documented. Rusty added that SCDHEC is responsible for developing a TMDL to address nutrients in the watershed; however, in so far as the project may be able to adjust operations to mitigate the problem while still achieving the project purpose, SCDHEC would ask SCE&G to consider that. Steve says he will also search for phosphorus data collected at the Project by SCE&G. Rusty and Steve both agree to search for additional information on copper, phosphorus and pH in the upper portion of Lake Monticello and elsewhere. Rusty said that SCDHEC would submit written comments and would help with downloading any additional SCDHEC data. Dick mentions that SCE&G can address nonpoint source concerns in the future through shoreline management, even though this isn't included as part of the 401 water quality certification.

Ron says that the pH and temperature at Lake Monticello raised some red flags. He would like to see more information on the mixing zone permit from SCDHEC to be included in the report. The thermal study that was performed at Lake Monticello will be added as an addendum. Ron says it is important to see what is permitted at the V.C. Summer Nuclear Station to understand what isn't going to change regarding water quality at Lake Monticello.

The group then begins discussion of the Baseline Macro/Mussel Report. David mentions that he would like to see another upstream site, on the flowing part of the river, included in the report. Milton says he will talk with Dan Carnagey to see what other data is available. Byron asks if five samples are enough to be representative of an area. Milton explains that the transects are representative and that they are compared over time, not to each other.

David requested that a separate mussel study be performed in Lake Monticello. He said the specifics of the study can be determined by John Alderman. Shane and Milton are currently talking with Alderman to develop a study plan. David said that the study should examine a few important spots over a day or so to characterize the reservoir.

Milton then gives a presentation on his findings from a study of the substrate in the Fairfield tailrace. He found sand, rock and *Corbicula spp.* at the three spots he examined along three transects. Overall, he found a hard, scoured bottom. Ray shows the group pictures of the tailrace as the plant was being built. The information collected by Milton will be consolidated and included in the Baseline Macro/Mussel Report as an addendum.

The group then discusses the Water Quality in the West Area Study Plan. Ron says he would like to see one more monitoring station added on the tailrace side of dam to use as a control. Henry mentions that there is a USGS gage on that side of the dam that can be used for this purpose. Byron says he would also like to see a control monitoring station located further down Henderson Island on the east bank of the river. The group agrees that a fourth monitor will be located in the east channel near the bridge that crosses the mid-point of the island. Milton says that access should be fairly easy by boat or walking for all four proposed monitoring sites. Rusty mentions that this could be an opportunity to collect more data (such as water quality grab samples for nutrients or metals) and Byron agrees. Ron points out that eight months of monitoring may not be enough to accurately portray the water quality of that area. Henry says that we can monitor for one 8-month season, then evaluate whether further study is needed. Ron agrees and would like for a caveat to be added to the study plan explaining this. The group defines this statement, which is included below.

> "This study may be extended based on a review of the results from the initial eight month period as determined by the Water Quality TWC."

Ron also adds that the proposed data collection interval of 15 minutes can be scaled back to hourly collection intervals. The group also decides to shift the study season one month to extend from April to November.

The group discusses the comments submitted via email by Vivianne Vejdani regarding the need to collect turbidity and conductivity within this study, in addition to dissolved oxygen (DO) and temperature. The group agrees that a YSI meter will be used each month to collect DO, water temperature, and conductivity when data is downloaded from the HOBO meters In addition, pH will also be collected at that time, but with a separate meter. These discussed changes will be incorporated into the study plan and the final will be sent out to the TWC.

After lunch Bill A. gives a presentation on the sediment situation in Parr Reservoir, which indicated that the reservoir sediment levels are in "equilibrium". The presentation can be viewed at the Project website at www.parrfairfieldrelicense.com. Ron says that sediment seems to be passing through Parr Hydro. The reservoir does not appear to be "filling in," as it did at Neal Shoals. The topography maps show remnants of existing islands that have been in the reservoir prior to the original dam being built. Ron mentions that the area at the mouth of Cannon's Creek is very shallow and can be difficult to navigate. He says that this might be something that should be examined further in the process, through the Recreation TWC. Bill A. shows the group a presentation on the trash rake that is located immediately upstream of Parr Hydro. This depicts how the area immediately in front of the powerhouse is kept clear of debris and sediment. Bill M. says that the upper end of Parr Reservoir might still have sedimentation issues. Bill A. says that there is a sand mining operation located at the upper end of the reservoir, and also points out that Fairfield operations help to keep sediment stirred up and moving through the reservoir.

The group then discusses future meeting dates and agrees to hold the next Water Quality TWC meeting in January 2014 to discuss the updated and finalized Baseline Water Quality Report and Water Quality in the West Area Study Plan. Rusty reminds the group that it was agreed at the first meeting, held in February, that requests for additional water quality data would be deferred until after the final Baseline Water Quality Report was reviewed and discussed. Kelly will send out a Doodle Poll for this and other upcoming meeting dates. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Steve will find out what other SCE&G water quality data is available and will send this data to Kelly to add in the Water Quality Report.
- Rusty will search for additional copper, phosphorous and pH data for the upper portion of Monticello Reservoir
- Kerry will send the SCDNR turbidity data to Kelly to add in the Water Quality Report.
- Byron will submit a list of the edits and additions he wants for the Water Quality Report.

- Kelly will make additions and edits to the Water Quality Report and resubmit to the TWC for review. These changes will include at least the following: metals downstream (including copper), USGS gauge at Carlisle data, phosphorous, pH, new nuclear SCDHEC mixing zone permit parameters.

- Shane Boring will begin developing a Mussel Study Plan for Monticello Reservoir.

- Kelly will make edits to the Water Quality in West Area Study Plan and resubmit to the TWC for review.

- Milton will talk with Dan Carnagey regarding other available macro data on Broad River upstream of the Parr Project to be included in the macro report.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Lake and Land Management and Recreation RCG Meeting

October 16, 2013

Final KDM 11-13-13

ATTENDEES:

Tommy Boozer (SCE&G)
Dick Christie (SCDNR)
Bill Stangler (Congaree Riverkeeper)
Randy Mahan (SCE&G)
Alison Jakupca (Kleinschmidt)
Kelly Miller (Kleinschmidt)
E. J. Jones (SCPRT)
Joseph Wojcicki (By-PAS)
Bill Marshall (SCDNR)
Beth Trump (SCE&G)
Bill Argentieri (SCE&G)
Scott Collins (SCE&G)
Steve Summer (SCANA)
Vivianne Vejdani (SCDNR)
Henry Mealing (Kleinschmidt)
David Haddon (SCE&G)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Alison opened the meeting by reviewing the agenda and the mission statement of the Lake and Land Management and Recreation RCG. She then directed the group in a discussion on the Recreation Use and Needs Study (RUNS) plan. David mentioned that the surveys included in the study plan seem to be extensive. He doesn't believe that many people will be willing to spend that much time answering questions. Alison said that we can go through the interview questions and remove any questions that the group decides are extraneous. Alison also mentioned that an incentive will be used to keep people interested, such as a floating key chain.

As the group reviewed the study plan, Tommy mentioned that the Scenic Overlook is only partially owned by SCE&G. He said he will call the county to see if they have any information on their portion of the overlook that can be included in the final recreation report. Dick also mentioned SCDNR will contribute data on the waterfowl areas that are located within the Project Boundary. Sam Stokes (Broad River waterfowl area) and Brett Moule (Enoree River waterfowl area) are the contacts for this information.

Alison discussed the study season for the RUNS. The study is scheduled so that it will cover the early crappie season, the Canada goose season, and the turkey season at Lake Monticello and the migratory waterfowl seasons at Parr Reservoir. However the exact study dates will not be set until 2015, since hunting and fishing season dates can change slightly each year. Henry asked if we want to study the Canada goose season on Parr Reservoir as well. Dick said he will investigate and let the group know what he finds out. After lunch Dick confirmed that the Canada geese season should also be studied on Parr Reservoir so that both the Parr and Monticello studies are consistent.

Kleinschmidt

Henry mentioned that the data Tommy will collect for the Form 80 Reports will also be included in the recreation report. The recreation site inventory for the report will be completed in 2015. The group agreed to the list of sites that were designated for on-site interviews and traffic counters as a means of data collection.

Bill M. asked if we want to quantify the number of users on the Broad River below the Parr Shoals Dam. If so, he mentioned that the Palmetto Trail would be a good place to do this. The option of using a traffic counter was suggested however the counters may collect false numbers because of residences in the area. Bill M. said he will find out if there are any use estimates available for the Palmetto Trail. Bill S. suggested using a traffic counter at the site on the west side of the river instead.

The group discussed the sample days that are included in the study. Alison will develop a draft schedule that will list the sample days and will send this out to the RCG for approval. Special event days, such as fishing tournaments, will not be determined until 2015, so the table will remain a draft until exact dates for the special events are set.

The group then agreed to adjust the waterfowl focus groups to only include 10-12 representatives. The smaller groups will allow for greater productivity at the meetings.

The group then moved on to discuss the Recreational Flows Study Plan. Bill S. asked how far down the study area reaches. This will be specified more clearly in the plan. Henry mentioned that a map will be developed for this plan, and also for the RUNS plan. Bill S. asked that the public access areas be shown on these maps. Maps will be developed, sent to the RCG for approval, and included in the final study plans.

Henry asked the group if there is a list of people that need to be included in the focus group for this study. Alison asked Bill S. if he and others could help develop that list. Bill S. said that the Chestnut Hill Plantation HOA and Stuart Greeter, a former Congaree Riverkeeper, could offer some information regarding this. He also suggested asking local outfitters, the Palmetto Paddlers, and Charlene Coleman for a list of names and organizations. Dick also mentioned that there may be some local river guides that would be good to include in the focus group, and that Hal Beard and Ron Ahle may be able to help identify these people.

Bill M. asked about the timeframe for when we want these flows, and mentioned that this is not included in the study plan. Henry said that we need to have the IFIM study completed before we complete the Recreational Flows Study. Dick mentioned that we also need to complete the Navigational Flows Study first, to develop a baseline for the Recreational Flows Study. The group decided that phase one, which includes the focus group meeting, should occur in late 2014. After the IFIM study, phase two and a second meeting of the focus group will occur in the fall of 2015 or spring of 2016. A final report will be issued by June 2016.

The group then discussed the Navigational Flows Study Plan. Bill S. said that the study area described in the plan does not include additional areas that were discussed at previous meetings. The group will look at the IFIM study transects to determine what additional study sites need to be examined. The areas of the river that are known to be the most difficult to navigate downstream of Parr Shoals Dam need to be studied, to ensure that navigation is possible in these areas.

After lunch, the group discussed the Shoreline Management Plan (SMP) for Lake Monticello. Alison reviewed the comment submitted by Bill M. regarding residential land use. Tommy said that there is no land to sell at Lake Monticello and there is no intention of selling any land. The majority of the land around the lake is classified as recreation. Section 3.2 of the Monticello SMP will discuss why there are no residential classifications at Lake Monticello.

Alison then began to review the Monticello and Parr SMPs from the beginning. She mentioned that any extraneous information will be removed from the SMPs for inclusion in the PAD. Specifics can be added back in later. The group removed and edited the land classifications included in the SMPs. The group also noted that examples of acceptable shoreline stabilization and rip-rap will be included in the permitting handbook, which is separate from the SMPs and does not require FERC approval. Also examples of private and common dock layouts and information on clearances in coves will be included in the permitting handbook.

The five documents discussed during this meeting are included at the end of these notes, with all edits shown in track changes. Revised and finalized copies of the documents will be emailed to the RCG. Bill A. told the group that he would like to begin developing text for the SMPs in 2014. A straw man will be sent out for RCG review no later than 2015, along with a straw man of the permitting handbook. The group agreed to this timeline.

Action items stemming from this meeting are detailed below.

ACTION ITEMS:

- Bill M. will find out if the Palmetto Trail collects use estimates for inclusion in the RUNS.
- Alison will develop a schedule that details the sample days for the RUNS and distribute to the RCG for review.
- Kleinschmidt will develop a map for inclusion in the RUNS Plan and a map for inclusion in the Recreational Flows Study Plan. These will be distributed to the RCG for review and included in the final study plans.
- SCE&G and Kleinschmidt will use the information provided by the RCG to begin reaching out to various people and organizations to help develop a list of participants for the RUNS and Recreational Flows Study focus groups.

DRAFT
RECREATION USE AND NEEDS STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

September 2013

DRAFT

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Parr Hydro Development forms Parr Reservoir along the Broad River. The Development consists of a 37-foot-high, 200-foot-long concrete gravity spillway dam with a powerhouse housing generating units with a combined licensed capacity of 14.9 MW. Parr Hydro operates in a modified run-of-river mode and normally operates to continuously pass Broad River flow. The 13-mile-long Parr Reservoir has a surface area of 4,400 acres at full pool and serves as the lower reservoir for pumped-storage operations.

The Fairfield Pumped Storage Development is located directly off of the Broad River and forms the 6,800-acre upper reservoir, Monticello Reservoir, with four earthen dams. As noted, Parr Reservoir serves as the lower reservoir for pumped storage operations. The Fairfield Development has a licensed capacity of 511.2 MW and is primarily used for peaking operations, reserve generation, and power usage.

2.0 PURPOSE OF THE STUDY

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new

Comment [b1]: Include map of Project area and study plan location.

operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

As a part of this process, SCE&G is proposing to perform an assessment of existing and future recreational use, opportunities, and needs for the Project. The assessment is designed to provide information pertinent to the current and future availability and adequacy of SCE&G owned and managed recreation sites and specific informal recreation areas at Monticello Reservoir and the Parr Reservoir. The overall study plan objective is to identify current and potential recreational use, opportunities, and needs at the Project by addressing the following goals and objectives:

Goal 1: *Characterize the existing recreational use of SCE&G's recreation sites on Monticello Reservoir and Parr Reservoir. This will be accomplished by meeting the following objectives:*

i. Identify recreation points, inventory the services and facilities offered at each, and assess the general condition of each site (including American with Disabilities Act [ADA] compliance).
ii. Identify the patterns of use at each site (type, volume, and daily patterns of use).

Goal 2: *Characterize existing use of waterfowl areas (Broad River Waterfowl Area, Enoree River Waterfowl area) and SCE&G recreation lands by hunters during designated hunting seasons. This will be accomplished by meeting the following objectives:*

i. Identify the patterns of use within the Project boundary (type, volume, and daily/seasonal patterns of use).

Goal 3: *Identify future recreational needs relating to public recreation sites on Monticello Reservoir and Parr Reservoir. This will be accomplished by meeting the following objectives:*

i. Identify existing user needs and preferences, including perceptions of crowding at recreation sites.
ii. Estimate future recreational use of existing recreation sites.
iii. Identify future needs for new recreation sites and facilities.

3.0 STUDY AREA

SCE&G designated recreation sites and informal recreation areas on Monticello Reservoir and Parr Reservoir that will be included in this assessment include the following:

TABLE 1 RECREATION SITES TO BE ASSESSED

MONTICELLO RESERVOIR RECREATION SITES & INFORMAL AREAS	PARR RESERVOIR RECREATION SITES & INFORMAL AREAS
1. Scenic Overlook (SCE&G-maintained portion)	1. Cannon's Creek Boat Ramp
2. Hwy 215 Boat Ramp	2. Heller's Creek Boat Ramp
3. Hwy 99 Boat Ramp	3. Broad River ~~Creek~~ Waterfowl Area (vehicle counter only)
4. Recreation Lake Access Area	4. Hwy 34 Boat Ramp
5. Informal fishing area, east side of Hwy 99	5. Enoree River Waterfowl Area (vehicle counter only)
	6. Enoree River Bridge Informal Access Area (vehicle counter only)

4.0 STUDY SEASON

Study seasons will vary by study area based upon current knowledge of use patterns. Study seasons should capture specific seasonal activities, including hunting during legal seasons and on-water recreational use during the peak season (typically defined as Memorial Day to Labor Day). As hunting season dates vary annually based upon SCDNR board decisions, only approximate date ranges for specific targeted mail-in survey activities are provided within this study plan. Exact dates for waterfowl survey activities will be determined ~~in~~ when study season dates are published, anticipated being mid-summer 2014. Study season specifics are further described below.

4.1 MONTICELLO RESERVOIR

Primary interview activities will occur from April 1 through Labor Day, 2015. Additional interviews will be conducted from February 1 through March 31, 2016 in order to capture recreational activity on the Reservoir during early crappie season. Specific targeted survey activities with mail-in surveys, as described in Section 5.5, will occur during the Canada Geese

hunting season (approximately September 1 through September 30, depending on yearly SCDNR approved seasons).

4.2 PARR RESERVOIR

Primary interview activities, as described in Section 5.0, will occur from April 1 through Labor Day, 2015, to encompass turkey hunting season, as well as the peak recreation season. Specific targeted survey activities with mail-in surveys, as described in Section 5.5, will occur during Migratory Waterfowl Seasons (approximately ~~mid~~ September 2015 through January 2016, depending on yearly SCDNR approved seasons).

Comment [b2]: Add Canada Geese wording to Parr Reservoir also.

5.0 DATA COLLECTION METHODS

A variety of data collection techniques will be used to obtain the information necessary to meet the study objectives. Table 2 identifies the information needed to address each objective and the data collection methods to be used. Both primary and secondary data will be utilized. Primary data will entail site inventories, user counts, and use surveys (exit interviews). Secondary data will include U.S. Bureau of Census data, the South Carolina Statewide Comprehensive Outdoor Recreation Plan (SCORP), SC Recreation Participation & Preference Study, and other relevant, readily available literature. Additional input will be solicited from the Lake & Land Management and Recreation Resource Conservation Group (RCG), Recreation TWC, and target "focus groups" of especially knowledgeable individuals, offering knowledge of the recreation resources and needs of the lake and river.

TABLE 2 RECREATION USE AND NEEDS STUDY PLAN OBJECTIVES AND EFFORTS

OBJECTIVES	INFORMATION NEEDED	SOURCE
Goal 1: Characterize existing recreational use of recreation sites on Monticello Reservoir and the Parr Reservoir		
Identify formal recreation sites, inventory the services and facilities offered at each, and assess the general condition and ADA compliance of each site	• Physical inventory of all boat ramps, grills, shelters, restrooms, parking capacity, etc., at each site • General assessment of site condition to include maintenance, basic rehabilitation needs, etc. • Visitors' assessment of site conditions • Identification of activities that occur at each site • ADA compliance assessment	• Recreation Site Inventory • Survey of Recreation Site Users
Identify the patterns of use at each site (type, volume, and daily patterns of use)	• Utilize vehicle counts as an estimation of people • Estimate of # people/vehicle • Estimate of # vehicles/site • Parking capacity	• Traffic Counter Data • Surveyor Counts of Vehicles at Recreation Sites • Survey of Recreation Site Users - # of people per vehicle and length of visit • Recreation Site Inventory - # of parking spaces • County data from Scenic Overlook

OBJECTIVES	INFORMATION NEEDED	SOURCE
Goal 2: Characterize existing use of waterfowl areas (Broad River Waterfowl Area, Enoree River Waterfowl area) and SCE&G recreation lands by hunters during designated hunting seasons.		
Identify the patterns of use within the Project boundary (type, volume, and daily/seasonal patterns of use).	• Estimation of # hunters/site or waterfowl area	• Counts of Vehicles at Recreation Sites/waterfowl areas • Mail-in questionnaire specific to hunting use at the Project • SCDNR waterfowl use data • SCDNR hunting permit data

OBJECTIVES	INFORMATION NEEDED	SOURCE
Goal 3: Identify future recreational needs relating to public recreation sites on Monticello Reservoir and Parr Reservoir		
Identify existing user needs and preferences, including perceptions of crowding at recreation sites	• User preferences and opinions of needs and crowding at sites • Condition assessment	• Survey of Recreation Site Users • Recreation Site Inventory
Estimate future recreational use of existing recreation sites	• Current inventory and use data from Goals 1 and 2 • Population projections for the project area • Recreational use trends	• Results of Goals 1 and 2 • U.S. Bureau of Census Data • SC Division of Research & Statistics (Budget and Control Board) • SCORP, SC Recreation Participation & Preference Study, or other readily available literature
Identify future needs for new recreation sites and facilities	• Population projections • Recreation use trends • "focus group" (stakeholders) knowledge of recreation resources and needs	• SC Div. of Research & Statistics • SCORP, SC Recreation Participation & Preference Study, or other literature • Recreation TWC and Lake and Land Management & Recreation RCG

The capacity, availability, and overall condition of existing recreation sites will be assessed through review of existing information and an on-site inventory (Section 5.1). Recreational use of SCE&G's public recreation sites (Table 2) during the appropriate recreation season (as described in 4.0) will be estimated using a combination of data including traffic count, survey data, spot counts, and additional collection methods as described in Section 5.2, 5.3, 5.4, and 5.5. Methods for estimating recreational use are described in Section 6.0.

5.1 RECREATION SITE INVENTORY

Data on the types of amenities, activities supported, and the parking capacity of recreation sites at the Project, and the land area each site encompasses will be obtained from two sources. First, existing information regarding recreation sites such as FERC Form 80's and existing GIS data layers will be referenced. Second, a site visit will be made to collect data on the type, number, and size of facilities (restrooms, parking areas, boat ramps, picnic shelters and tables, etc.) located at each site. The general condition of recreation facilities and a qualitative assessment of each site's compliance with the ADA will also be recorded. A copy of the inventory form is provided in Appendix A.

Comment [b3]: Change all references of ADA to "Barrier Free"

Upon completion of the inventory, all data will be uploaded into a database; anticipated to be a GIS database. The database will be structured so that it can be used in a variety of formats (brochure, maps, web pages, etc.) and can be updated as recreation sites are modified, added, or changed in any way.

5.2 TRAFFIC COUNTS

Traffic counters will be installed to record the number of vehicles that enter and exit the public recreation areas. Traffic count data will be collected for an entire year in order to capture the various hunting seasons. On Monticello Reservoir, traffic counters will be installed at the lake access point of the Scenic Overlook, the Hwy 215 Boat Ramp, the Hwy 99 Boat Ramp, Recreation Lake Access Area, and the Hwy 99 informal fishing area. At Parr Reservoir, traffic counters will be installed at Cannon's Creek Boat Ramp, Heller's Creek Boat Ramp, Broad River Waterfowl Area, Hwy 34 Boat Ramp, Enoree River Waterfowl Area, and the Enoree River Bridge informal area.

5.3 PUBLIC RECREATION AREA VISITOR EXIT INTERVIEWS

The preferences and perceptions of people using SCE&G's recreation sites and informal areas are important inputs in management decisions regarding the adequacy and availability of existing recreation sites. Information from recreation site users will be obtained via an onsite survey from April 1 through Labor Day, 2015, and from February 1 through March 31, 2016, on Monticello Reservoir and from April 1 through Labor Day, 2015, for Parr Reservoir.

Exit surveys will be administered to collect user characteristics (origin, gender, age, group size, etc.), the type of land-based and water-based recreation activities individuals are participating in, length of stay, perceptions of crowdedness, and conditions of recreation sites at the Project. Visitor demographic information will also be collected. Surveys will be conducted at the following locations:

Monticello Reservoir

- Scenic Overlook
- Hwy 215 Boat Ramp
- Hwy 99 Boat Ramp
- Recreation Lake Access Area
- Hwy 99 informal Fishing Area

Parr Reservoir

- Cannon's Creek Boat Ramp
- Heller's Creek Boat Ramp
- Hwy 34 Bridge

The data collected will be used to provide a general pattern of recreation use and assist in the development of recreation use estimates at access sites. The data will also provide recreation user inputs on "crowdedness" and potential facility needs. The survey will be pre-tested in the field prior to implementation and revisions will be incorporated, as necessary. If any significant revisions to the survey or study protocol are deemed necessary subsequent to field pre-testing, the TWC will be notified.

Two survey versions will be implemented – one for Monticello Reservoir and one for Parr Reservoir. The two survey versions will be very similar to each other and will contain similar questions. Draft questionnaires are provided in Appendix B.

Stratified random sampling will be used to develop a sampling plan in order to complete at least 30 days of interviewing at each recreation site. Sampling days will be made up of weekends, weekdays and holidays; however, weekends and holidays will be sampled at a greater rate than weekdays, to account for the heavier use that typically occurs during those periods. In preparing the sampling plan, the TWC will be consulted on the potential for including special event days with the holidays.

Comment [b4]: Clarify better which days are being surveyed. Identify all holidays will be surveyed.

Comment [b5]: Add to this study plan a list of the proposed days that will be surveyed.

All survey clerks will be trained thoroughly as a means of quality control. Survey clerks will be provided with detailed information on the study schedule, appropriate materials to aid in data collection, and direction on appropriate interviewing techniques and attire. Interviewers will also be provided with an incentive for survey respondents to complete the survey.

5.4 SPOT COUNTS

Spot counts will be conducted at the public recreation sites identified in Section 5.3 once per interview period, concurrent with exit interviews. Specifically, spot counts will document the number of visitors and/or vehicles present at that visit and help to characterize site use. Information recorded during spot counts will include: date, time, and weather; amount of vehicle and vehicle/trailer parking capacity in use; number and type of activities observed at the site; and state license plate data. Spot count data will be used in parallel with traffic counter data.

5.5 ADDITIONAL USER DATA COLLECTION EFFORTS

Waterfowl hunting typically occurs during the fall and winter months. Waterfowl hunters represent a unique group of users whose preferences and perceptions may differ from those using recreation sites during the summer months. The preferences and perceptions of waterfowl hunters will be identified through use of a panel of waterfowl hunters.

Kleinschmidt will work with the Recreation TWC to identify waterfowl organizations whose hunters use the Project. A panel will be assembled from willing participants of the respective organizations. Should not enough participants be available from the organizations, additional individual hunters may be sought out to serve on the panel. ~~Up to 20~~A small group of hunters will be invited to participate in a group meeting, similar to a focus group, to identify the opportunities and needs of waterfowl hunters using Project access areas. The information collected will be similar to that of the access site survey. Kleinschmidt will recruit the hunters,

develop a meeting format and materials, and will conduct the meeting. It is anticipated that the meeting will occur during the waterfowl hunting season.

Additionally, mail-in surveys similar to the access site survey will be distributed at the Broad River and Enoree River Waterfowl Areas during waterfowl hunting season. The study seasons for Monticello Reservoir and Parr Reservoir, as discussed in Section 4.0, will capture the turkey hunting season through exit interview activities.

Representation of those utilizing the Project during local fishing tournaments are anticipated to be represented during access site exit interviews, as registration, check-in and weigh-in typically occurs at access areas.

6.0 ANALYSIS

The following sections provide a description of the approach for estimating existing and future recreational use, recreation site capacity and use density percentages, and recreation needs.

6.1 CURRENT RECREATION USE ESTIMATES

The reported estimates of recreation will be presented in "recreation days". The FERC defines a recreation day as one visit by a person to a development for purposes of recreation during any 24-hour period. The weekday, weekend, and holiday average recreation days will be calculated for each Monticello Reservoir and Parr Reservoir recreation site utilizing the traffic counters and recreation site survey data. The average number of people at each site within the morning and afternoon periods will be estimated within each day type and converted to a daily estimate. Daily estimates for each day type will be expanded to represent the study period and summed for a total estimate for each recreation site.

6.2 FUTURE RECREATION USE ESTIMATES

Estimated projections of future recreation use at Monticello Reservoir and Parr Reservoir will be developed using the average annual increase in population growth over the past 10 years, as reported by the Census Bureau or the State Division of Research and Statistics, for Newberry, Fairfield and Richland counties[1]. The estimates will be augmented with discussion of trends reported in the SCORP (2014) and the SC Recreation Participation & Preference Study (2005). Estimated projections will be provided in 5 year intervals for the anticipated term of the license up to 50 years into the future (through year 2070).

While it is acknowledged that future changes in the supply of recreation resources, either in their quantity, accessibility, and/or quality may influence future demand and use, the demand analysis undertaken for this study does not attempt to predict what these future changes might consist of or how they might specifically affect levels of use at Project facilities. Therefore, the demand analysis results should be viewed as a general guide of potential future recreation pressure developed for planning purposes only.

[1] Although Richland County is not within the FERC Project boundary, it is believed that a significant number of those who recreate at the Project reside within Richland County.

6.3 RECREATION SITE CAPACITY

For purposes of this study, the carrying capacity for a recreation site is defined as the number of vehicles and boat trailers that can be parked at a recreation site at one time, based on the number of available parking spaces associated with each site. For paved parking areas, this will be achieved by counting the number of designated parking spaces available at the recreation site. For gravel parking areas, the number of available parking spaces for each recreation site will be estimated by measuring the area (sq ft) available for parking and estimating the number of vehicles that could be parked at the location, if optimal space were utilized. These estimates will be based on parking capacity standards for vehicle length, width, and available turn around space.

6.4 RECREATION SITE USE DENSITY

The use density of recreation sites will be estimated by comparing the average observed number of vehicles at the sites on sampled weekday, weekend, and holiday days with the available parking capacity for each recreation site. The average observed number of vehicles divided by the parking capacity will provide an estimated use density for each site.

6.5 RECREATION NEEDS ASSESSMENT

The need for recreation and site development or modification of existing recreation resources will be assessed based on the inventory, condition, capacity, and exit interview survey results. The needs assessment will focus on the existing condition and user opinions of recreation sites, ADA compliance, and the ability of sites to meet current and anticipated future recreation demand pressures. Consideration will also be given to site opportunities and constraints, as well as support facilities such as signage and maintenance. The need for new recreational sites, facilities, and shoreline will be determined through assessment of the information collected and the input of stakeholders on the Recreation TWC and Lake & Land Management RCG.

7.0 SCHEDULE

The proposed schedule for completion of the Recreation Use and Needs Study is as follows:

TASK	DATE
Mobilization for field work (includes field clerk hiring, training, etc.)	March 2015
Survey development and pre-testing	March 2015
Installation of Traffic Counters	March 31, 2015
Interview survey collection (Monticello Reservoir)	April 1-September 7 (Labor Day, 2015); and February 1 - March 31, 2016[2]
Interview survey collection (Parr Reservoir)	April 1 -September 7 (Labor Day, 2015)
Waterfowl survey activities	Throughout 2015 and early 2016 during appropriate seasons.
Early data entry, cleaning, and processing	Early October 2015
Determine if additional data collection is needed	December 2015[3]
Conduct analyses	April - July 2016
Submit draft report	July 2016
Finalize report	July/August 2016

8.0 REFERENCES

South Carolina Department of Parks, Recreation and Tourism, Recreation, Planning and Engineering Office. 2008. South Carolina Statewide Comprehensive Outdoor Recreation Plan.

University of South Carolina. 2005. South Carolina Recreation Participation & Preference Study. Prepared for the South Carolina Department of Parks, Recreation and Tourism. (Online) [URL]: http://www.scprt.com/files/RPE/2005%20Rec%20Study.pdf

[2] The recreation season has been extended into 2016 on Monticello Reservoir in order to capture use data during the early crappie season, from February 1 through March 31, 2016.

[3] If additional data collection is required, data collection methods, results and analyses, developed and assessed in cooperation with the Recreation RCG, will be provided in an addendum to the report.

APPENDIX A

SITE INVENTORY FORM

SOUTH CAROLINA ELECTRIC & GAS COMPANY

RECREATION ASSESSMENT STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SCE&G Public Site Inventory Form

Inspected by: _____ Date: _____

Site Name: _____

Site Address: _____

City: _____ State: _SC_ Zip Code: _____

Facility Type:

_____ Primitive Camp _____ Picnic Area ____ Day Use

_____ Overlook Site _____ Informal Site ____ Launch Ramp

Road Access:

_____ Paved access.....______ # of lanes

_____ Unpaved access.....______ # of lanes – (Circular entrance/exit)

Operations:

_____ Manned _____ Seasonal (From_____To_____)

_____ Unmanned _____ Year Round

_____ Fee ($) ..... (Site_____; Parking;_____)

Site Amenities:

# Type	# Type
_____ Picnic Tables	_____ Potable Water
_____ Grills	_____ Boat Fuel
_____ Firepit/ring	_____ Trash Cans
_____ Boat Pump Out	_____ Docks
_____ Trails (specify use_____: Miles_____)	_____ Playground
_____ Shelter	_____ Showers
_____ Designated Swim Area	_____ Concession
_____ Store	_____Marina (# of slips_____)
_____ Dumping Station	

Parking Lots:

Type	Estimated # Paved	Estimated # Gravel	
ADA Spaces	_____	_____	_____ Spaces delineated?
Regular Spaces	_____	_____	_____ Curbs?
Vehicle & trailer spaces	_____	_____	

Sanitation Facilities:

	Flush	(ADA?)	Portable	(ADA?)	Showers	(ADA?)
Unisex	_____	(_____)	_____	(_____)	_____	(_____)
Women	_____	(_____)	_____	(_____)	_____	(_____)
Men	_____	(_____)	_____	(_____)	_____	(_____)

Campground/Campsite:

	RV sites	Cabins	Tent sites	Primitive sites
# of sites	_____	_____	_____	_____
On site parking	_____	_____	_____	_____
Water front	_____	_____	_____	_____
ADA compliant	_____	_____	_____	_____

Boat Launch Facilities:

_____ Hard surface _____ Unimproved (informal) _____ # of Lanes

_____ Gravel _____ Carry In _____ Boat Prep Area?

Courtesy/Fishing Docks:

Courtesy/Fishing	Dimensions	ADA Compliant
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Notes:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Picture Number From _____ To ____

APPENDIX B

RECREATION SITE QUESTIONNAIRES

Monticello Reservoir Public Access Site Questionnaire

Clerk:_____ Site: _____ Date: _____ Time: _____ am/pm

Weather: ☐ Sunny ☐ Partly Cloudy ☐ Cloudy ☐ Light Rain ☐ Heavy Rain

RESPONDENT GENDER: ☐ Male ☐ Female RESPONDENT REFUSED INTERVIEW: ☐
NUMBER OF PEOPLE IN VEHICLE: RESPONDENT DOES NOT SPEAK ENGLISH: ☐
VEHICLE HAS A BOAT TRAILER: ☐ RESPONDENT IS NOT 18 YEARS OR OLDER: ☐
RESPONDENT HAS BEEN INTERVIEWED AT THIS SITE PREVIOUSLY: ☐

THE FIRST FEW QUESTIONS ASK ABOUT YOUR EXPERIENCE HERE TODAY

1. Including yourself, how many people are in your party today? *(Fill in blank.)*

   _____ people in party

2. What time did you arrive ***at Monticello Reservoir*** today? *(Fill in blank.)*

   _____ am / pm

3. What is the primary recreation activity that you participated in today ***at Monticello Reservoir***? *(Please read the list to respondents. Check only one main activity in the first column.)*

What other activities did you participate in today ***at Monticello Reservoir***? *(Check all that apply in the second column.)*

Check only <u>one</u> main activity	*Check all other activities*	*Types of Activities*
		FISHING:
☐	☐	***boat fishing***
☐	☐	***pier/dock fishing***
☐	☐	***bank fishing***
		BOATING:
☐	☐	***motor boating***
☐	☐	***pontoon/party boating***
☐	☐	***sailing***
☐	☐	***canoeing/kayaking***
☐	☐	***windsurfing***
☐	☐	***paddleboarding***
		OTHER:
☐	☐	***bicycling***
☐	☐	***tent or vehicle camping***
☐	☐	***horseback riding***
☐	☐	***walking/hiking/backpacking***
☐	☐	***sightseeing***
☐	☐	***hunting***
☐	☐	***nature study/wildlife viewing/photography***
☐	☐	***swimming***
☐	☐	***picnicking***
☐	☐	***sunbathing***
☐	☐	***other:_____***

Check only one main activity	*Check all other activities*	*Types of Activities*
	☐	***None***

4. Did you spend any time ***on the water on Monticello Reservoir*** today? *(Check one box.)*

☐ YES
☐ NO *(If no, skip to Question 6.)*

5A. Did you recreate on any of the ***islands on Monticello Reservoir*** today?

☐ YES
☐ NO *(If no, skip to Question 6.)*

5B. ~~Here is a map of the islands on Monticello Reservoir. Can you show me which island(s) that you went to? (*Check all that apply.*)~~

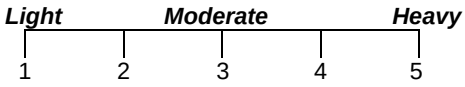
~~☐ Island 1~~ ~~☐ Island 5~~
~~☐ Island 2~~ ~~☐ Island 6~~
~~☐ Island 3~~ ~~☐ Island 7~~
~~☐ Island 4~~

Formatted: Tab stops: Not at 1.5"

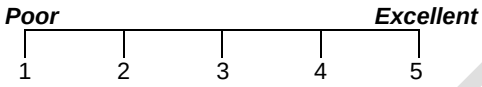
5C. What activities did you participate in ***while on the island(s)***? *(Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)*

~~☐ boat fishing~~	☐ bank fishing	☐ hunting
☐ camping	☐ walking/hiking	☐ sightseeing
☐ nature study/wildlife viewing/photography	☐ swimming	☐ picnicking
☐ sunbathing		
☐ other (please specify: _____)		

6. On a scale from 1 to 5, with 1 being light, 3 being moderate, and 5 being heavy, how would you rate the crowdedness ***at this recreation site*** today? *(Circle one number.)*



7A. On a scale from 1 to 5, with 1 being poor and 5 being excellent, how would you rate the overall condition ***of this recreation site*** today? *(Circle one number.)*



7B. Why did you choose to come to ***this recreation site*** today? (*Fill in the blank.)*

_____
_____
_____
_____

7C. Are there any additional facilities needed ***at this recreation site***? *(Check one box.)*

☐ YES
☐ NO *(If no, skip to Question 8.)*

7D. What do you recommend? *(Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)*

☐ access road	☐ bank fishing area	☐ boat dock
☐ boat launch	☐ camping area	☐ fish cleaning station
☐ fishing pier/dock	☐ lighting	☐ parking lot
☐ picnic tables/shelter	☐ restrooms	☐ signs & information
☐ swimming area	☐ trails	☐ trash cans
☐ RV camping	☐ tent camping	☐ bilingual signs & information
☐ other (please specify: _____)		

7E. Are there any other improvements that you would recommend for this site?

☐ YES
☐ NO *(If no, skip to Question 8.)*

7F. What improvements do you recommend? *(Fill in the blank.)*

_____
_____
_____
_____

8. What was your primary reason for choosing to recreate ***at Monticello Reservoir*** today verses another lake or area? *(Fill in blank.)*

_____
_____
_____

9. What ***other lakes*** do you recreate at? *(Fill in blank.)*

_____
_____
_____
_____

I HAVE JUST A FEW MORE QUESTIONS

10. Do you own a permanent or seasonal lakefront residence ***on Monticello Reservoir***? What is your zip code? *(Check one box and fill in the blank for zip code.)*

☐ YES – Permanent Home→ ZIP CODE: _____

☐ YES – Seasonal Home → ZIP CODE: _____

☐ NO - Non-lakefront resident → ZIP CODE: _____

11. In what year were you born? *(Fill in blank.)*

_____ YEAR

12. Do you have any additional comments about the recreation facilities at ***Monticello Reservoir***? (*Please fill in blank and be as specific as possible.*)

_____
_____
_____
_____
_____
_____

THANK YOU FOR YOUR HELP! WE APPRECIATE YOUR TIME TODAY!

Parr Reservoir/Broad River Public Access Site Questionnaire

Clerk:_____ Site: _____ Date: _____ Time: _____ am/pm

Weather: ☐ Sunny ☐ Partly Cloudy ☐ Cloudy ☐ Light Rain ☐ Heavy Rain

RESPONDENT GENDER: ☐ Male ☐ Female RESPONDENT REFUSED INTERVIEW: ☐
NUMBER OF PEOPLE IN VEHICLE: RESPONDENT DOES NOT SPEAK ENGLISH: ☐
VEHICLE HAS A BOAT TRAILER: ☐ RESPONDENT IS NOT 18 YEARS OR OLDER: ☐
RESPONDENT HAS BEEN INTERVIEWED AT THIS SITE PREVIOUSLY: ☐

THE FIRST FEW QUESTIONS ASK ABOUT YOUR EXPERIENCE HERE TODAY

1. Including yourself, how many people are in your party today? *(Fill in blank.)*

   _____ people in party

2. What time did you arrive ***at Parr Reservoir*** today? *(Fill in blank.)*

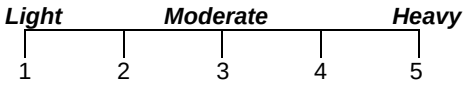
   _____ am / pm

3. What is the primary recreation activity that you participated in today ***at Parr Reservoir***? *(Please read the list to respondents. Check only one main activity in the first column.)*

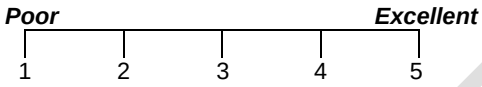
   What other activities did you participate in today ***at Parr Reservoir***? *(Check all that apply in the second column.)*

Check only <u>one</u> main activity	*Check all other activities*	*Types of Activities*
		FISHING:
☐	☐	***boat fishing***
☐	☐	***pier/dock fishing***
☐	☐	***bank fishing***
		BOATING:
☐	☐	***motor boating***
☐	☐	***canoeing/kayaking***
		OTHER:
☐	☐	***tent or vehicle camping***
☐	☐	***horseback riding***
☐	☐	***walking/hiking/backpacking***
☐	☐	***Sightseeing***
☐	☐	***Hunting***
☐	☐	***nature study/wildlife viewing/photography***
☐	☐	***Swimming***
☐	☐	***Picnicking***
☐	☐	***Sunbathing***
☐	☐	***other:_____***
	☐	***None***

4. On a scale from 1 to 5, with 1 being light, 3 being moderate, and 5 being heavy, how would you rate the crowdedness ***at this recreation site*** today? *(Circle one number.)*



5A. On a scale from 1 to 5, with 1 being poor and 5 being excellent, how would you rate the overall condition ***of this recreation site*** today? *(Circle one number.)*



5B. Why did you choose to come to ***this recreation site*** today? (*Fill in the blank.)*

_____
_____
_____
_____

5C. Are there any additional facilities needed ***at this recreation site***? *(Check one box.)*

☐ YES
☐ NO *(If no, skip to Question 6.)*

5D. What do you recommend? *(Do not read this list. Allow respondent to answer and check all that apply and/or fill in the blanks.)*

☐ access road	☐ bank fishing area	☐ boat dock
☐ boat launch	☐ camping area	☐ fish cleaning station
☐ fishing pier/dock	☐ lighting	☐ parking lot
☐ picnic tables/shelter	☐ restrooms	☐ signs & information
☐ swimming area	☐ trails	☐ trash cans
☐ RV camping	☐ tent camping	☐ bilingual signs & information
☐ other (please specify: _____)		

5E. Are there any other improvements that you would recommend for this site?

☐ YES
☐ NO *(If no, skip to Question 6.)*

5F. What improvements do you recommend? *(Fill in the blank.)*

_____

_____

_____

_____

I HAVE JUST A FEW MORE QUESTIONS

6. Do you own a permanent or seasonal residence ***on the Broad River***? What is your zip code? *(Check one box and fill in the blank for zip code.)*

☐ YES – Permanent Home→ ZIP CODE: _____

☐ YES – Seasonal Home → ZIP CODE: _____

☐ NO - Non-lakefront resident → ZIP CODE: _____

7. In what year were you born? *(Fill in blank.)*

_____ YEAR

8. Do you have any additional comments about the recreation facilities on ***Parr Reservoir***? (*Please fill in blank and be as specific as possible.*)

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR HELP! WE APPRECIATE YOUR TIME TODAY!

DRAFT

DOWNSTREAM RECREATIONAL FLOW ASSESSMENT STUDY PLAN

PARR HYDROELECTRIC PROJECT (FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

September 2013

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DOWNSTREAM RECREATIONAL FLOW ASSESSMENT STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Parr Hydro Development, in particular, forms Parr Reservoir along the Broad River. The Development consists of a 37-foot-high, 200-foot-long concrete gravity spillway dam with a powerhouse housing generating units with a combined licensed capacity of 14.9 MW. Parr Hydro operates in a modified run-of-river mode and normally continuously operates to pass Broad River flow. The 13-mile-long Parr Reservoir has a surface area of 4,400 acres at full pool and serves as the lower reservoir for pumped-storage operations at the Fairfield Pumped Storage Development.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

Accordingly, SCE&G organized a Recreation TWC (Appendix A), comprised of interested stakeholders who will collaborate with SCE&G to identify and make recommendations related to

recreational needs and opportunities in the Project area. The TWC has requested that a study be designed and implemented that would assess flows downstream of the Parr Shoals Dam (Parr Dam) that provide quality recreational experiences and identify preferred flows for recreational activities, primarily as they relate to wade-angling, canoeing and kayaking.

2.0 PURPOSE OF THE STUDY

To fulfill the needs identified by the TWC, this study will serve to assess potential and identify preferred recreational flows downstream of the Parr Dam primarily as they relate to wade-angling, canoeing and kayaking. This study encompasses the following goals and objectives:

Goal 1: *Characterize currently available recreational opportunities on the Broad River, downstream of the Parr Dam, as they relate to wade-angling, canoeing and kayaking. This will be accomplished by meeting the following objectives:*

i. Utilize the information collected during focus group activities to identify the current patterns of non-motorized boating use on the Broad River, below the Parr Dam, by location and volume, and the quality of those activities.
ii. Estimate preferred flows and seasonal distribution associated with reasonable and safe recreational use of the Broad River, below Parr Dam, for target activities.

Goal 2: *Evaluate potential issues related to portage around Parr Dam. This will be accomplished by meeting the following objectives:*

i. Identify the need among paddlers for portage opportunities around Parr Dam through focus group discussions.

3.0 STUDY AREA

The Project boundary, as defined by FERC, does not encompass the Broad River below the Parr Dam. However, operation of the Parr Development affects and could serve to enhance recreational opportunities below Parr Dam. As noted, SCE&G currently operates the Parr Dam in a modified run-of-river capacity.

Comment [b1]: Add map of boundary of sturdy area and location of current public access points

For this study, the geographic scope will begin at the base of the Parr Dam and encompass limited downstream areas of the Broad River. Focus group discussions will be directed toward recreational wading and boating flow opportunities as they relate to representative hydraulic conditions (i.e. runs, pools, and rapids) in identified reaches of the Broad River. Should Phase 2 be implemented, as discussed below, the specific areas of any on-water evaluations/verifications will be chosen with regards to access and in consultation with the TWC/focus group.

4.0 METHODOLOGY

Information gathered for this study will be used to examine the suitability of the Broad River, downstream of the Parr Dam, for different recreational activities under various flow ranges. The study may involve a one or two-phase approach, depending upon the outcome of Phase 1, to meet the goals of the study through the objectives identified above. Phase 1 will involve convening a panel of experienced anglers, paddlers, NGOs and agency staff familiar with the study reaches to assess the feasibility and potential quality of particular flow ranges for specified on-water activities. Pertinent existing information will also be reviewed as it relates to this effort. Phase 2 will involve an on-site evaluation with members of the TWC and/or focus group convened during Phase 1, if the information gleaned during Phase 1 activities does not serve to meet study goals.

In addition to these efforts, the planned Project Recreation Use and Needs Study will provide information regarding recreational opportunities, patterns and levels of use on the Broad River, primarily above the Parr Dam. This data may be utilized in association with the data gathered from Phase 1 and, potentially, Phase 2 efforts.

4.1 PHASE 1 - FOCUS GROUP AND EXISTING INFORMATION REVIEW

A panel of knowledgeable and experienced parties will be formed to collect and disseminate information regarding recreation opportunities and potential flow effects on recreation on the Broad River downstream of the Parr Dam. The panel will include local paddlers/outfitters, anglers, canoe/kayak clubs, and members of the TWC. A focus group discussion will be conducted to identify and document characteristics of the Broad River within the Study Area with respect to the nature, seasonal distribution, and quality of target on-water activities and preferred river flows.

Existing information about the Broad River channel, hydrology, and flow data for the Broad River in the vicinity of the Project, will be compiled and reviewed to determine if there is any information or data pertinent to this effort. Literature searches will be conducted via the web, libraries, and SCE&G and agency and NGO collections.

4.2 PHASE 2 - SITE RECONNAISSANCE

Contingent upon discussions with the TWC and panel members under Phase 1, a site reconnaissance may be necessary to augment existing information and for the field verification of preferred recreational flows. Critical areas for evaluation will be pre-determined in consultation with the TWC. Information gained from mesohabitat studies may also aid in the identification of instream hydraulic alterations and may provide useful information for selecting on-water evaluation areas. The TWC and panel will observe and assess the quality of target recreational activities at the pre-determined locations and at the preferred flow ranges determined as part of the Phase 1 analysis.

5.0 DELIVERABLES

A draft and final report will be prepared for this effort. The draft report will be reviewed internally by the Recreation TWC and the Lake and Land Management and Recreation Resource Conservation Group (RCG). Comments and edits from the TWC will be incorporated into a Final Report for the relicensing effort. The report will include an executive summary, an introduction, objectives, methods and the resulting recommendations for recreational flows.

6.0 SCHEDULE

The proposed schedule for completion of the Downstream Recreational Flow Assessment is as follows:

TASK	DATE
Focus Group ~~ Meeting 1~~and Literature Review	~~April - June 2015~~September – October 2014
Focus Group ~~ Meeting 2~~	September 2015
Phase 2 Panel Reconnaissance	~~July - ~~ ~~September~~October - November 2015
Submit Draft Report	~~October - November 2015~~2016
TWC Review	~~December 2015 - January~~ 2016
Submit Final Report	~~February - March~~ 2016

7.0 REFERENCES

South Carolina Department of Parks, Recreation and Tourism, Recreation, Planning and Engineering Office. 2008. South Carolina Statewide Comprehensive Outdoor Recreation Plan.

University of South Carolina. 2005. South Carolina Recreation Participation & Preference Study. Prepared for the South Carolina Department of Parks, Recreation and Tourism. (Online) [URL]: http://www.scprt.com/files/RPE/2005%20Rec%20Study.pdf

Whitaker, Doug, Bo Shelby, and John Gangemi. 2005. Flows and Recreation: A Guide to Studies for River Professionals. October 2005.

DRAFT

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The Project is currently engaged in a relicensing process which involves cooperation and collaboration among SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

The Recreation TWC has requested that flows downstream of the Parr Shoals Dam (Parr Dam) be assessed during planned Instream Flow Incremental Methodology (IFIM) studies to determine if downstream flows currently facilitate one-way navigation at an identified point of constriction in the Broad River, downstream of the Project. Although the primary purpose of the IFIM study is to develop an understanding of key habitat-flow relationships for aquatic species in the Broad River, the IFIM study also provides an appropriate means of determining consistency with navigational goals under various flow scenarios.

2.0 STUDY OBJECTIVE

The objective of the navigational analysis is to assess the flow levels within the Broad River, at identified points of constriction, needed to facilitate one-way navigation. The criteria for one-way navigation can be defined as a "minimum depth of one foot across a channel 10 feet wide or across 10 percent of the total stream width, whichever is greater. Minimum depth does not need to occur across a continuous 10 percent of the stream width, but each point of passage must be at least 10 feet wide."(SCWRC, 1988)

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

The navigational analyses will evaluate flows within the Broad River at points of navigational constriction downstream of the Parr Dam. Recreation TWC participants initially have identified one point of potential constriction at the shoal located roughly 2.4 miles upstream of Haltiwanger Island or Bookman Island (Figure 1). This area is included within the study area for the IFIM and Mesohabitat studies. Other specific areas of constriction may be reviewed and assessed during IFIM study efforts.

Comment [b1]: Revise map to include Book man Island in addition to Haltiwanger Island and IFIM Study Site 7.

Comment [b2]: Revise wording to determine for most restrictive spot as determined by mesohabitat field survey later this year. .

The navigational analyses will be conducted during the summer of 2015 concurrent with IFIM study efforts.

4.0 METHODOLOGY

IFIM study transects will include representative locations at points of navigational constriction, as discussed in 3.0, to allow the characterization of hydraulics (wetted depth and width) during a range of flows. The "navigational" transect locations will be field blazed with flagging, recorded via GPS, or other appropriate means. The study sites will be mapped sufficiently to quantify the areas represented by the transects. Consistent with IFIM survey protocol, transect headpin and tailpin ends will be located at or above the top-of-bank elevation, and secured by steel rebar or other similar means. A measuring tape accurate to 0.1-foot will be secured at each transect to enable repeat field measurements, if necessary. Stream bed and water elevations tied to a local datum will be surveyed to the nearest 0.1-foot using standard optical surveying instrumentation and methods. If USGS gage data is not available, a staff gage may be placed at the study site to confirm stable flow during measurements. Survey activities are anticipated to take place at a

flow of 400 cfs. A water level logger will also be placed at the transect locations to gather water surface elevation data under various flow events. Water surface elevations will be used to develop stage-discharge relationships for the site and the stage-discharge relationships will be assessed on whether one-way navigation is achieved.

Information obtained during survey activities will be included within the draft IFIM report that will be submitted to the study team for review and comment. The report will document the methods and results as encountered in the field. Supporting data will be presented in graphic and tabular form and appendices will include cross-sectional survey data and reference photographs of study sites.

The methodology for this analysis may be revised or supplemented based on consultation with the Instream Flow TWC and other interested stakeholders, or if field efforts so dictate.

5.0 SCHEDULE AND REPORTING

Data will be gathered during the IFIM study, anticipated to occur in 2015. A final report summarizing IFIM study findings, including an analysis of impediments to one-way navigation under various flow conditions, will be issued subsequent to the completion of field work.

6.0 USE OF STUDY RESULTS

Study findings will be used as an information resource during discussion of downstream flow issues with the Instream Flows TWC, and other relicensing stakeholders.

7.0 LIST OF ATTACHMENTS

Figure 1: Potential Point of Navigational Constriction

8.0 REFERENCES

South Carolina Water Resources Commission (SCWRC). 1988. Instream Flow Study Phase II: Determination of Minimum Flow Standards to Protect Instream Uses in Priority Stream Segments: A Report to the South Carolina General Assembly. Available Online. [URL]: http://scwaterlaw.sc.gov/Instream%20Flow%20Study%20ph2.pdf. Accessed August 2013.

FIGURE 1 POTENTIAL POINT OF NAVIGATIONAL CONSTRICTION

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SHORELINE MANAGEMENT PLAN
PARR RESERVOIR

DRAFT

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

September 2013

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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[Discuss the purpose of the SMP and balance that it assists in providing between developmental, recreational and environmental issues]

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[Include discussion on the history of the Project and a discussion of the history of development surrounding the Project. Also discuss FERC approval of the current SMP.]

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3.2 PROJECT BOUNDARY

3.3 ACREAGE OF PROJECT LANDS

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[Discuss specific goals related to the relicensing process, and consultation that has taken place]

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4.1.1 RECREATION/LAKE AND LAND MANAGEMENT RESOURCE CONSERVATION GROUP

4.1.2 LAKE AND LAND MANAGEMENT TECHNICAL WORKING COMMITTEE

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6.5 WILDLIFE CONSERVATION AREA

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6.7 DOCK APPROVAL AREA

6.8 ISLANDS

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[*Discuss the land management prescriptions, as administered through the permitting handbook, and the guiding principles regarding the management of SCE&G-owned lands within each classification*]

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Comment [b2]: Sections 6 and 7 - Reorder as appropriate

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MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Rare, Threatened and Endangered Species TWC Meeting

October 22, 2013

Final KDM 11-13-13

ATTENDEES:

Bill Argentieri (SCE&G)
David Eargle (SCDHEC)
Steve Summer (SCANA)
Shane Boring (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Gerrit Jobsis (American Rivers)
Vivianne Vejdani (SCDNR)
Henry Mealing (Kleinschmidt)
Milton Quattlebaum (SCANA)
Alison Jakupca (Kleinschmidt)
Randy Mahan (SCANA)
Bill Stangler (Congaree Riverkeeper)
Byron Hamstead (USFWS)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting by reviewing the agenda. The group then began to discuss the RT&E Literature Based Study Plan. The group reviewed the USFWS list of RT&E species for Newberry and Fairfield counties. Henry told the group that we plan to begin the research for this study in 2014, and if any other species are added to the list in 2015, they will be included in the final report. The group agreed to this timeline. Byron brought maps to show the locations of the active bald eagle nests near the Project. Steve said that SCE&G also keeps track of the nests. The two groups agreed to work together to make sure that all of this information is shared. Byron agreed to send the Bald Eagle nesting location information to Kelly electronically.

The group then discussed Tom McCoy's comment regarding the Carolina darter. Byron explained that there was a historical record of the species occurring in the Project Area, and that the Project Area provides the correct habitat for this species. However, it is unknown if the record is pre-impoundment. While this species is not currently federally listed (it is a federal species of concern and a state threatened species). Shane will do some research on this species to determine its status in the Project Area. Shane reminded the group that any species the agencies want to be included in the study will be added to the list.

Vivianne commented that since this is a desktop study, she isn't sure if the objectives listed in the study plan can be met, including the identification of appropriate habitat for specific species and the verification of the presence or absence of specific species in the study area. She also suggested that the other RT&E studies that will be conducted are referenced in the literature-based study. The study plan was edited to reflect Vivianne's comments.

Byron mentioned that the Newberry burrowing crayfish, a federal at-risk species, needs to be included in the RT&E literature based study plan. Shane said he would make sure this species is captured in the study.

Bill S. asked why the study area specified in the RT&E Literature Based Study Plan only extends a ½ mile below the Parr Shoals Dam. The group agreed that the study needs to extend down to, and include, Frost Shoals. All study plans will be adjusted to be consistent with this geographic scope.

The group then discussed the Rocky Shoals Spider Lily (RSSL) Study Plan and the comments submitted by the USFWS. The USFWS questioned whether the GPS locations of the RSSL should be public knowledge. The group agreed that many locations are already public knowledge and this hasn't been a problem in the past.

Wording is added to Section 7 of the study plan to explain that information collected during the studies will be used in the development of potential PM&E measures. This wording will be added to all of the study plans.

Gerrit requested that elevation information for the RSSL be documented during the study. Bill S. added that the big concern for the species is how long the plants are completely inundated. Too long of an inundation period and they may die, but not long enough leaves the plants susceptible to predation. The group agreed that elevations of some lily populations will be collected during the IFIM study. The RSSL location data will be compared to the proposed IFIM transects, and the IFIM transects could be slightly shifted so that IFIM study data could apply directly to populations of RSSL. The IFIM study plan and the RSSL study plan will be edited to reflect this.

The group then discussed the Spiny Crayfish Study Plan. The USFWS provided comments on the study plan including the concern of how the crayfish will be correctly identified. Alison explained that only the Form I males will be collected in the field, and then sent to Arnie Eversole, or another qualified astacologist for further identification.

USFWS was also concerned about how frequently the traps will be monitored. Alison explained that the traps will be checked weekly, unless cannibalism or predation seems to be an issue. The traps will then be checked more frequently. The USFWS suggested changing the bait to canned cat food, and everyone agreed that this is an appropriate and effective bait. The study plan was edited to reflect this change. David then asked if the timing of the study is most appropriate for catching crayfish. Alison will contact Arnie Eversole to confirm that this is the correct time for the study, and that the traps are being checked at the appropriate frequency.

The group discussed the proposed monitoring sites for the crayfish study. Byron would like to see the traps set near woody debris, at a variety of depths in the river. Bill S. says that no monitoring location is currently set for downstream of the Parr Shoals Dam, and that maybe another site should be added in that area. The group decided that the best option would be to include general areas for monitoring in the study plan and then go on a reconnaissance trip to determine exact locations closer to the time the study will be conducted. USFWS, SCE&G and Kleinschmidt will work together to determine the best locations for the traps, with consideration to habitat, likely hood of success, and accessibility. Byron also suggested the possibility of having more than one trap at each monitoring location. This was also included in the study plan edits and will be determined during the reconnaissance trip.

Byron also suggested collecting water quality data at the sampling stations. Henry said that a YSI meter can be taken when the traps are checked and temperature, dissolved oxygen and conductivity will be recorded.

After lunch, the group discussed the Monticello Mussel Study Plan. The USFWS requested that water quality data be collected at the sampling sites. Shane spoke with John Alderman prior to the meeting and asked his opinion on this. John said he didn't think it was necessary, since it just provides a snapshot of the water quality in a specific location. However the group decided that when the study is performed, water quality data, including temperature, dissolved oxygen and conductivity, will be collected using a YSI meter at some of the sampling sites. USFWS was also interested in learning the qualifications of the malacologist that will be performing the study, to ensure that he or she has the correct permits to handle RT&E species in the event one is discovered. Shane said that John Alderman or a similarly qualified group will likely be leading the study, and all are qualified and permitted to handle any sensitive species. David asked if the Carolina heelsplitter needs to be specifically mentioned in the study plan. Shane told David that all mussels found will be identified, and if the Carolina heelsplitter is found in Monticello Reservoir that it will be documented.

Henry told the group that if anyone is interested in participating in a particular study, to let SCE&G or Kleinschmidt know. They are welcome to participate in the field studies if we can accommodate them.

The four study plans discussed during this meeting are included at the end of these notes, with all edits shown in track changes. Revised and finalized copies of the documents will be emailed to the TWC. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Byron will email the Bald Eagle nesting information to Kelly.
- Shane will research the Carolina darter to determine if the species is located in the Project Area.
- Bill S. will send Kelly the Davenport study and reference for the Rocky Shoals Spider Lily.
- Alison will talk to Arnie Eversole verifying the correct time and frequency to sample crayfish.
- Kleinschmidt will update the geographic scope of all study plans to extend downstream of Parr Shoals Dam to include Frost Shoals. The study plans will also be updated to mention that all information collected during the studies will be considered in the development of potential PM&E measures.

- Kleinschmidt will revise the RSSL and IFIM Study Plans to include documenting elevation of the RSSL populations.

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Fairfield Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1).

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as the licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGOs), and interested individuals. Collaboration and cooperation of stakeholders is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWCs), including members from among the interested stakeholders, with the objective of achieving consensus regarding the identification and proper treatment of these resource issues in the context of a new license.

In preparation for relicensing, SCE&G formed a Rare, Threatened and Endangered Species Technical Working Committee ("RT&E TWC" or "TWC"), which is comprised of interested stakeholders who are working with SCE&G to identify potential issues, make biological study recommendations, and provide technical and experience-based input related to rare, threatened and endangered (RT&E) species potentially residing in the Project area. SCE&G is planning to conduct a literature-based study to compile existing information on federally and state listed RT&E species in the immediate project area. SCE&G will use this information in developing their license application for Federal Energy Regulatory Commission (FERC).

2.0 STUDY OBJECTIVES

The objective of this study is to ~~accurately~~ characterize the present status of RT&E species at the Parr Fairfield Hydroelectric Project by providing information regarding the availability of RT&E habitat and ~~by verifying the presence or absence~~characterize the known status of RT&E species within the Project boundary and Project vicinity. The presence or absence of selected species will be verified through targeted field studies.

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

This study will focus on all areas within the FERC Project boundary, including Parr and Monticello reservoirs and the immediate vicinity of the Project in Fairfield and Newberry counties. As this study is a desktop exercise, no field reconnaissance will be implemented. RT&E species that are deemed as potentially occurring within the Project Area and from Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island~~vicinity will be noted through this study,~~ along with the known presences of available RT&E habitat will be evaluated. The study is scheduled to commence in 2015.

Comment [b1]: Add a section listing the RT&E studies that we are doing, such as spiny crayfish, RSSL, etc.

Comment [b2]: Make the geographic scope consistent throughout all of the study plans.

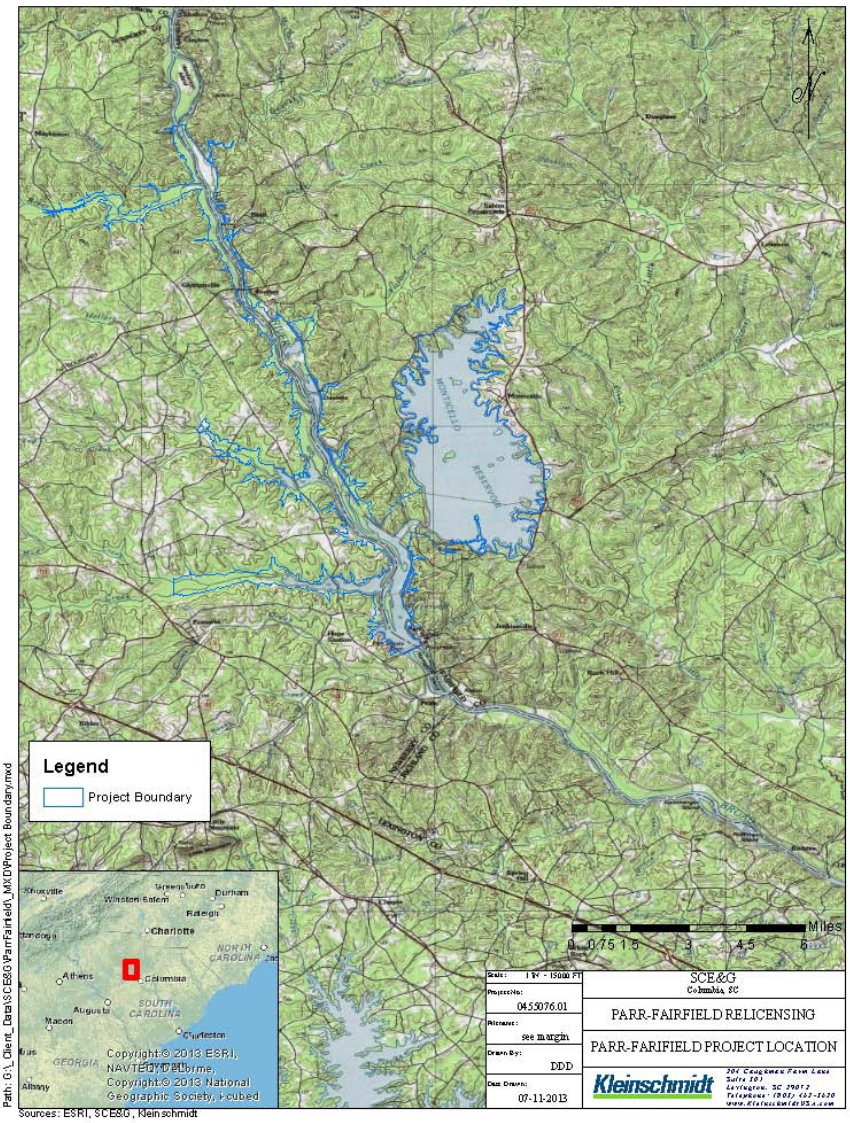

FIGURE 1 PARR-FAIRFIELD PROJECT LOCATION MAP

4.0 COLLECTION METHODS AND ANALYSIS

In order to appropriately characterize the present status of RT&E species in the Project vicinity, information will be collected from various sources, including the South Carolina Department of Natural Resources (SCDNR) and the U.S. Fish and Wildlife Service (USFWS) RT&E databases.

As an initial step, a list of RT&E species documented as occurring in the counties surrounding the Project and downstream (Newberry, ~~and~~ Fairfield and Richland) will be compiled based on the USFWS and SCDNR county level listings. Additional key species may be added at the request of TWC members, if agreed to be appropriate. The federal, state and global status of each of these species will be summarized, along with counties of occurrence. As a second step, known ranges of these species, along with occurrence data from the SCDNR Natural Heritage Program and other survey data, will then be used to eliminate species occurring in the counties but not in the Broad River Basin. Habitat requirements of each of the remaining species will then be summarized and compared to available habitat within the Project boundary and include an area ~~just~~ downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island~~for approximately ½ mile~~. This analysis will yield a list of species that potentially occur within the Broad River Basin, and that have suitable habitat within the Project Boundary and ~~just~~ downstream of the Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island~~for approximately ½ mile~~.

5.0 SCHEDULE

Research and data collection efforts will begin ~~in~~ no later than the spring of 2015. A final report summarizing the study findings including the compiled spreadsheets will be issued within 120 days of the completion of data collection. Study methodology and timing may be adjusted based on consultation with resource agencies and interested stakeholders.

6.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, USFWS, RT&E TWC and other relicensing stakeholders.

DRAFT
ROCKY SHOALS SPIDER LILY *(HYMENOCALLIS CORONARIA)* STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

DRAFT
ROCKY SHOALS SPIDER LILY
(Hymenocallis coronaria)
STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC No. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

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October 2013

DRAFT ROCKY SHOALS SPIDER LILY
***(HYMENOCALLIS CORONARIA)* STUDY PLAN**

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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DRAFT ROCKY SHOALS SPIDER LILY
***(HYMENOCALLIS CORONARIA)* STUDY PLAN**

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

The Parr Fairfield Hydroelectric Project (FERC No. 1894) ("Parr Fairfield Project" or "Project"), owned and operated by the South Carolina Electric & Gas Company ("SCE&G" or "Licensee"), is seeking a new license from the Federal Energy Regulatory Commission ("FERC"), as their current license is set to expire on June 30, 2020. The Parr Fairfield Project consists of two developments, including the Parr Hydro Development and the Fairfield Pumped Storage Development, located in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWCs) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license. A Rare, Threatened & Endangered Species TWC ("RT&E TWC" or "TWC") was formed to address potential RT&E related issues associated with the Project. It is comprised of stakeholders including the U.S. Fish and Wildlife Service ("USFWS"), the National Marine Fisheries Service ("NMFS"), the South Carolina Department of Health and Environmental Control ("SCDHEC") and the South Carolina Department of Natural Resources ("SCDNR"), among others. During issues scoping, the TWC identified a South Carolina state species of concern, the Rocky Shoals Spider Lily (*Hymenocallis coronaria*) as occurring in the Broad River, downstream of the Parr Shoals Dam (Parr Dam). TWC members requested a survey to document the presence of this species in reaches downstream of the Project Area.

2.0 RELEVANT LIFE HISTORY INFORMATION

The Rocky Shoals Spider Lily (*Hymenocallis coronaria*), a recognized species of concern for South Carolina, is an aquatic, perennial flowering plant easily identified by its large white flowers. The plant develops from a bulb and grows to be approximately 3 feet tall. *H. coronaria* requires a specialized habitat of swift, shallow flowing water over rocks and direct sunlight (Davenport, 2007). The Broad River downstream of the Parr Dam contains shoal areas which provide the necessary habitat for this species. During winter months, plant bulbs and seeds stay buried in the rocky riverbed until May, when leaves begin to emerge above the water surface. During this time, flower stalks begin to develop and the short blooming season occurs from mid-May through June (Davenport, 2007).

3.0 STUDY OBJECTIVES

The objective of this study is to assess the status of *H. coronaria* within the area of Project influence by identifying and documenting all populations in the portion of the Broad River from Parr Dam extending to and including Frost Shoals, near Boatwright Island~~to Boatwright Island, including Frost Shoals~~.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

As the life history information indicates, *H. coronaria* populations may occur at various shoals along the Broad River downstream of the Parr Dam. For this reason, the survey area will include the stretch of the Broad River downstream of the Parr Dam extending to and including Frost Shoals, near Boatwright Island. The survey reach is depicted in yellow in Figure 1.

The study will occur during the flowering season over two to three days in May or June, depending on flows and weather.

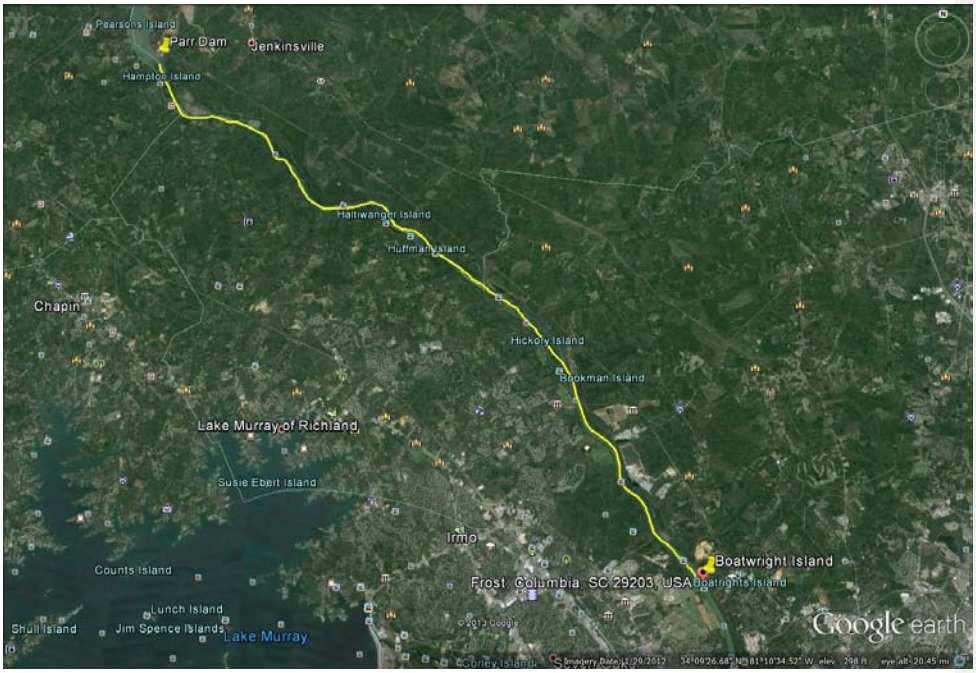

FIGURE 1 ROCKY SHOALS SPIDER LILY SURVEY REACH

5.0 COLLECTION METHODS AND ANALYSIS

The survey will take place during the flowering season of the *H. coronaria*, which occurs from late spring to early summer. A survey crew(s) will deploy in kayaks or canoes at the base of the Parr Dam and paddle downstream, observing the area for populations of *H. coronaria*. The main stem river channel, side channel areas and island complexes will be thoroughly surveyed. The crew(s) will paddle approximately halfway down the survey reach on Day 1. The group will then reconvene at the take-out location from Day 1 on Day 2 and paddle the remainder of the study area. When populations are sighted, the crew will document the exact location of the plants using GPS. The basal area of plants or clumps of plants will be measured and recorded. Elevation data for documented plants or clumps of plants will be obtained either during this survey or during the IFIM Survey. ~~The number of individual plants within each population will also be estimated and recorded.~~

6.0 SCHEDULE

It is anticipated that data collection will occur in the spring of 2015. Due to the variability in flows and meteorlogic conditions, the exact survey dates will be determined at a later date and announced two weeks in advance to the TWC members. If 2015 has extensive high flow conditions that would not allow for an effective assessment, the study will be postponed until the spring of 2016.

Within 90 days of the close of field work, a final report summarizing the study findings will be issued. Study methodology, duration and timing may be adjusted based on consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Comment [b1]: Add reference to potential PM&E measures to all study plans

Study results will be used as an information resource during the discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, SCDHEC, USFWS, RT&E TWC, and other relicensing stakeholders.

8.0 REFERENCES

Davenport, L. J. (2007). "Cahaba Lily." *The Encyclopedia of Alabama*. [Online] URL: http://www.encyclopediaofalabama.org/face/Article.jsp?id=h-967. Accessed August 7, 2013.

DRAFT
BROAD RIVER SPINY CRAYFISH *CAMBARUS SPICATUS* STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

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September 2013

DRAFT

BROAD RIVER SPINY CRAYFISH *CAMBARUS SPICATUS* STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
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September 2013

DRAFT BROAD RIVER SPINY CRAYFISH
***CAMBARUS SPICATUS* STUDY PLAN**

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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***CAMBARUS SPICATUS* STUDY PLAN**

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894)(Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

During issues scoping, the TWC identified the potential need for a crayfish survey dependent upon discussions with U.S. Fish and Wildlife Service ("USFWS"). Based upon communications with the USFWS on June 6, 2013, the Broad River Spiny Crayfish (*Cambarus spicatus*), a South Carolina species of special concern, may be located within the Project area. As such, crayfish surveys were recommended to document the presence of this species within the Project area and downstream of the Parr Shoals Dam.

2.0 RELEVANT LIFE HISTORY INFORMATION

As noted, the Broad River Spiny Crayfish (*Cambarus spicatus*) is a species of concern in South Carolina. Eversole (1990) identified *C. spicatus* as having a distribution limited to lotic environments in the Broad River drainage basin. *C. spicatus* collections in the vicinity of the Project occurred within the Little River, a tributary to the Broad River, in Fairfield County. Although *C. spicatus* collections are limited, individuals were primarily associated with leaf litter and other organic debris located along the banks of streams. Preferred substrates have been found to be comprised primarily of sand and tend to be unstable in nature with a lack of rooted aquatic vegetation. Current information indicates that *C. spicatus* reproduces during the summer months (Eversole, 1990). *C. spicatus* was described by Hobbs (1956) as gray-green with cream, pink, purple and brown highlights. The chelae (the "claw" or "pincer") are green with orange tips and a double row of tubercles. Individuals range from about 60 mm (2.4 inches) to 78 mm (3.1 inches) in length.

3.0 STUDY OBJECTIVES

The objective of this survey is to assess the status of *C. spicatus* in the portion of the Broad River located within the Project boundary and an accessible area downstream of the Parr Shoals Dam.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

Based upon the life history information identified above, sampling sites will be located along the margins of the Broad River and associated tributaries, in areas of leaf litter/detritus, if possible. At least ~~Three~~ three sampling ~~sites~~ areas are proposed to be included as a part of this survey. ~~These~~ General locations are listed in Table 1 and in Figure 1, below. These locations are approximate and actual sampling sites will be determined ~~in the field~~in consultation with USFWS prior to start of survey.

TABLE 1 BROAD RIVER CRAYFISH SAMPLING LOCATIONS

SAMPLING ~~LOCATIONS~~AREAS
1. ~~Cannon's Creek Boat Ramp~~Main Reservoir
2. ~~Heller's Creek Boat Ramp~~Broad River Downstream of Parr Shoals Dam
3. Hwy 34 Boat Ramp

The study season will extend from August 1 through October 1, 2015.

Comment [b1]: Verify this time frame is correct.

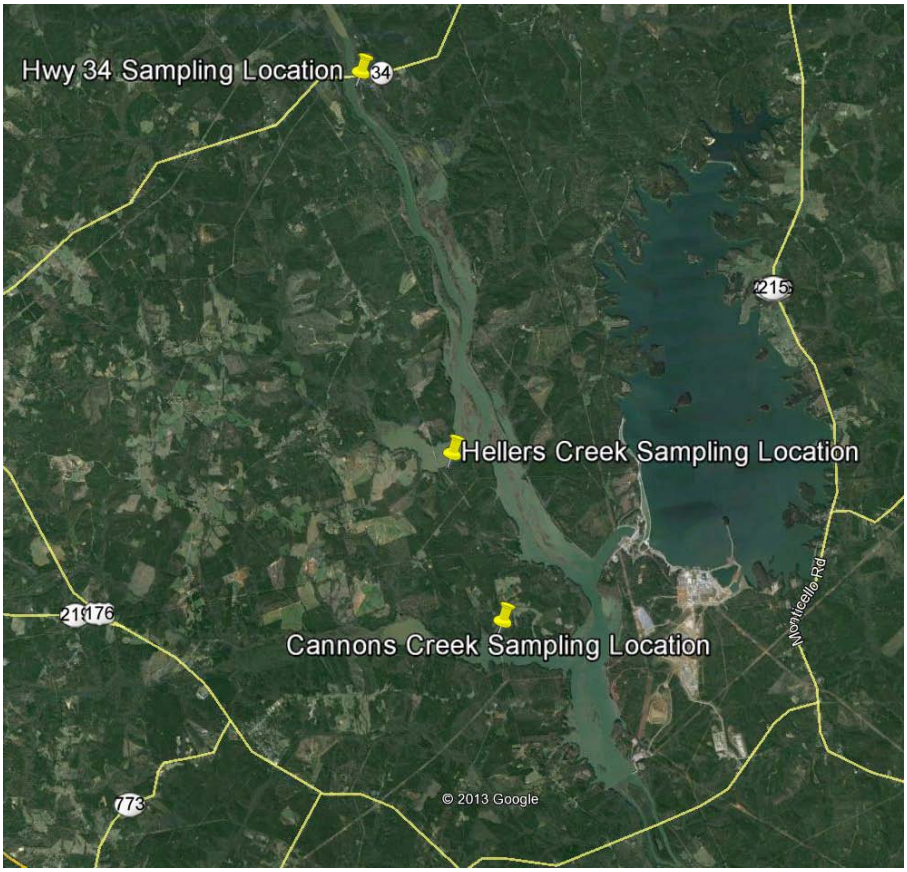

FIGURE 1 CRAYFISH SAMPLING LOCATIONS

Comment [b2]: Change / expand map move pins to proposed areas.

5.0 COLLECTION METHODS AND ANALYSIS

Passive trap methods will be utilized for this study. Traps will consist of double-entry, galvanized wire mesh minnow traps with 1" opercula. Traps will be baited with ~~herring~~ canned fish and will be re-baited at weekly intervals, or as needed. A one-pound weight will be placed in the traps to ensure that they remain submerged. Traps will be deployed along ~~river margins~~shoreline, in areas of detritus and/or leaf litter, if possible. The number of traps per area will be determined during sample location reconnaissance. Traps will also be placed in locations where water depth is sufficient to ensure that they remain inundated ~~over the full range of~~

~~reservoir fluctuations~~. They will also be positioned such that they are not readily noticeable in an effort to decrease disturbance and vandalism. In the event of vandalism or theft, the trap will be replaced as soon as possible.

The traps will be checked on a weekly basis. Data recorded for each collection event will include: location (including site description and GPS coordinates), date, name of water body, basic water quality parameters (temperature, DO and conductivity), trap retrieval and deployment times~~;~~, the total number of crayfish collected~~;~~, the number of males and females. For the purposes of identification, only Form I males will be collected from the sample; other individuals will be released. Collected materials will be fixed in 5% neutral formalin, washed in tap water and preserved in 70% ethyl alcohol. Samples will be transported to a qualified astacologist for species identification.

6.0 SCHEDULE

Site location reconnaissance will be conducted in consultation with USFWS prior to start of survey. Crayfish traps will be deployed at the ~~three~~ sampling locations on or around August 1, 2015 and will be allowed to sample for approximately eight weeks. The traps will be checked weekly during this sampling period.

Comment [b3]: Verify actual date for this activity.

A final report summarizing the study findings will be issued within 120 days of completion of field work. Study methodology, timing and duration may be adjusted based on consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the South Carolina Department of Natural Resources, USFWS, RT&E TWC, and other relicensing stakeholders.

8.0 REFERENCES

Eversole, Arnold G. 1990. Status Report on *Cambarus (Puncticambarus) spicatus* Hobbs, *Distocambarus (Fitzcambarus) youngineri* Hobbs, and *Procambarus (Pennides) echinatus* Hobbs. Completion Report. 21 pp.

Hobbs, H. H., Jr. 1956a. A new crayfish of the genus Procambarus from South Carolina (Decapoda:Astacidae). J. Wash. Acad. Sci. 46(1):117-121.

NatureServe. 2013. *Cambarus spicatus* Hobbs, Broad River Spiney Crayfish. (Available Online)[URL]: http://www.natureserve.org/

Price, Jennifer. Undated. Broad River Spiny Crayfish *Cambarus spicatus*. 2pp.

DRAFT

LAKE MONTICELLO FRESHWATER MUSSEL RECONNAISSANCE SURVEY STUDY PLAN

PARR HYDROELECTRIC PROJECT (FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

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October 2013

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October 2013

LAKE MONTICELLO FRESHWATER MUSSEL RECONNAISSANCE SURVEY

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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LAKE MONTICELLO FRESHWATER MUSSEL RECONNAISSANCE SURVEY

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

The Parr-Fairfield Hydro Project (FERC No. 1894) (Project) is a 525 megawatt (MW) licensed hydroelectric facility owned and operated by South Carolina Electric & Gas (SCE&G). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1).

The Parr Hydro Development forms Parr Reservoir along the Broad River. The Development consists of a 37-foot-high, 200-foot-long concrete gravity spillway dam with a powerhouse housing generating units with a combined licensed capacity of 14.9 MW. Parr Hydro operates in a modified run-of-river mode and normally operates to continuously pass Broad River flow. The 13-mile-long Parr Reservoir has a surface area of 4,400 acres at full pool and serves as the lower reservoir for pumped-storage operations.

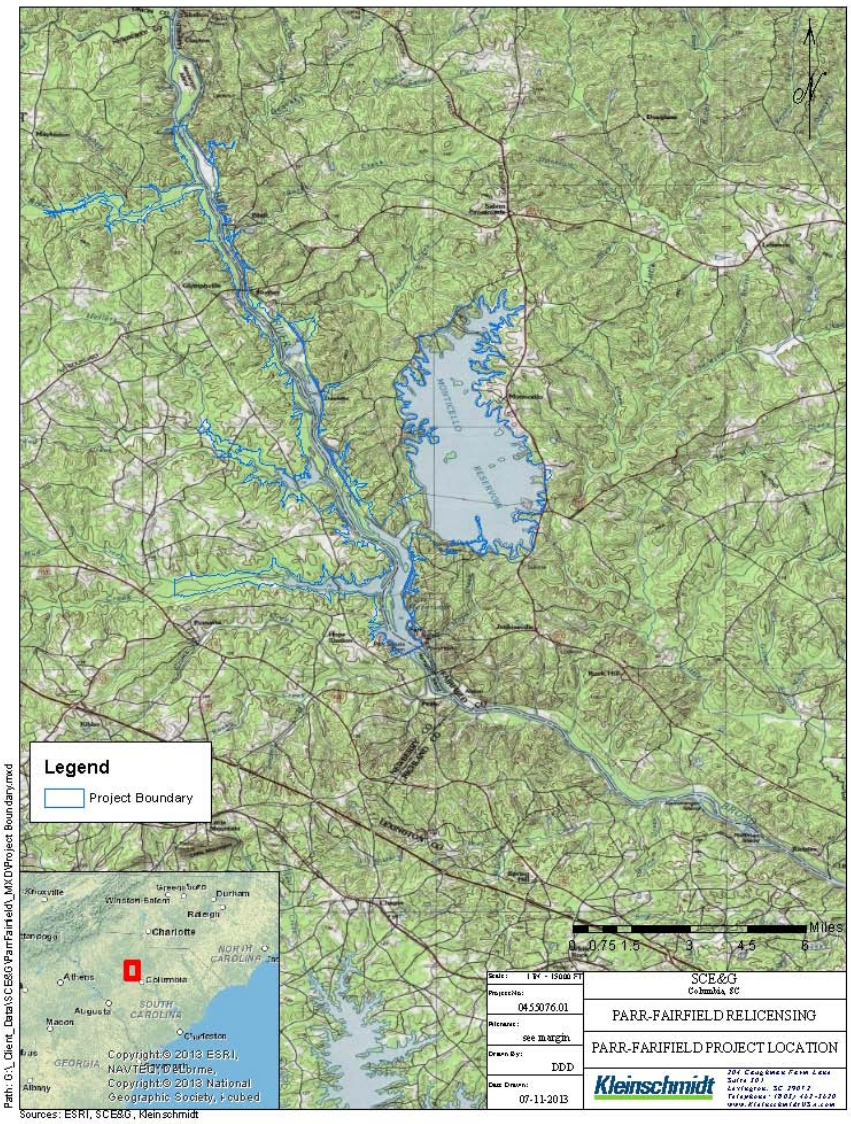
The Fairfield Pumped Storage Development is located directly off of the Broad River and forms the 6,800-acre upper reservoir, Monticello Reservoir, with four earthen dams. As noted, Parr Reservoir serves as the lower reservoir for pumped storage operations. The Fairfield Development has a licensed capacity of 511.2 MW and is primarily used for peaking operations, reserve generation, and power usage.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. Their collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working

Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

During early meetings aimed at scoping appropriate relicensing studies, the Rare, Threatened and Endangered Species (RT&E) TWC requested information describing the status of freshwater mussels in Parr and Monticello reservoirs, as well as in the downstream reach of the Broad River influenced by Project operations. A subsequent TWC review of existing mussel data for the Project vicinity determined that recent surveys conducted by the South Carolina Department of Natural Resources (SCDNR) (Price, 2010) and Alderman Environmental Services (Alderman and Alderman, 2012) were adequate for characterizing the mussel fauna of Parr Reservoir and the downstream reach of the Broad. The TWC further determined that no such data were available for Monticello Reservoir; thus a qualitative survey would be needed. This Study Plan was prepared pursuant to that determination.

FIGURE 1 PROJECT LOCATION MAP



2.0 STUDY OBJECTIVE

The study objective will be to determine whether native freshwater mussels are present within the pool of Monticello Reservoir, and if so, gather qualitative data describing the diversity, spatial distribution and relative abundance of the mussel fauna inhabiting the lake.

3.0 GEOGRAPHIC AND TEMPORAL SCOPE

The reconnaissance survey described herein will focus on selected habitats within the Monticello Reservoir pool that are likely to support populations of native freshwater mussels. Surveys will be conducted in 2015, likely during the summer to early fall months when water clarity and temperatures are sufficiently high to support wading and other in-water survey methods.

4.0 METHODOLOGY

Freshwater mussel surveys in Monticello will utilize qualitative methods that allow for rapid coverage of larger survey areas and have proven more robust at determining diversity of surveyed areas (Miller and Payne, 1993). Qualitative surveys will involve timed visual and/or tactile inspections of suitable habitat for presence of live freshwater mussels and/or shell material and will be conducted by a qualified malacologist with expertise in Broad River fauna. Although the number and specific location of qualitative survey points will likely be refined in the field based on professional judgment of the lead malacologist, it is expected that a minimum of 30 representative sites will be distributed throughout the reservoir[1]. Particular attention will be placed upon the examination of potential Savannah lilliput (*Toxolasma pullus*) (federal at-risk species and State species of concern) habitat within backwater areas of the reservoir.

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Exact methods for conducting visual and tactile searches will vary depending on water depth. However, it should be noted that water levels on Monticello Reservoir typically fluctuate up to 4.5 ft daily as a result of pumping operations, and as such, mussel surveys will focus primarily on those areas below the 4.5 ft depth contour where mussels are likely to become established. Depending upon water depths, wading, batiscope, snorkeling, or SCUBA will be used to conduct timed surveys at each of the selected sites:

[1] It is estimated that each site will require an average of 30 man-minutes to conduct a reconnaissance level survey.

- Wading – Where water is relatively shallow, clear, and flat (no disturbances by wind), a biologist walks over an area to conduct a visual~~ly~~ and/or tactile survey ~~an area~~ for live mussels and shells. This method is typically focused upon examinations of exposed near-shore habitats.
- Batiscope or snorkeling – In clear to slightly turbid waters up to 2 meters deep, or in waters with wind-disturbed surfaces, a batiscope or snorkeling will be used to conduct a visual and/or tactile~~visually~~ survey ~~an area~~ for live mussels and shells.
- SCUBA – In survey areas of Monticello Reservoir with depths from 1 to 8+ meters, a biologist will traverse the lake bottom using SCUBA to conduct a visual and/or tactile survey for mussel species that prefer deeper waters and may not be detected at near-shore sites.

Live and fresh dead mussels collected during the survey will be identified to species, enumerated and returned to their habitat, although some shell material and/or live specimens may be preserved and returned to the laboratory for taxonomic confirmation. All sampling stations, as well as any significant mussel beds found during sampling, will be documented using a Global Positioning System (GPS) receiver. Mussel habitat surveyed at each sample location, as well the species collected during the survey, will also be photo documented. Basic water quality parameters (temperature, DO and conductivity) will be collected near the substrate at representative sample areas.

5.0 REPORTING

A report will be prepared for TWC review and comment. The report will document methods and results as encountered in the field including:

- A species list documenting the diversity of mussel fauna of Monticello Reservoir.
- GIS maps depicting spatial distribution of mussel populations.
- Tabular summaries comparing Catch per Unit Effort and relative abundance of species encountered.
- Summarize water quality data.

6.0 SCHEDULE AND REQUIRED CONDITIONS

As previously noted, it is expected that field surveys will be conducted during the summer or fall of 2015. It is expected that this effort will require 2-3 days of field work to complete. A final

report summarizing the study findings will be issued subsequent to the completion of field work. The methodology for this survey may be revised or supplemented based on consultation with the RT&E TWC and other interested stakeholders.

7.0 USE OF STUDY RESULTS

Study findings will be used as an information resource during discussion of RT&E species issues and developing potential Protection, Mitigation and Enhancement measures with the TWC, and other relicensing stakeholders.

8.0 REFERENCES

Alderman, J.M. and J.D. Alderman. 2012. Freshwater Mussel Surveys within The Broad River, East of Hampton Island. Prepared by Alderman Environmental Services, Inc. for SCANA Services, Inc. October 29, 2012. 48 pp.

Miller, A.C. and B.S. Payne. 1993. Qualitative versus quantitative sampling to evaluate population and community characteristics at a large-river mussel bed. American Midland Naturalist 130:133-145.

Price, J. 2010. Fish Passage on the Broad River: an assessment of the benefits to freshwater mussels. Completion Report to the Broad River Mitigation Fund. University of SC and South Carolina Department of Natural Resources. 59 pp.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Fisheries TWC Meeting

December 19, 2013

Final KDM 1-24-14

ATTENDEES:

Bill Marshall (SCDNR)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Shane Boring (Kleinschmidt)
Dick Christie (SCDNR)
Kelly Miller (Kleinschmidt)
Byron Hamstead (USFWS)
Sam Stokes (SCDNR)
Bill Argentieri (SCE&G)
Ron Ahle (SCDNR)
Randy Mahan (SCANA)
Henry Mealing (Kleinschmidt)
Fritz Rohde (NOAA)
Dan Dieter (Kleinschmidt)
Scott Lamprecht (SCDNR)

These notes serve as a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions and then briefly discussed the agenda with the group.

Fisheries Baseline Report

Shane then reviewed the edits made to the Fisheries Baseline Report. He mentioned that there was only a small amount of fisheries information available for the Recreation Lake and asked that if anyone had more information to send it to him and he would include it in the report. Additional data will be accepted until August 2014 for inclusion in the PAD. Shane also told the group that an addendum was added to the report, summarizing the American Eel and American Shad data collected by SCDNR as part of the Santee River Basin Accord (Accord). SCDNR reviewed the summary before it was finalized and added to the Fisheries Baseline Report.

Robust Redhorse Spawning Areas

The group then discussed the potential Robust Redhorse spawning areas that were identified during the Mesohabitat Assessment. Shane said the search for spawning sites wasn't quantitative however the group had published habitat requirements (Freeman and Freeman 2002) in mind during the survey and identified a few potential sites as they moved downriver. Shane showed the group a few pictures of the two areas that were identified as potential spawning areas for Robust Redhorse. This information is included at the end of these notes. Scott noted that he believed these to also be the two sites where he had tracked his limited number of telemetered fish. Shane noted that Scott and Milton are planning to go out on the river again to search for more potential spawning sites. The group agreed that the best way to document all of this information is for Shane to develop a memo that will be added as an appendix to the IFIM Report, as well as be included in the PAD.

Reservoir Fluctuations

Next the group focused on the fluctuations of Parr and Monticello Reservoirs, and discussed what would be the best way to study these fluctuations and determine possible effects. At an earlier meeting, the group discussed the possibility of using existing LiDAR data to measure the fluctuation zone of each reservoir. Dan analyzed the existing LiDAR data and determined it was unreliable for analyzing the fluctuation zone for a variety of reasons. Since the LiDAR data collected was for land and not water, it was full of errors, most notably related to data not being available for the full range of reservoir fluctuations. Also, Monticello Reservoir was at full pool when the LiDAR was collected, so no shoreline was visible below 425 ft msl. Dan's PowerPoint presentation which summarizes his findings is included at the end of these notes.

Bill A. then presented information on the fluctuations of the two reservoirs, collected by SCE&G and USGS. For both reservoirs, the greatest amount of fluctuation occurs in August and the least amount occurs in February. The average fluctuation for Parr Reservoir over the course of a year is approximately 4.69 ft and the average fluctuation for Monticello Reservoir is approximately 2.46 ft. Henry explained to the group that since reservoir fluctuation occurs every day, fish are not likely to use the habitat that is subject to the daily fluctuations. Ron added that fish don't have to spawn every year, such as during dry years when spawning habitats may not be available. Ron also mentioned that flow control and pool management were potential mitigation options. Henry asked the group to brainstorm other ways that the spawning areas could be enhanced besides flow control. Installation of spawning benches, bamboo bundles, and artificial reefs below the fluctuation zone in Monticello Reservoir can all create artificial spawning habitat for various fish species. Because of the flowing nature of Parr Reservoir, it may be more difficult to permanently install some of these natural or artificial habitats. The group discussed the need to go on site at Parr Reservoir and document the fluctuation effects. Information can be collected at a few select sites, including taking pictures during a drawdown and gathering slope and distance of exposed littoral zones. Milton suggested installing some enhancement measures in areas such as Cannon's Creek, where they are less likely to be washed away. Scott said that in his experience, the best enhancements are of natural materials, such as cedar trees. If cedar trees are submerged when they are still green with the root wads attached, they are very effective and last for a long time. Scott also said that gravel beds are effective at attracting Centrarchids, although it is unknown as to whether they actually use these areas for spawning. Scott also suggested building a small dyke to create a littoral impoundment within Parr Reservoir which would retain water between fluctuations. This would be another way to create spawning habitat. Henry said that all of these ideas can be evaluated in the future as PM&E measures. In the meantime, the group agreed to go out to representative locations within the two reservoirs and document the exposed areas during fluctuations to create a baseline. Steve also suggested that the group could consider the total surface area of Parr Reservoir before and after the 9 ft crest gates were built. This area accounts for 9 of the 10 feet of fluctuation zone in Parr Reservoir. SCE&G and Kleinschmidt will develop a study plan to include existing information on the fluctuations with Parr and Monticello Reservoirs, an action plan for gathering more information at select sites within the reservoirs, and possible options for PM&E measures.

Waterfowl Study

Shane then discussed the changes that were made to the Waterfowl Study Plan. At the request of SCDNR, three additional monitoring dates per study year were added to the existing six monitoring dates per study year, for a total of 18 monitoring dates, or nine per year. Everyone agreed to these changes, so this study plan will be finalized for inclusion in the PAD.

American Eel Abundance Study

The group then discussed the American Eel Study Plan. There was initial concern over the frequency in which the American eel trap was to be checked. Traps were originally to be checked weekly, but after further discussion, the study plan was amended to specify that traps would be checked every Monday, Wednesday, and Friday during the study period. Henry then explained that SCE&G and Kleinschmidt are investigating the use of a "wireless camera" to aid in monitoring. This way, traps could be remotely monitored on a daily basis. Since technology is constantly changing, the group agreed to amend the study plan explaining that the eel trap would be monitored remotely via on-site camera or on-site every Monday, Wednesday and Friday. Fritz expressed concern that one trap may not be enough to thoroughly monitor the area for eels, and showed the group images of traps from an American eel study that was performed at Roanoke Rapids in North Carolina. Henry reminded the group that previous eel studies at the Columbia Dam, located downstream of Parr Shoals Dam, collected less than 10 eels over several years of study. Based on that information the group decided that one trap should be satisfactory for the study. Henry added that electrofishing efforts would also be utilized to ensure the study area is thoroughly examined for American eels. Fritz agreed that one trap would be fine, as long as it is properly placed. Kleinschmidt will edit the study plan to reflect the changes discussed and Bill A. will submit the final plan to the Accord members for approval.

Entrainment/Impingement Study

The group discussed the draft Entrainment/Impingement Study Plan. Prior to the meeting, Byron submitted comments and questions regarding this study plan, which were addressed as the group worked through the document. Henry explained to the group how a desktop entrainment study is prepared and some history on how these desktop studies began in the 1990's. He explained that factors such as bar rack spacing, entrainment velocities, location of intakes, reservoir stratification, species composition, and turbine size and type are all considered, among others, during a desktop study. There was some general discussion regarding collecting hydroacoustic information as part of the study. Dick explained that hydroacoustic data was collected at the Keowee-Toxaway Project, and data collected showed that operational changes at one of the units resulted in a reduction in entrainment. Field work was performed at that Project because fish populations were a concern however this is not the case at the Parr/Fairfield Project. There was general consensus that a desktop Entrainment/Impingement Study was an acceptable method to address this issue. The group discussed the need for hold points to occur during the study. The group will meet to discuss the progress of the study after each of the following parts of the study is complete: Step 1 - Develop an entrainment and turbine mortality database that can be applied to the Parr and Monticello developments; Step 3 - Characterize the species composition of potential fish entrainment; Step 5 - Estimate the total annual entrainment for the Project based on normal operation; and Step 7 - Estimate impingement mortality for fish elimination from entrainment estimates. A draft report will then be issued. Bill M. asked if any information was available on fish distribution in the forebay area. Very little is currently available, so the group agreed to have Milton conduct some additional electrofishing surveys in the forebay in Monticello Reservoir and the tailrace canal in Parr Reservoir when he collects fish for the VC Summer Nuclear Plan studies in the spring and fall of 2014 and 2015. This information will also be used in the Entrainment study. Kleinschmidt will revise the study plan to reflect the changes discussed and send out a revised draft to the TWC for approval. The study plan will then be finalized and included in the PAD.

Diadromous Fish Passage

The group then talked about the need for a Diadromous Fish Passage Alternatives Evaluation, an issue that was originally raised by Gerrit Jobsis and Karla Reece at one of the initial RCG meetings. Byron noted in an email prior to the meeting that the USFWS thought that this issue would be addressed as part of the Accord. Bill A. explained for the group that the Accord has identified triggers for a fish passage alternatives analysis. Henry said that information on the Accord, along with information on the Santee-Cooper Basin Diadromous Fish Passage Restoration Plan, will be included in the PAD however moving forward with a fish passage alternatives plan is premature at this point. Fritz noted that there has been internal discussion within the NOAA Protected Resources Group about becoming more involved in the Parr/Fairfield Relicensing and the Accord. The group agreed that this is an appropriate way to handle the issue at this point and in the meantime, SCE&G and Kleinschmidt will reach out to Gerrit and Karla to discuss any further concerns they may have.

After discussion of the fish passage issue, Henry closed the meeting. Action items identified during the meeting are included below.

ACTION ITEMS:

- Ron will send his photos of the two sites identified for Robust Redhorse spawning to Kelly.
- SCE&G will develop graphs depicting the fluctuations during wet versus dry years at Parr and Monticello Reservoir.
- SCE&G will find information on the reservoir surface areas before and after the crest gates were built, to be included in the Fluctuation Study Plan.
- Kleinschmidt will develop a Fluctuation Study Plan and submit to the TWC for review.
- Kleinschmidt will finalize the Waterfowl Study Plan and distribute to the TWC.
- Kleinschmidt will amend and finalize the American Eel Study Plan as discussed at the meeting and distribute to the TWC. Bill A. will submit this study plan to the Accord members for approval.
- Kleinschmidt will revise the Entrainment/Impingement Study Plan and resubmit the draft to the TWC for review.

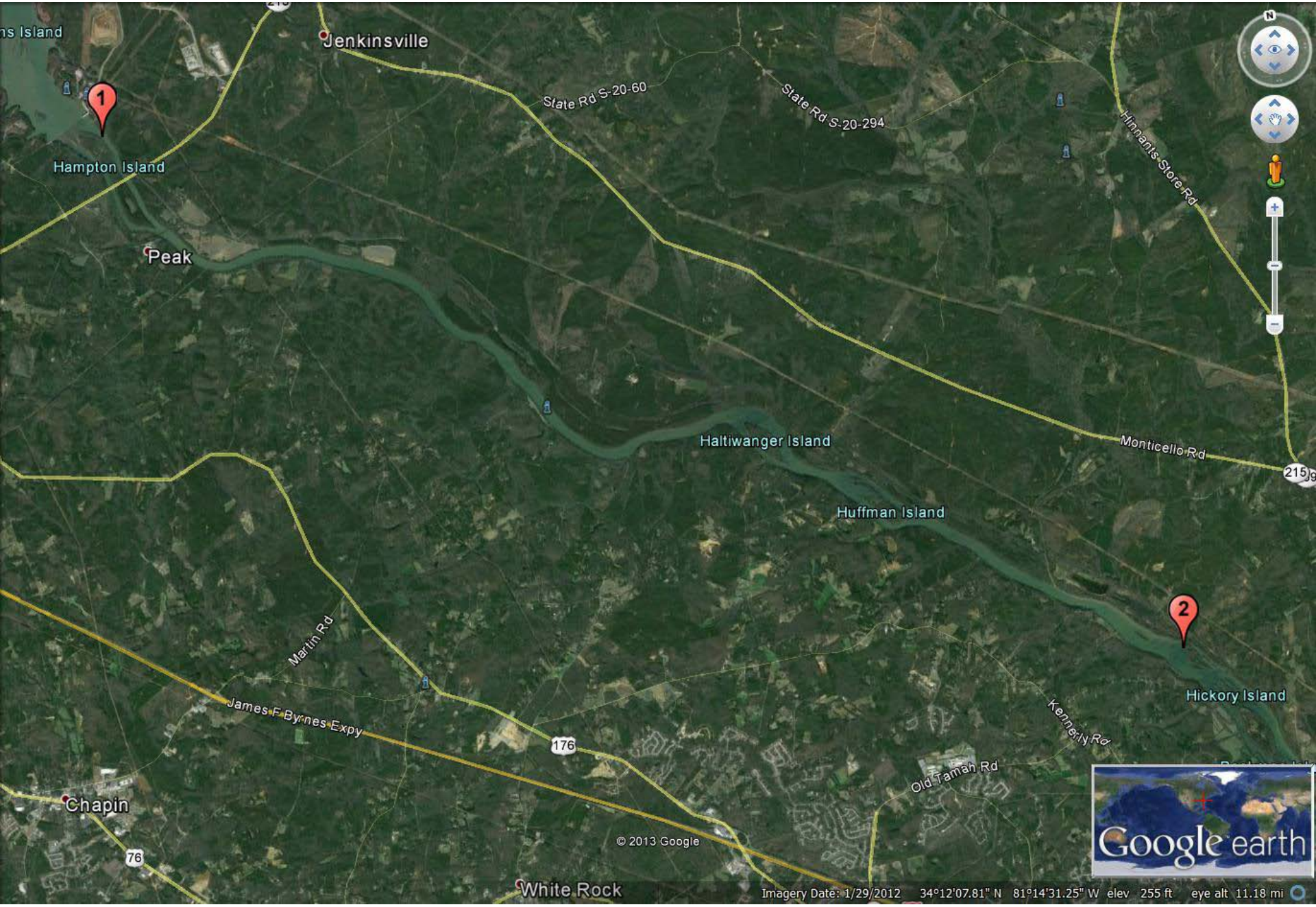
Potential Robust Redhorse Sites

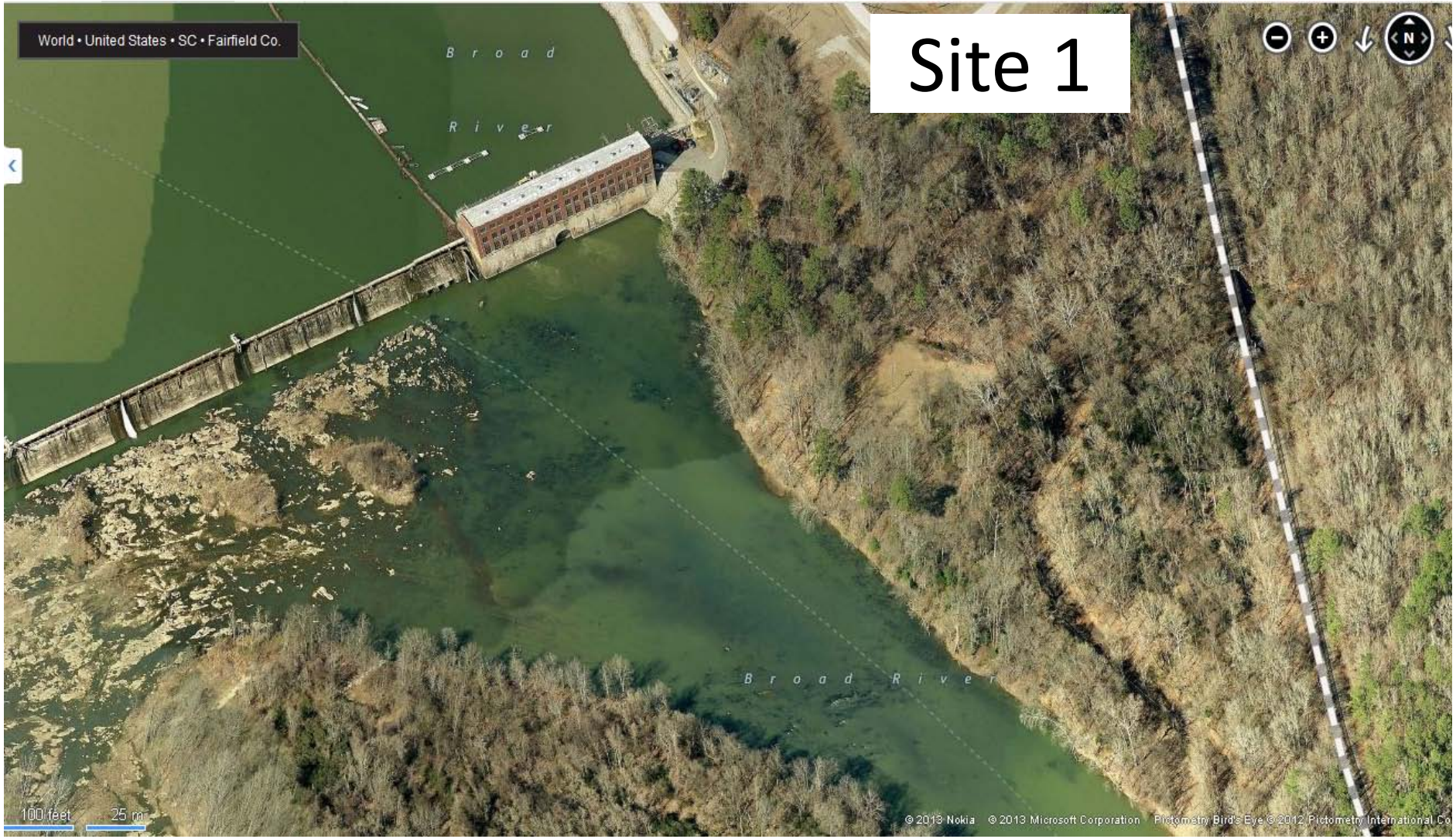
Robust Redhorse Spawning Habitat (Freeman and Freeman, 2001)

- Mid-channel gravel bars
- Dominated by medium - coarse gravel, 12-50 mm (0.5 – 2.0 in)
- < 30 % sand and minimal fine particles
- “small enough to be moved and allow egg deposition….yet large enough to provide interstitial space for eggs and larvae”

Robust Redhorse Spawning Habitat (Freeman and Freeman, 2001)

- Suitable water depth: 0.29 - 1.1 m (1 – 3.6 ft)
- Suitable average water column velocity: 0.26 - 0.67 m/s (0.85 – 2.20 ft/s)
- Interstitial flow thought to be very important, hence spawning in “heads of gravel-bottom riffle” (glides)


Jenkinsville
State Rd S-20-60
State Rd S-20-294
Hinnants Store Rd
1
Hampton Island
Peak
Haltiwanger Island
Monticello Rd
215
Huffman Island
2
Martin Rd
Hickory Island
James F Byrnes Expy
176
Kennerly Rd
Old Taman Rd
Chapin
76
© 2013 Google
White Rock
Google earth
Imagery Date: 1/29/2012 34°12'07.81" N 81°14'31.25" W elev 255 ft eye alt 11.18 mi


World • United States • SC • Fairfield Co.
Broad River
Broad River
100 feet
25 m
© 2013 Nokia © 2013 Microsoft Corporation Pictometry Bird's Eye © 2012 Pictometry International Co

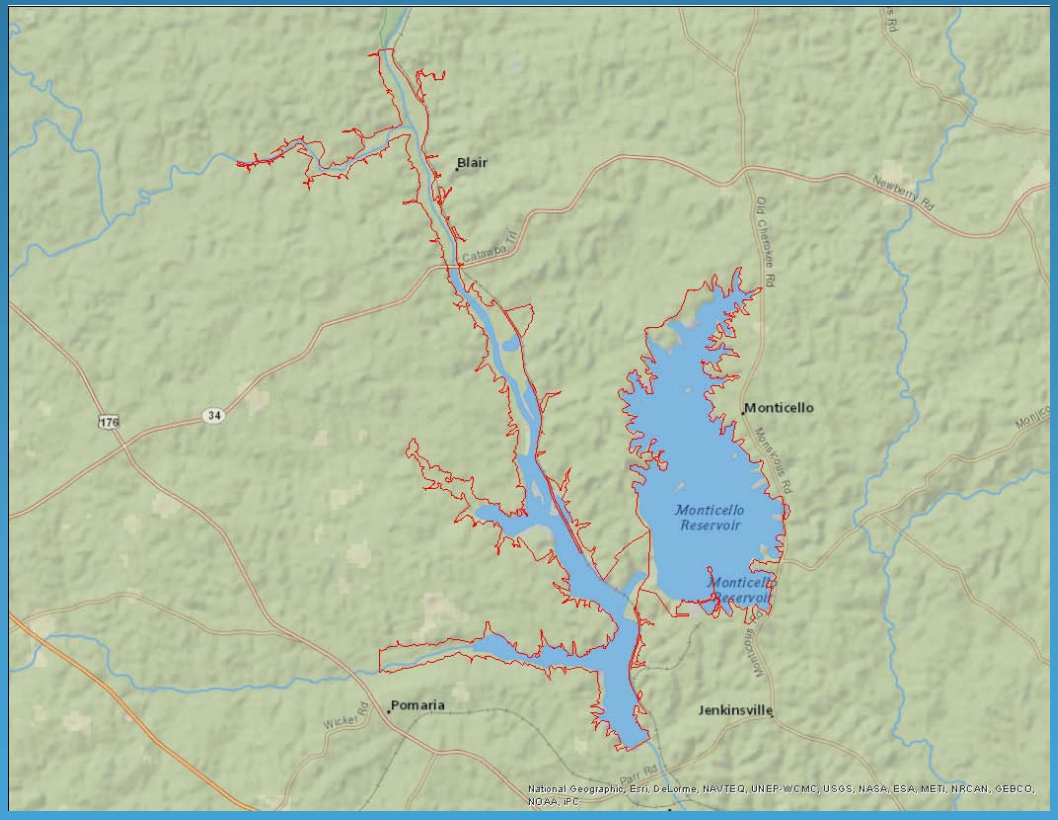
Site 1


World • United States • SC • Richland Co. • North Area
Site 2
B r o a d R i v e r
25 feet
10 m
© 2013 Microsoft Corporation © 2012 Pictometry International Corp


10/24/2013


10/24/2013

Reservoir Fluctuation at Parr and Monticello Reservoirs



Introduction

- Minimum reservoir pools create some dynamic riparian areas

- Public LiDAR data was studied to determine the surface area exposure resulting from reservoir fluctuation within the project boundary

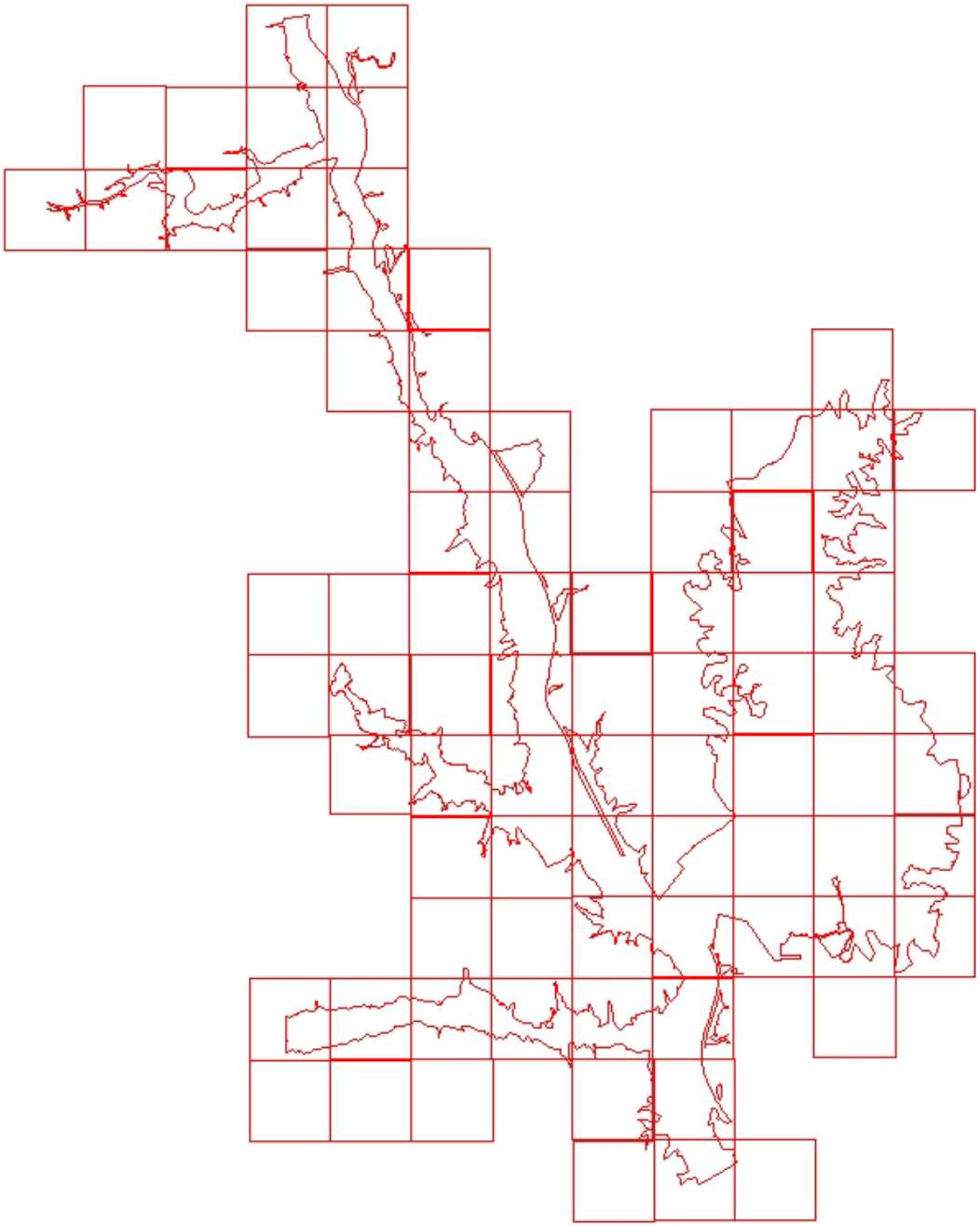
Background

- Parr Reservoir water surface elevations resulting from the Fairfield Pump Storage System
  - Maximum pool elevation 266 ft
  - Minimum pool elevation 256 ft

- Surface Area of Parr Reservoir – 4,400 acres
- Surface Area of Monticello Reservoir – 6,800 acres
- Total Surface Area of Both Reservoirs – 11,200 acres

Methods

- LiDAR point cloud data (.las) collected and verified for USGS by contractor Dewberry and subcontractor Fugro EarthData
- Collected from January, 15 2008 to February 10, 2008
- <2% error in dataset



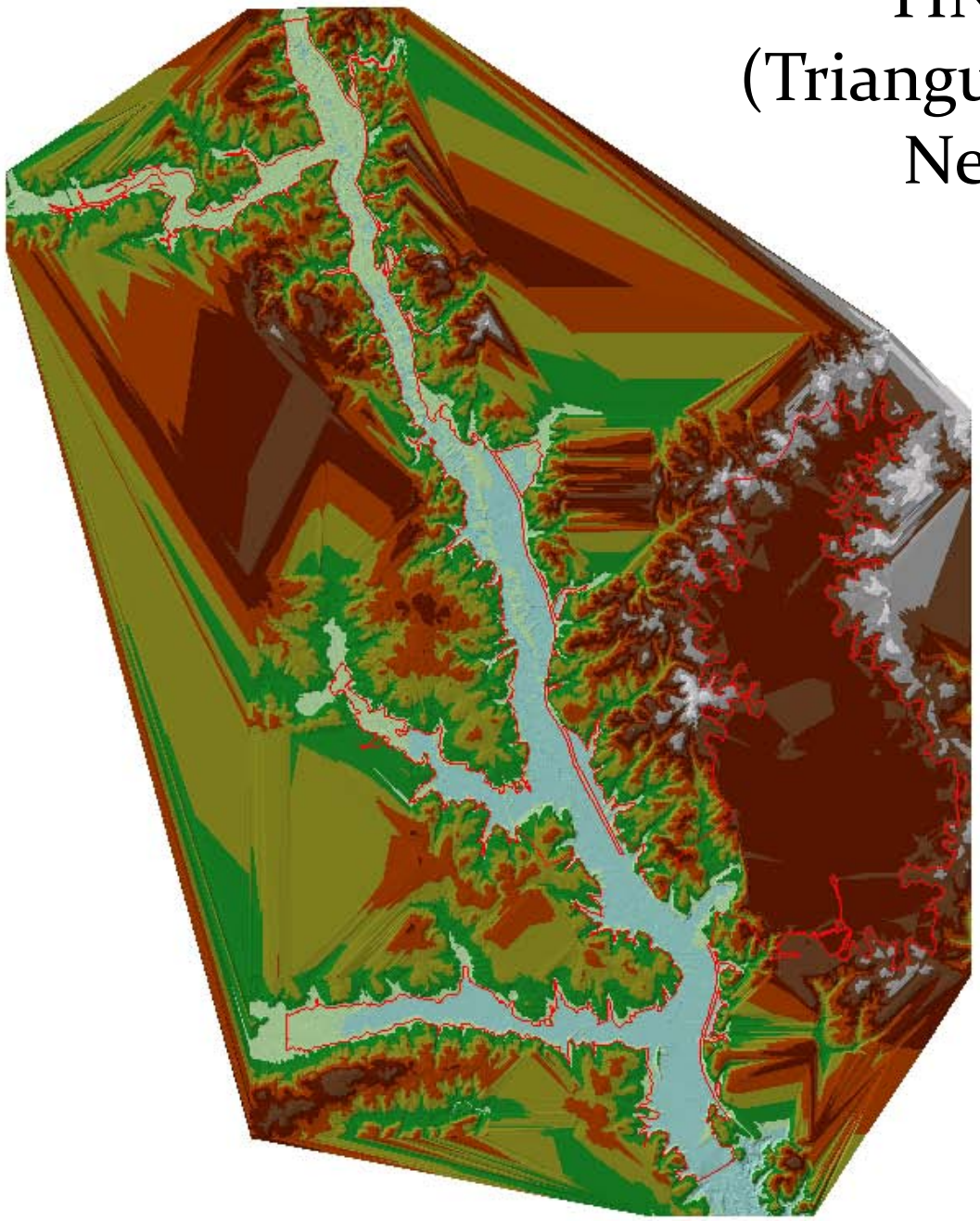
Methods (cont'd)

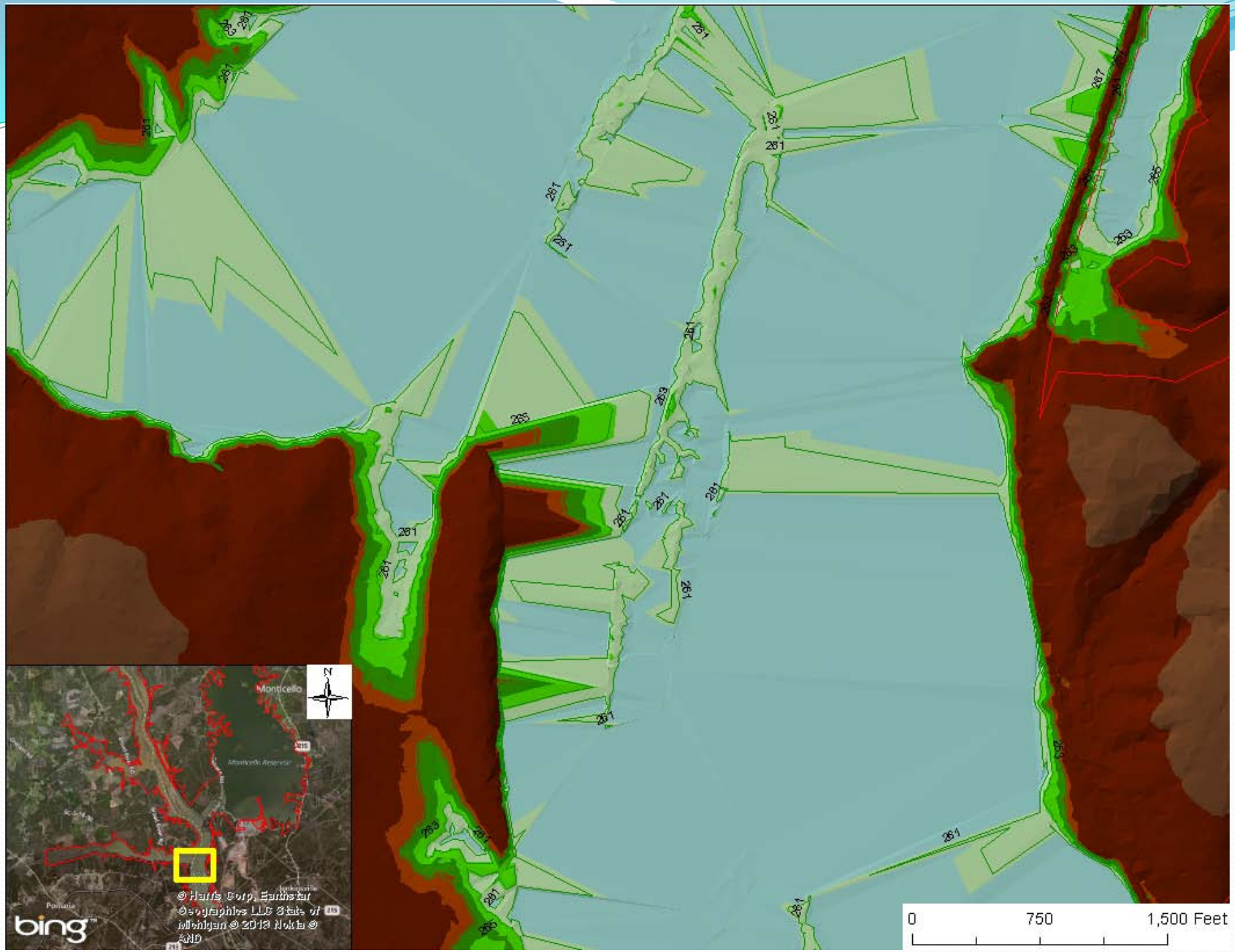
- Las Dataset created in ArcMap 10.1 with project boundary as a surface constraint
- Data conversion from Las to TIN
  - Surface Volume Functional tool to calculate surface area
- TIN to Contours
  - Contours illustrate 2ft topographical elevations

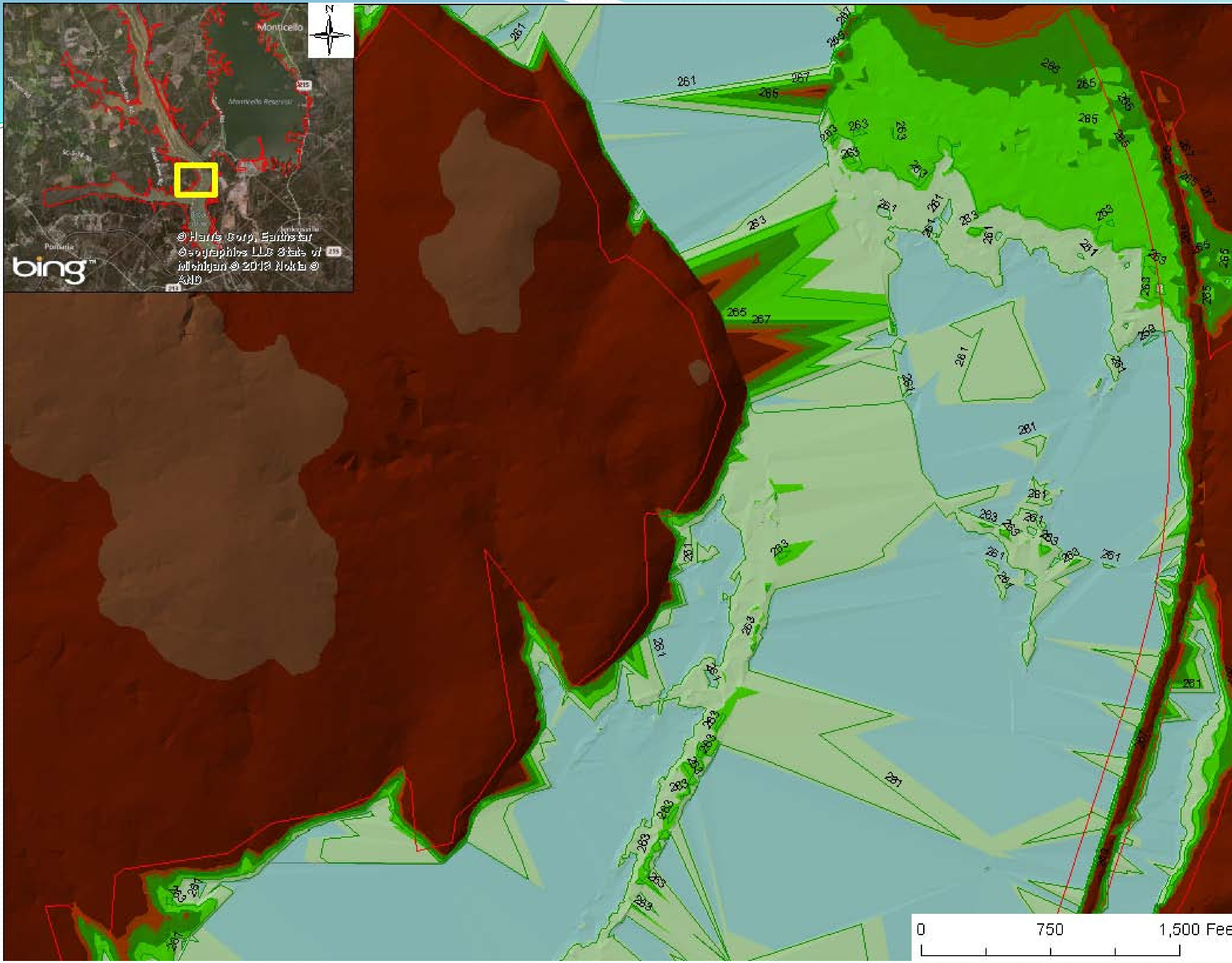
Methods (cont'd)

- Areas of exposure were measured in 2ft increments of total acreage within the project boundary at Parr Reservoir
  - 267-265
  - 265-263
  - 263-261
  - 261-259
  - 267-259 (total)

TIN Model (Triangular Irregular Network)




261
263
265
N
Monticello
Pomaria
bing
0
750
1,500 Feet



Monticello
Monticello Reservoir
N
© Harris Corp, Earthstar Geographics LLC State of Michigan © 2013 Nokia © AND
bing
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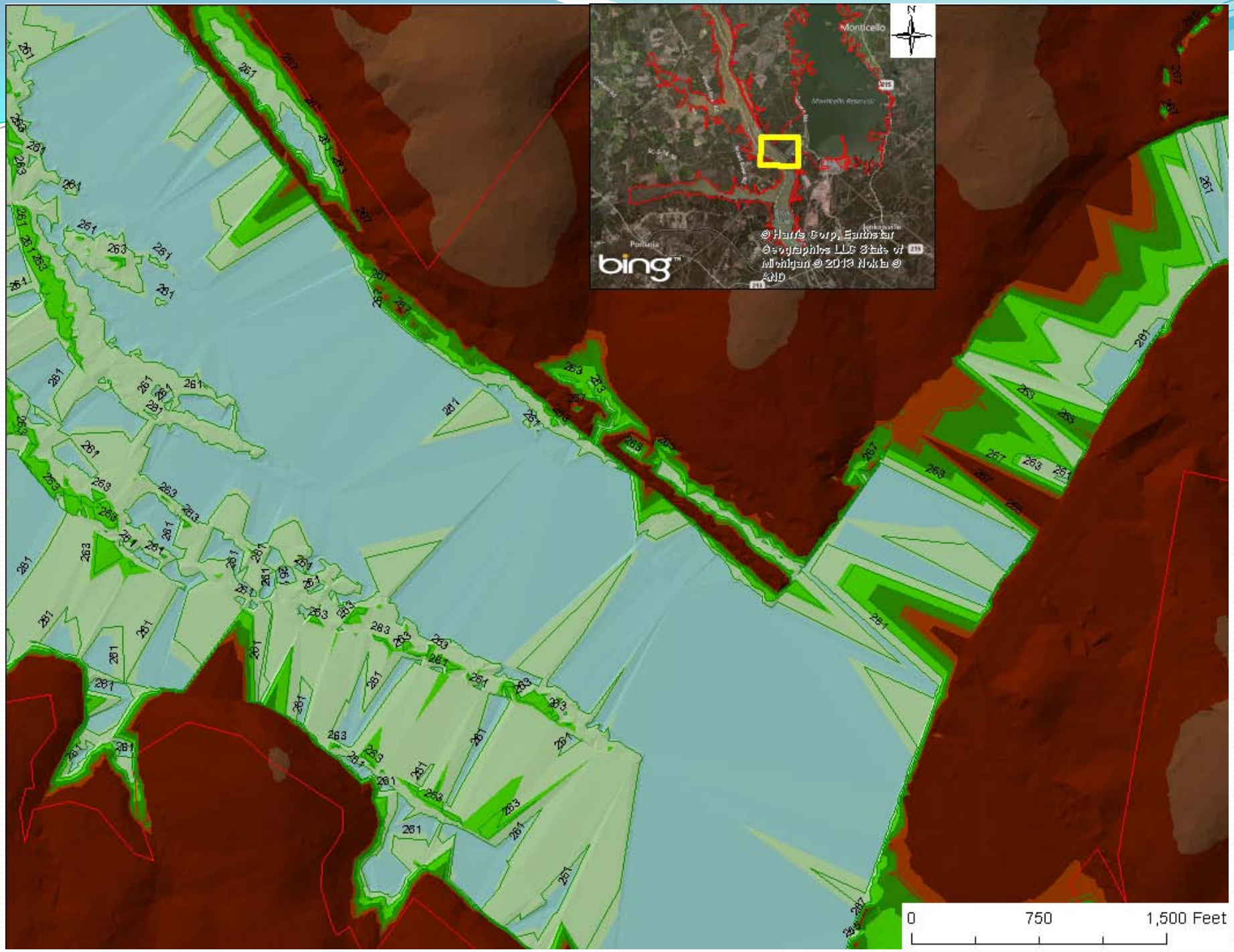
1,500 Feet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Monticello
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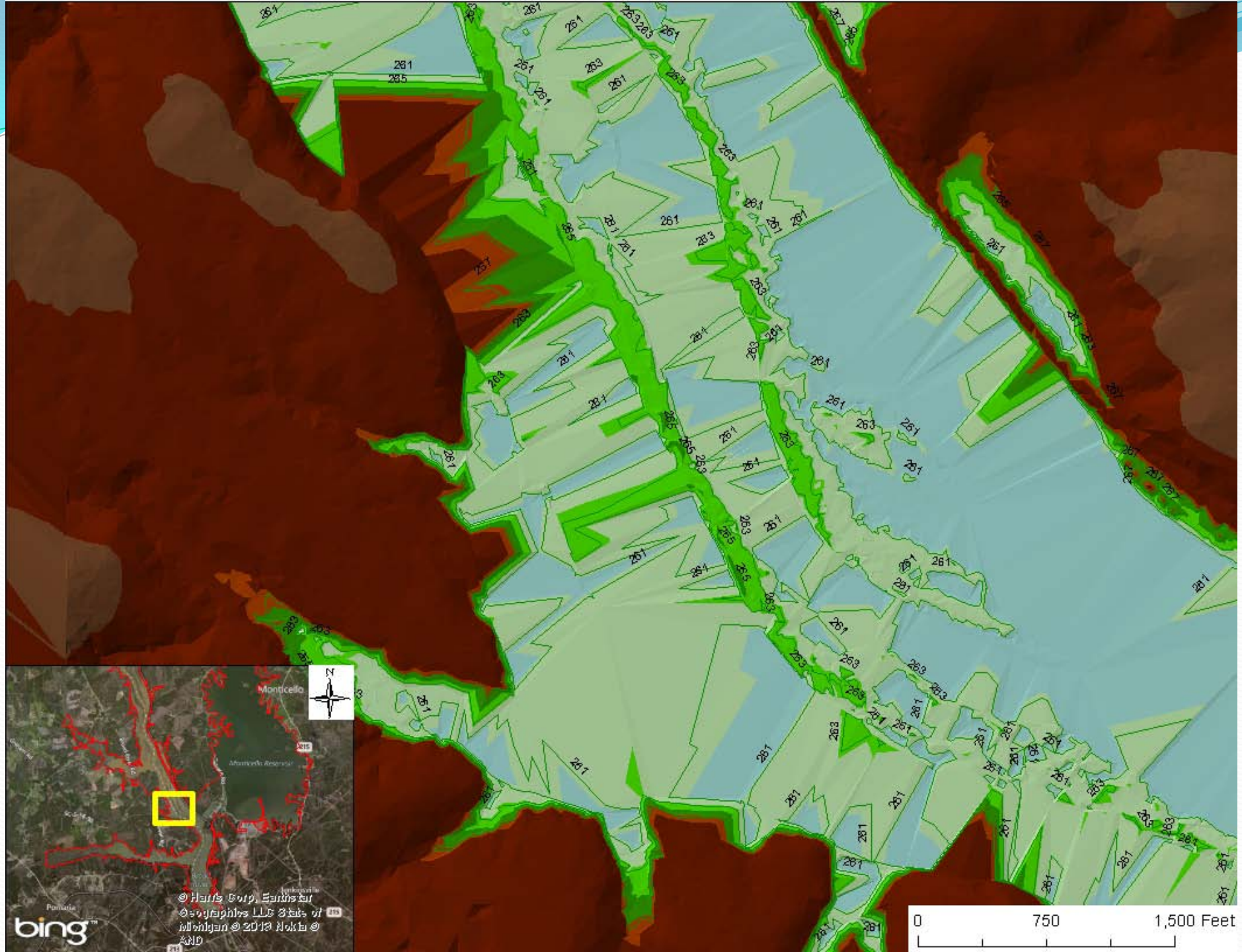
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Monticello
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© Harris Corp, Earthstar Geographics LLC State of Michigan © 2013 Nokia © AND
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1,500 Feet

Broad River
Broad River
261
263
265
267
259
Monticello
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© Harris Corp, Earthstar Geographics LLC State of Michigan © 2013 Nokia © AND
bing
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750
1,500 Feet


N
Monticello
Monticello Reservoir
© Harris Corp, Earthstar Geographics LLC State of Michigan © 2013 Nokia © AND
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Broad
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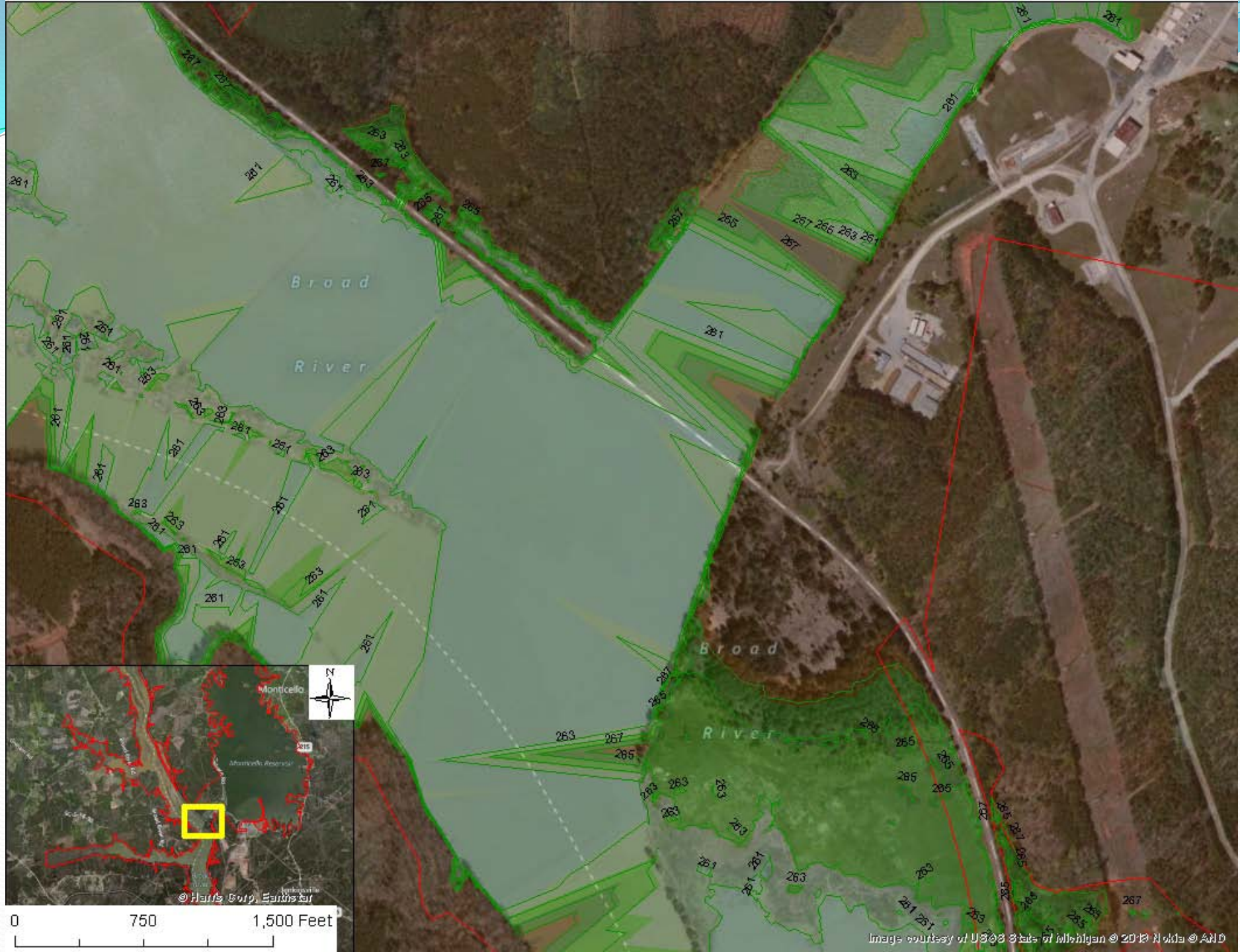
Broad
River
Broad
River
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Monticello
© Harris Corp, Earthstar
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1,500 Feet
Image courtesy of USGS State of Michigan © 2013 Nokia © AND


George Buck Rd
Monticello
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© Harris Corp, Earthstar
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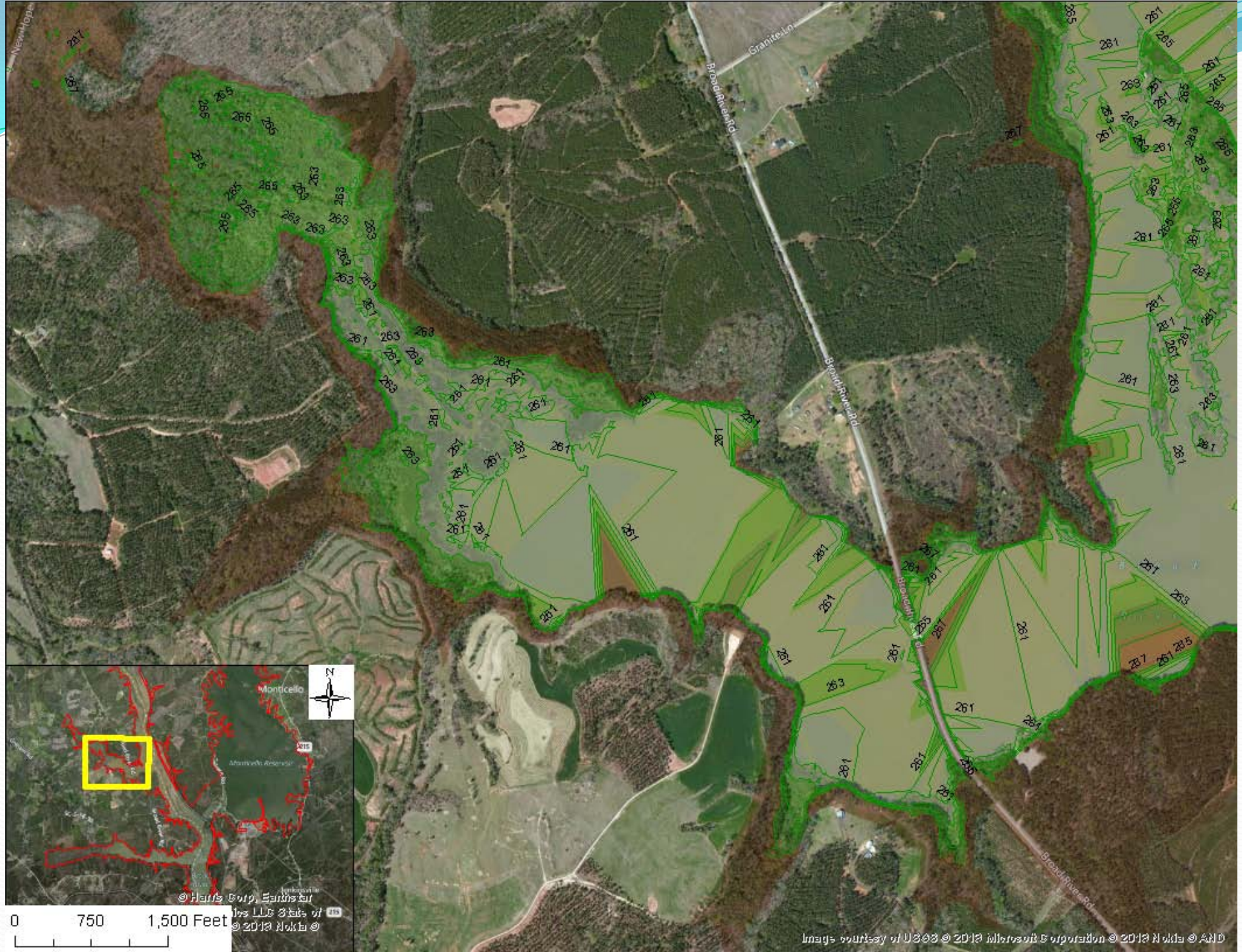
1,500 Feet
Image courtesy of USGS State of Michigan © 2013 Nokia © AND


Granite Ln
Broad River Rd
Broad River Rd
Broad River Rd
Monticello
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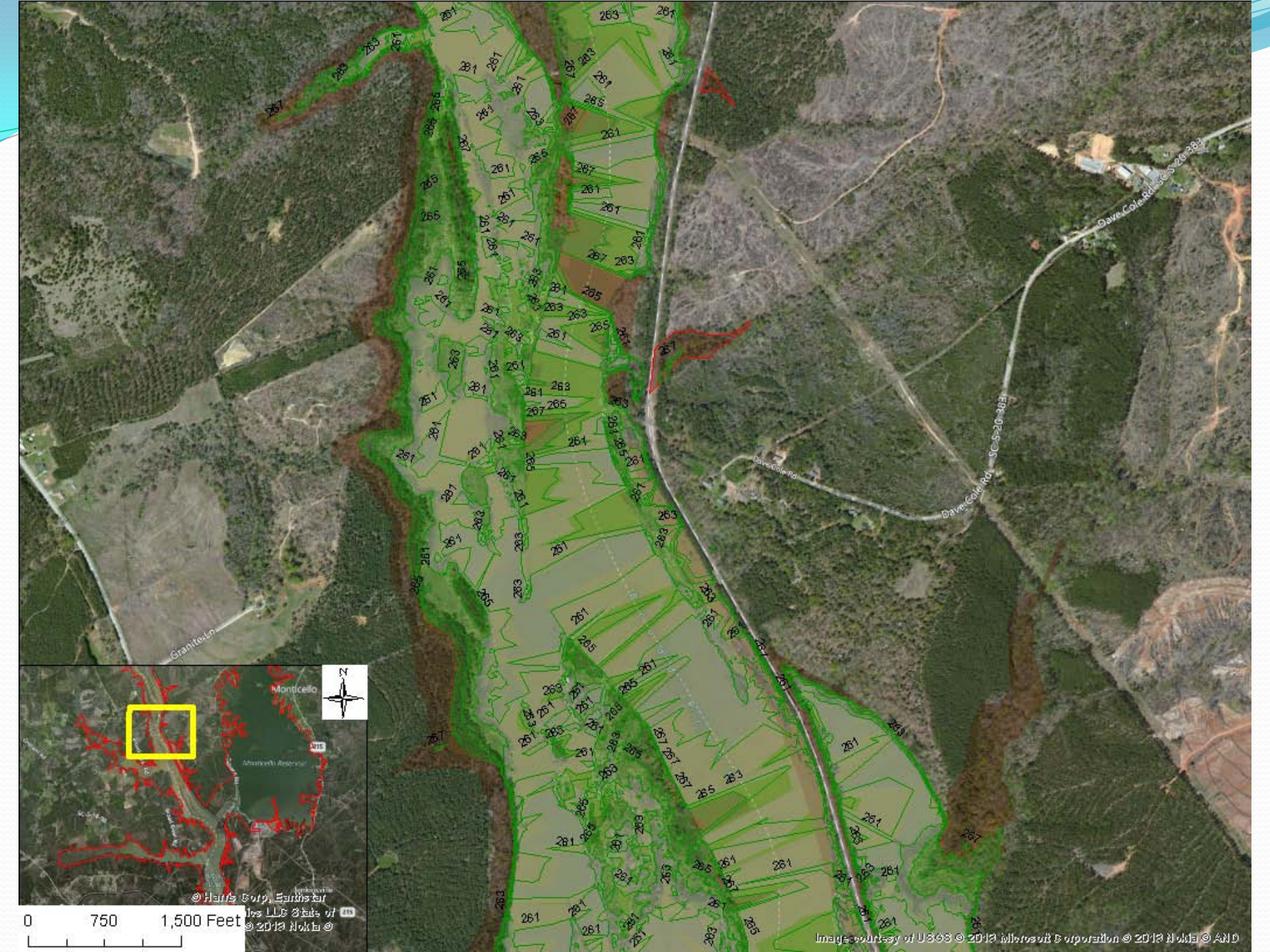
Granite Ln
Dave Cole Rd
Dave Cole Rd - SC-S-20-383
Monticello
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750
1,500 Feet
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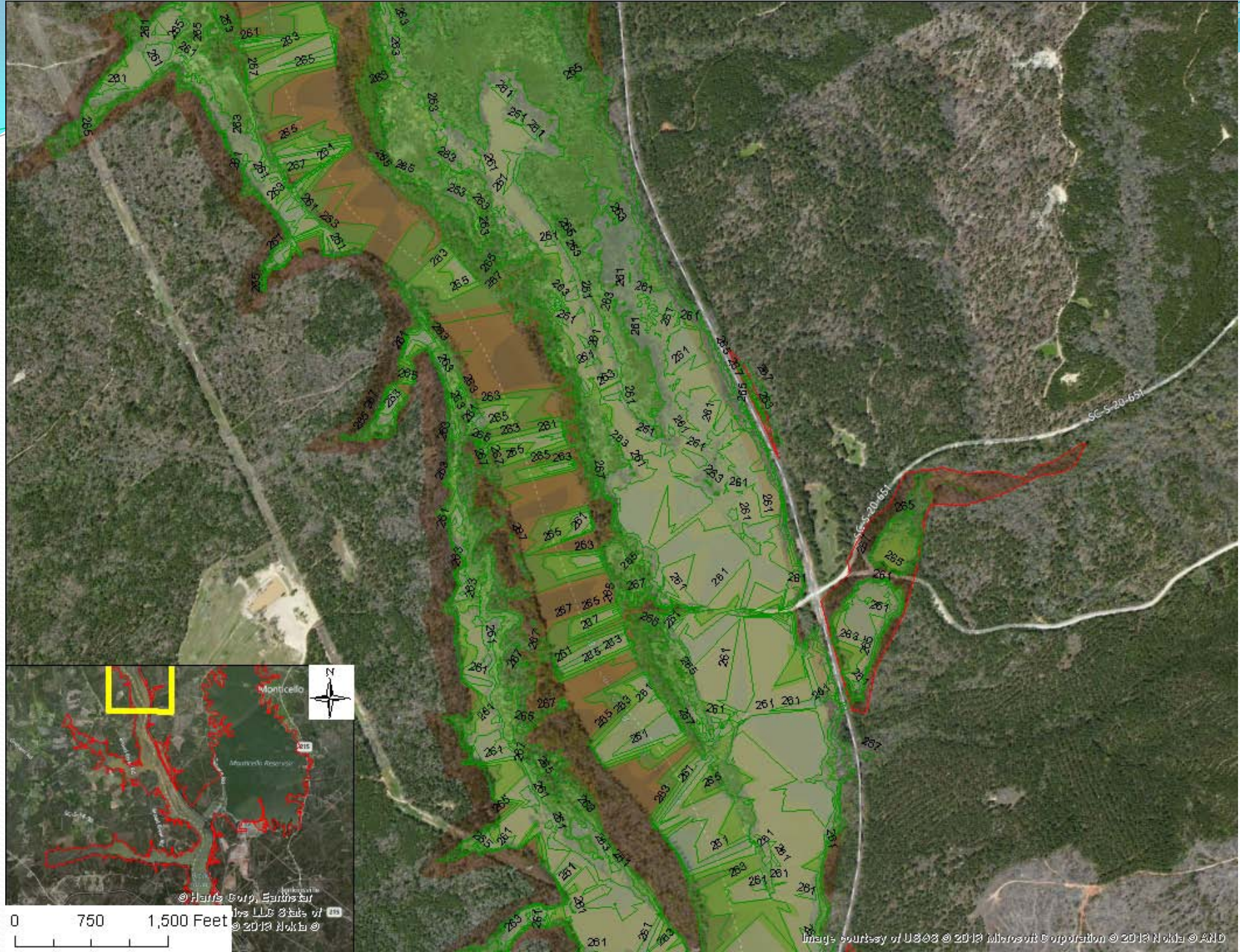
© 2013 Nokia ©
Image courtesy of USGS © 2013 Microsoft Corporation © 2013 Nokia © AND


SC-5-20-451
SC-5-20-451
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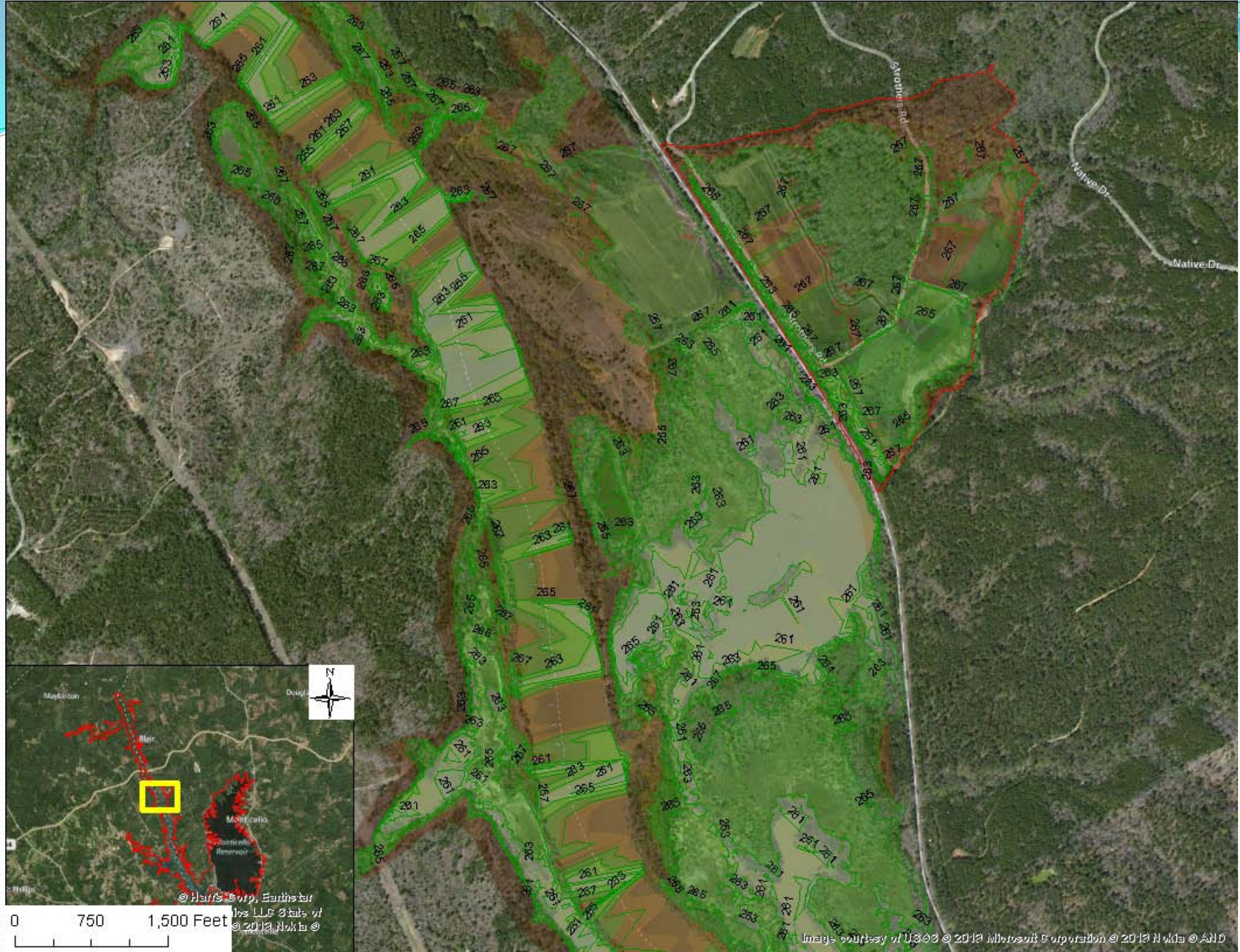
Brothers Rd
Native Dr
Native Dr
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750
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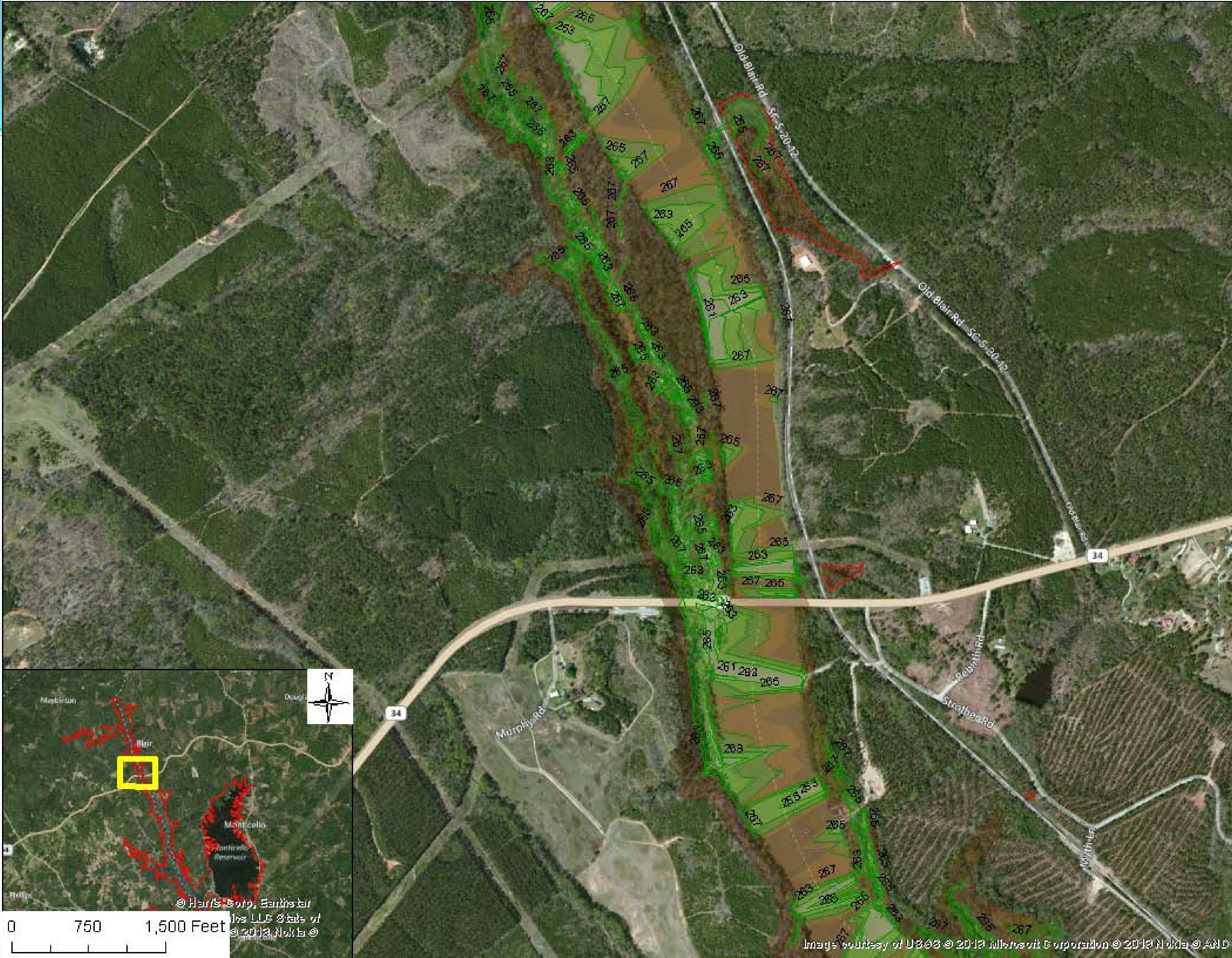
Image courtesy of USDA © 2013 Microsoft Corporation © 2013 Nokia © AND



Old Blair Rd SC-S-20-12
Old Blair Rd SC-S-20-12
34
34
Murphy Rd
Rebirth Rd
Strother Rd
Blair
Monticello Reservoir
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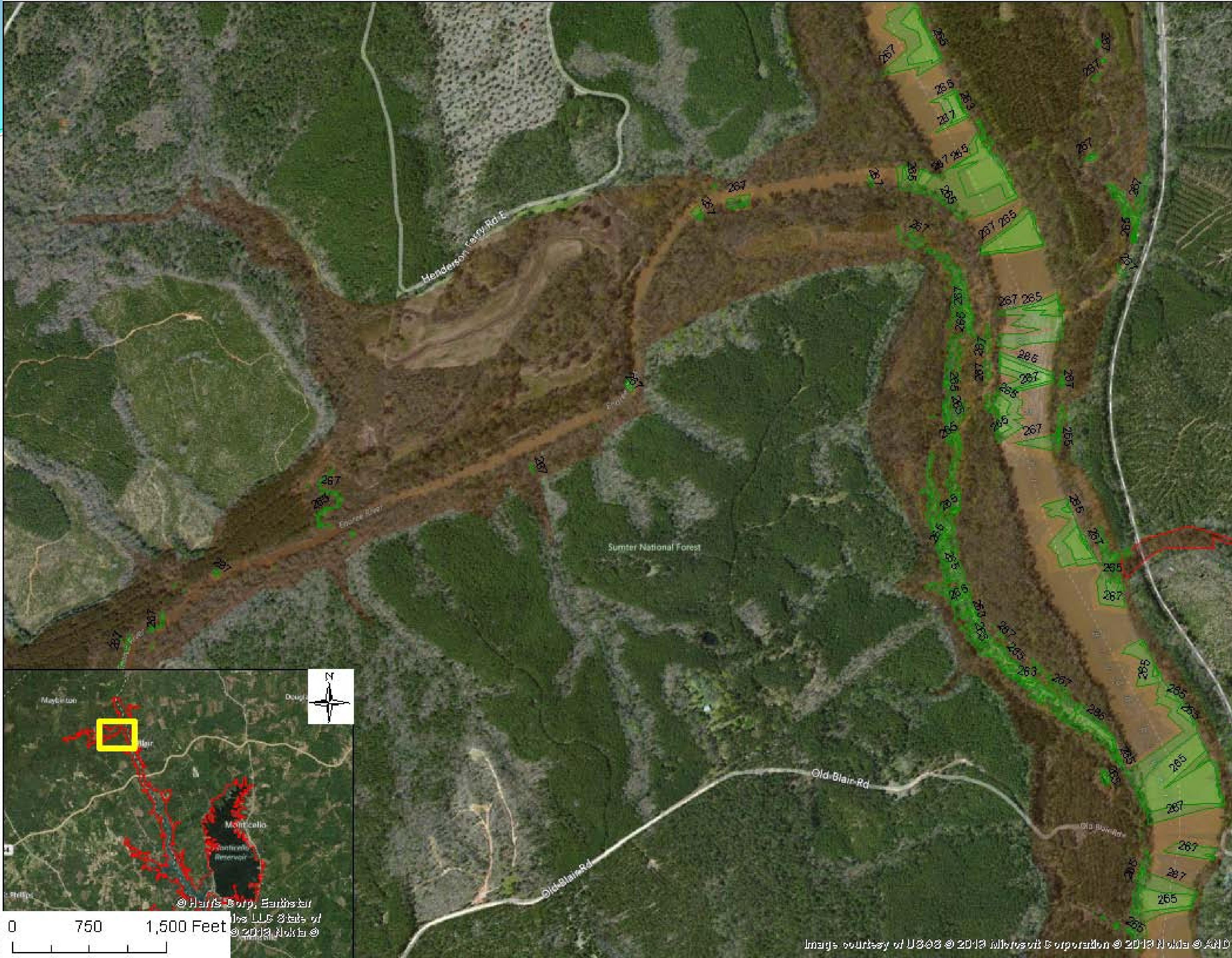
0 750 1,500 Feet
Image courtesy of USGS © 2013 Microsoft Corporation © 2013 Nokia © AND



Henderson Ferry Rd E
Enoree River
Sumter National Forest
Old Blair Rd
Maybinton
Blair
Monticello
N
0 750 1,500 Feet
Image courtesy of USGS © 2013 Microsoft Corporation © 2013 Nokia © AND

Parr Reservoir Results

Area between contours :

267-265 = 686 Acres

265-263 = 798 Acres

263-261 = 1,387 Acres

261-259 = 1,273 Acres

Total 267 - 259 = **4,143 Acres**

Percent of Parr Reservoir affected by Fluctuation

4,143/4,400 = **94.2%**

Results for Monticello Reservoir

- Elevations of the shoreline at 425 ft (full pool)

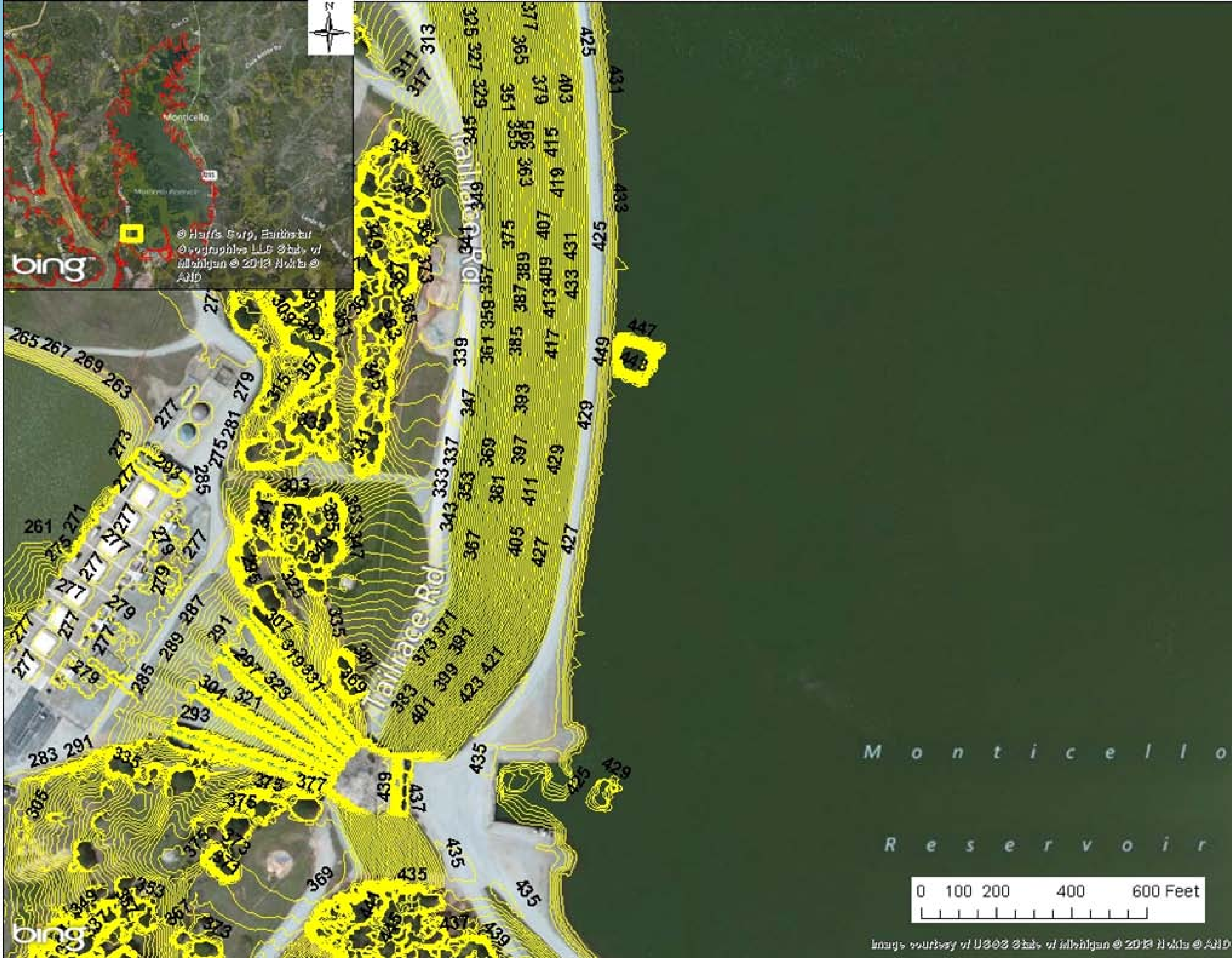

Tailrace Rd
Monticello
Reservoir
0 100 200 400 600 Feet
Monticello
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Image courtesy of USGS State of Michigan © 2013 Nokia © AND

Monticello
Terrace Rd
Monticello
Reservoir
0 100 200 400 600 Feet
bing
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Image courtesy of USGS State of Michigan © 2013 Nokia © AND

Summary

- LiDAR data does not accurately depict Parr Reservoir bottom elevations

- Monticello Reservoir LiDAR extents are limited to full pool

Parr & Monticello Reservoir Fluctuation

Parr Hydroelectric Project Relicensing

Fisheries Technical Working Committee

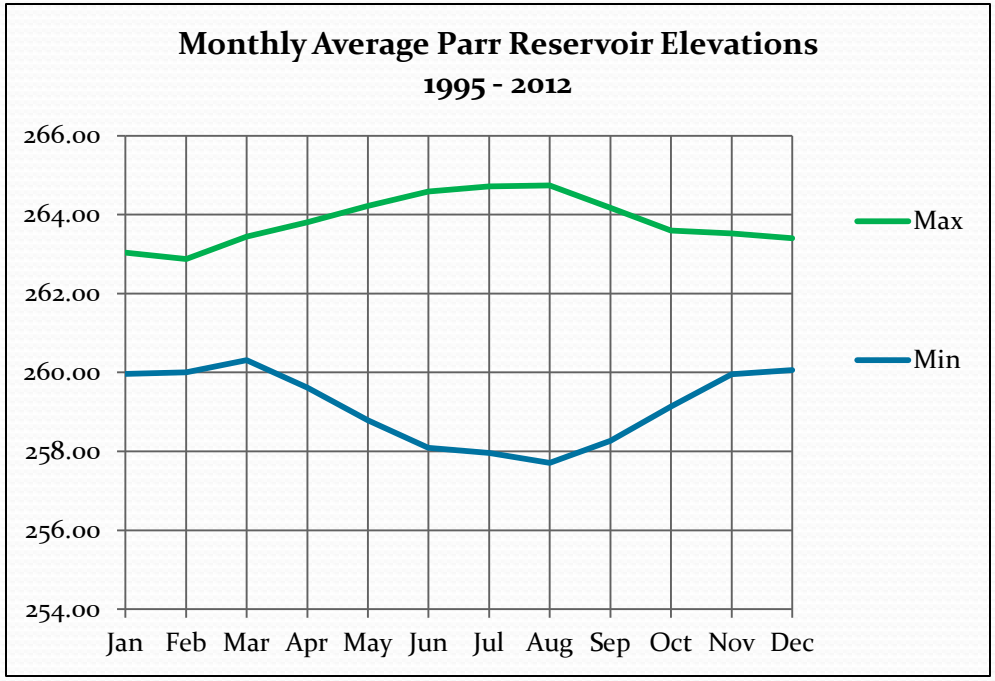
December 19,2013

Reservoir Data

- Daily minimum and maximum Parr Reservoir levels from USGS station 02160990, Parr Shoals Reservoir at Parr, SC; period of record 1995-2012.
- Daily minimum and maximum Monticello Reservoir levels from SCE&G data; period of record 2005-2012.

Parr Reservoir Monthly Data 1995-2012

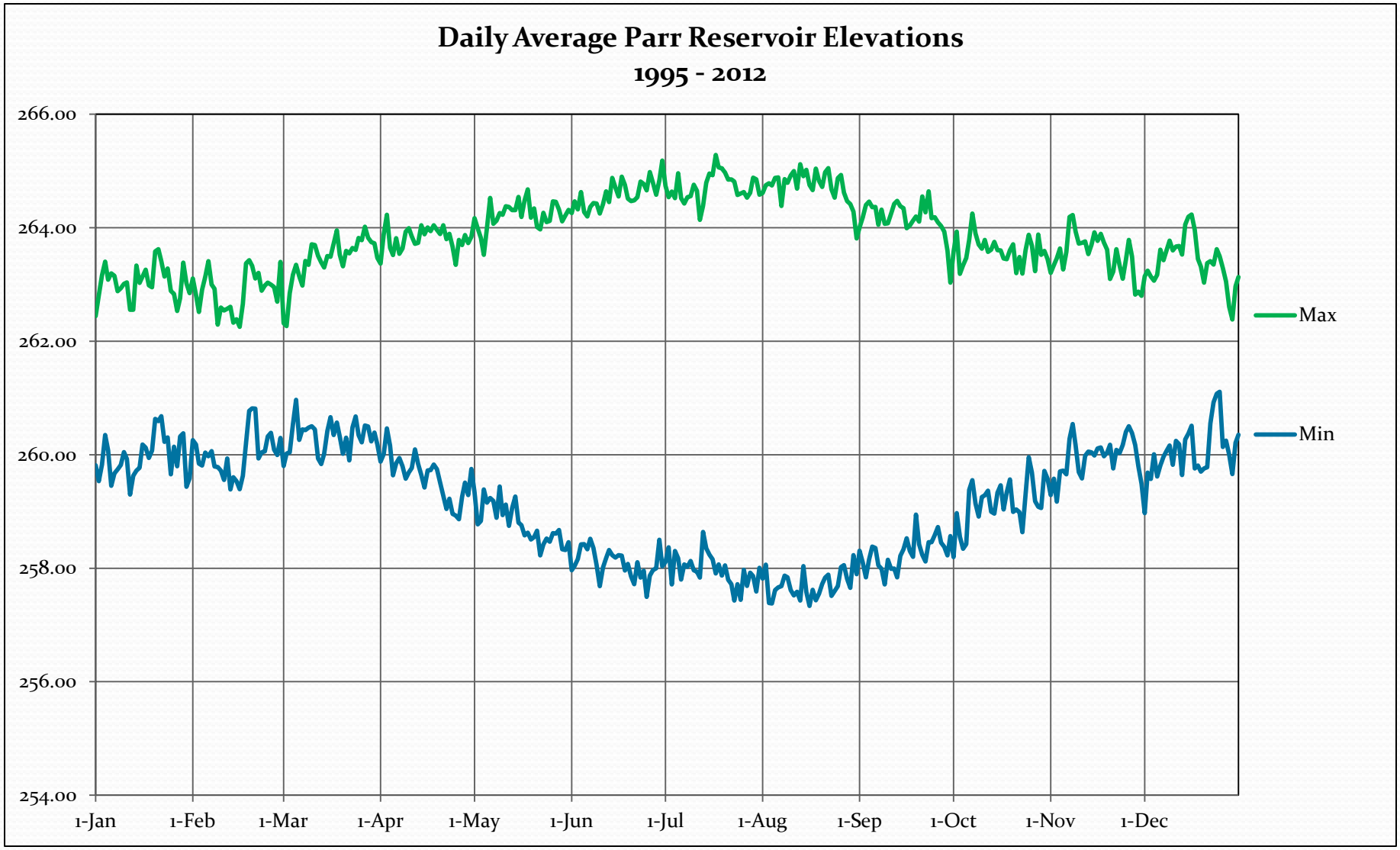
Monthly Average Res. Elev.			
	Max	**Min**	**Range**
Jan	263.04	259.96	3.08
Feb	262.88	260.01	2.87
Mar	263.44	260.32	3.13
Apr	263.81	259.61	4.20
May	264.22	258.79	5.43
Jun	264.59	258.09	6.49
Jul	264.72	257.96	6.75
Aug	264.74	257.71	7.03
Sep	264.17	258.27	5.90
Oct	263.60	259.14	4.46
Nov	263.53	259.96	3.57
Dec	263.41	260.06	3.34
Average	**263.84**	**259.16**	**4.69**



Parr Reservoir Average Daily Fluctuation 1995-2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.63	2.85	2.51	3.49	4.83	6.29	6.63	6.80	5.69	5.38	3.92	4.17
2	3.27	2.64	2.25	3.87	5.21	6.42	6.17	6.69	6.08	4.96	3.76	3.56
3	3.33	2.67	2.80	3.77	4.99	6.16	6.92	7.39	6.56	4.63	4.29	3.56
4	3.06	3.10	2.64	3.49	4.13	6.21	6.22	7.37	6.31	5.00	3.93	3.06
5	3.00	3.10	2.38	3.88	4.85	5.85	6.79	7.26	5.98	5.04	3.55	3.55
6	3.74	3.44	2.89	3.97	5.29	5.86	6.72	7.23	6.01	4.41	3.92	3.81
7	3.48	2.93	2.53	3.60	4.89	5.85	6.36	6.70	6.01	4.70	3.91	3.46
8	3.14	3.13	2.98	3.84	5.23	6.08	6.52	6.99	6.33	4.76	3.68	3.53
9	3.11	2.51	2.87	4.35	4.82	6.37	6.43	6.95	6.35	4.79	3.77	3.61
10	2.97	2.87	3.20	4.30	5.29	6.56	6.80	7.31	5.93	4.38	4.03	3.78
11	3.11	2.99	3.25	4.08	5.26	6.40	6.71	7.48	6.25	4.50	4.16	3.43
12	3.26	2.64	3.57	3.62	5.62	6.46	6.30	7.10	6.43	4.21	3.78	3.50
13	2.92	3.22	3.55	3.90	5.25	6.13	5.75	7.69	6.63	4.61	3.48	3.88
14	3.61	2.72	3.28	4.40	5.05	6.65	6.44	6.87	6.16	4.79	3.66	3.79
15	3.26	2.85	3.09	4.46	5.74	6.52	6.72	7.44	6.01	4.27	3.94	3.82
16	2.96	2.86	2.83	4.28	5.43	6.32	6.77	7.42	5.46	4.14	3.66	3.72
17	3.14	3.03	3.37	4.21	5.90	6.68	7.38	7.05	5.74	4.42	3.76	4.20
18	3.04	3.17	3.39	4.22	6.05	6.79	7.00	7.60	5.92	4.10	3.77	3.64
19	2.88	2.65	3.21	4.22	5.67	6.44	7.17	7.28	5.25	4.04	3.58	3.61
20	2.95	2.51	3.30	4.38	5.79	6.61	6.92	6.99	5.69	4.72	2.92	3.28
21	3.03	2.30	3.29	4.77	5.35	6.76	7.05	7.14	6.32	4.16	3.47	3.60
22	2.73	3.27	3.65	4.75	5.74	6.43	7.13	7.17	6.15	4.50	3.53	2.86
23	2.91	2.85	3.16	4.67	5.84	6.98	7.39	7.16	6.18	4.56	3.31	2.42
24	2.98	2.92	2.93	4.71	5.57	6.82	6.86	6.93	5.71	4.31	2.93	2.55
25	3.23	2.71	3.47	4.42	5.65	7.16	7.16	7.19	5.60	3.92	3.04	2.39
26	2.69	2.61	3.56	4.92	5.85	7.11	6.66	6.91	5.37	4.00	3.28	3.16
27	2.74	2.86	3.50	4.44	5.85	6.82	6.84	6.56	5.58	4.05	3.11	2.81
28	2.44	2.70	3.32	4.36	5.65	6.58	6.70	6.66	5.55	4.80	2.65	2.61
29	3.01	3.11	3.51	4.44	5.78	6.34	7.03	6.76	5.38	4.46	3.08	2.72
30	3.59		3.34	4.09	5.90	7.15	7.26	6.05	4.47	3.88	3.31	2.76
31	3.26		3.29		5.86		6.57	5.92		3.87		2.78
Average	**3.08**	**2.87**	**3.13**	**4.20**	**5.43**	**6.49**	**6.75**	**7.03**	**5.90**	**4.46**	**3.57**	**3.34**

Parr Reservoir Daily Data 1995-2012

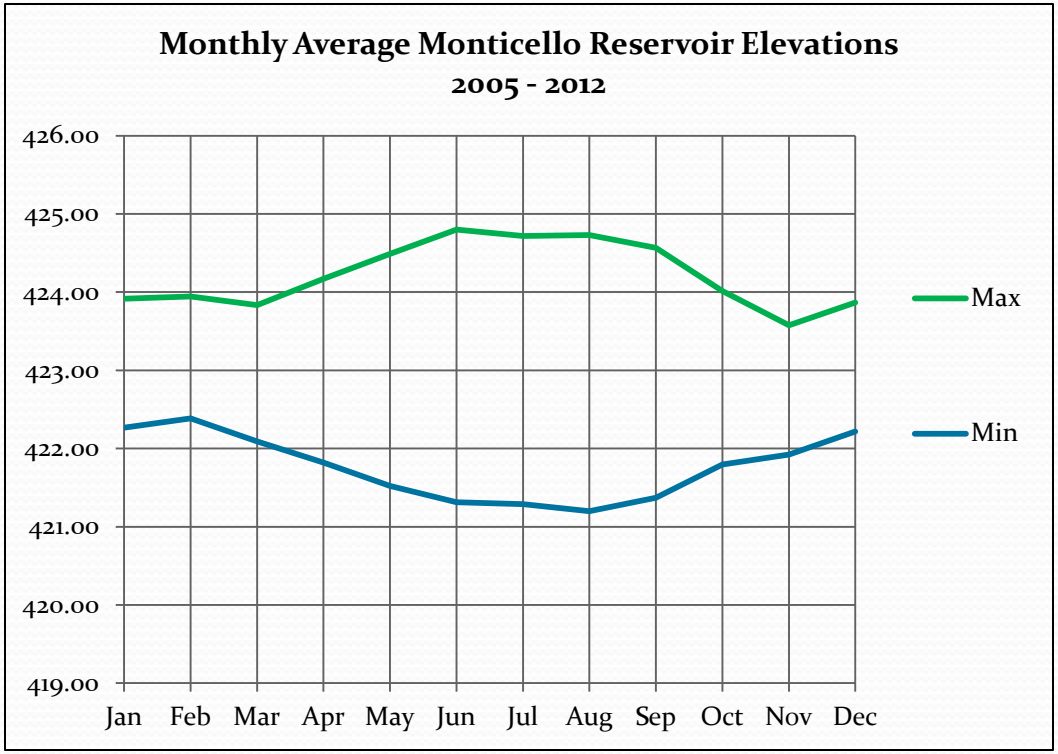


Parr Reservoir Summary

- February has smallest average fluctuation – 2.87 feet.
- August has largest average fluctuation – 7.03 feet.
- Average fluctuation for year is 4.69 feet.
- Average fluctuation March – May is 4.25 feet.
- Average fluctuation April – July is 5.72 feet.

Monticello Reservoir Monthly Data 2005-2012

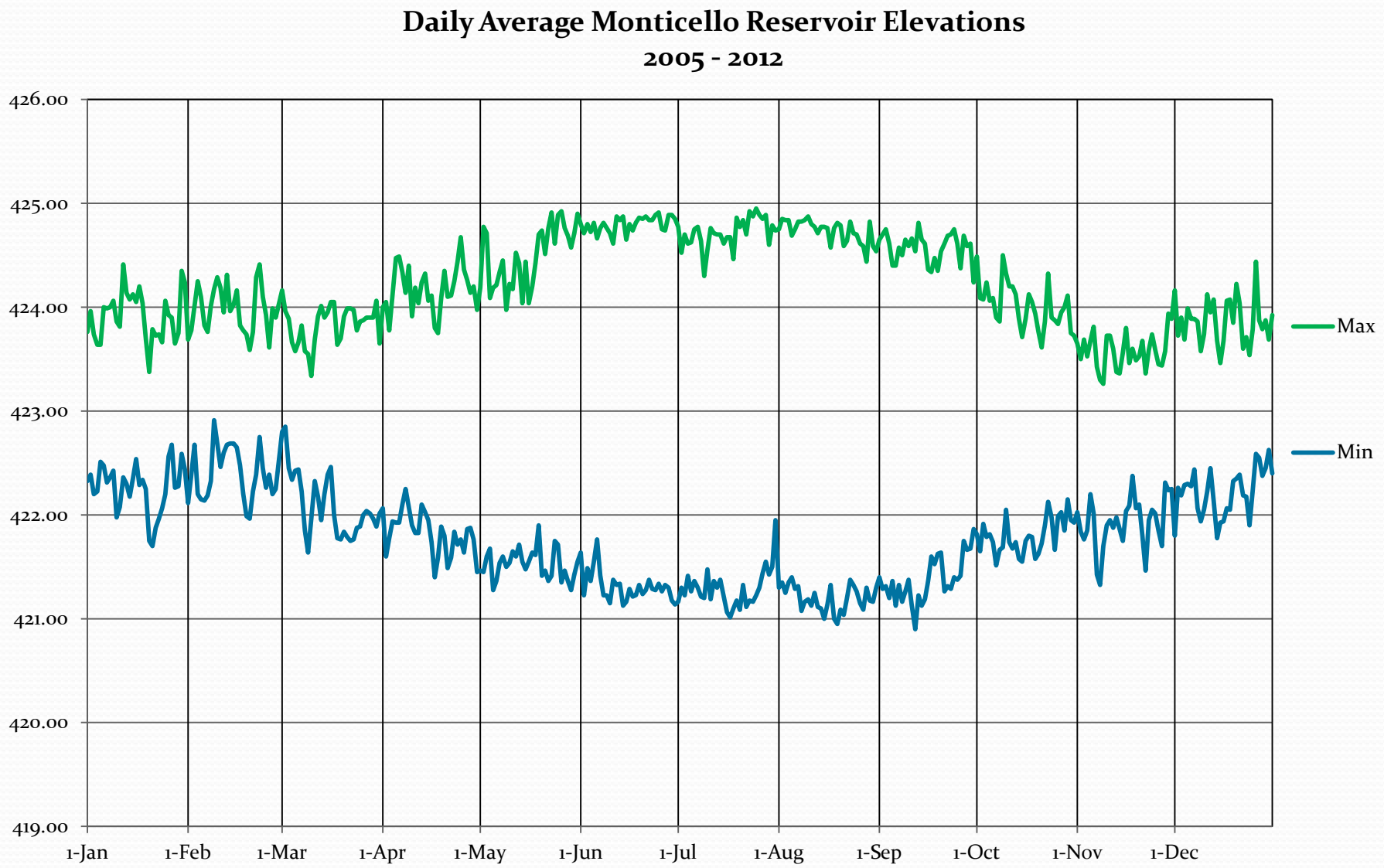
Monthly Average Res. Elev.			
	Max	**Min**	**Range**
Jan	423.91	422.27	1.65
Feb	423.94	422.39	1.58
Mar	423.84	422.09	1.74
Apr	424.17	421.82	2.35
May	424.49	421.52	2.96
Jun	424.80	421.31	3.48
Jul	424.72	421.29	3.43
Aug	424.73	421.20	3.53
Sep	424.57	421.37	3.20
Oct	424.01	421.80	2.22
Nov	423.58	421.92	1.65
Dec	423.87	422.22	1.65
Average	**424.22**	**421.77**	**2.45**



Monticello Reservoir Average Daily Fluctuation 2005-2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.44	1.57	1.36	1.94	2.73	3.16	3.61	3.45	3.25	2.68	1.62	2.36
2	1.57	1.39	1.11	2.45	3.33	3.49	3.22	3.50	3.41	2.44	1.66	1.46
3	1.54	1.34	1.44	2.00	3.11	3.31	3.48	3.59	3.44	2.16	1.93	1.71
4	1.41	2.05	1.32	2.18	2.41	3.36	3.20	3.49	3.41	2.45	1.67	1.40
5	1.12	1.95	1.15	2.55	2.91	3.26	3.36	3.29	3.04	2.25	1.47	1.69
6	1.52	1.69	1.22	2.56	2.85	2.90	3.39	3.46	3.27	2.35	1.80	1.61
7	1.68	1.58	1.60	2.24	2.80	3.35	3.48	3.51	3.25	2.39	2.00	1.45
8	1.64	1.69	1.73	1.89	2.85	3.59	3.43	3.75	3.34	2.20	1.97	1.80
9	1.64	1.26	1.91	2.32	2.47	3.54	3.10	3.68	3.39	2.81	1.56	1.64
10	1.89	1.60	1.38	2.01	2.69	3.56	3.07	3.69	3.21	2.27	1.82	1.69
11	1.74	1.73	1.36	2.36	2.52	3.24	3.58	3.68	3.54	2.46	1.78	1.90
12	2.05	1.35	1.74	2.21	2.92	3.55	3.35	3.52	3.64	2.52	1.73	1.50
13	1.84	1.64	2.06	2.14	2.71	3.50	3.40	3.60	3.59	2.39	1.40	1.94
14	1.90	1.27	1.70	2.30	2.49	3.75	3.33	3.67	3.52	2.31	1.50	1.90
15	1.78	1.34	1.56	2.11	2.96	3.49	3.40	3.78	3.43	2.16	1.81	1.54
16	1.51	1.51	1.59	2.38	2.49	3.51	3.61	3.63	3.00	2.14	1.76	1.74
17	1.91	1.35	2.05	2.40	2.56	3.53	3.66	3.25	2.74	2.32	1.38	2.00
18	1.70	1.57	1.86	2.16	2.81	3.59	3.36	3.76	2.95	2.26	1.22	2.03
19	1.45	1.75	1.94	2.20	2.80	3.54	3.69	3.86	2.73	2.36	1.42	1.53
20	1.63	1.62	2.07	2.55	3.32	3.61	3.69	3.70	2.90	2.14	1.43	1.87
21	2.09	1.54	2.20	2.61	3.05	3.60	3.51	3.55	3.35	1.89	1.87	1.65
22	1.85	1.90	2.24	2.53	3.40	3.46	3.59	3.44	3.38	1.96	1.90	1.41
23	1.78	1.66	2.21	2.41	3.50	3.55	3.75	3.45	3.41	2.20	1.64	1.54
24	1.60	1.65	1.90	2.72	2.86	3.61	3.71	3.39	3.35	1.93	1.69	1.64
25	1.86	1.66	1.98	2.91	3.18	3.57	3.73	3.44	3.24	2.21	1.58	1.55
26	1.36	1.23	1.88	2.73	3.57	3.49	3.59	3.46	2.96	1.85	1.60	1.85
27	1.23	1.79	1.86	2.40	3.30	3.41	3.41	3.50	2.94	1.93	1.74	1.33
28	1.39	1.65	1.89	2.26	3.32	3.59	3.34	3.14	2.93	2.15	1.26	1.41
29	1.48		1.94	2.44	3.30	3.71	3.17	3.65	2.94	1.96	1.70	1.43
30	1.76		2.18	2.53	3.29	3.71	3.29	3.43	2.38	1.80	1.64	1.06
31	1.80		1.64		3.35		2.79	3.24		1.80		1.53
Average	**1.65**	**1.58**	**1.74**	**2.35**	**2.96**	**3.48**	**3.43**	**3.53**	**3.20**	**2.22**	**1.65**	**1.65**

Monticello Reservoir Daily Data 2005-2012



Monticello Reservoir Summary

- February has smallest average fluctuation – 1.58 feet.
- August has largest average fluctuation – 3.53 feet.
- Average fluctuation for year is 2.46 feet.
- Average fluctuation March – May is 2.35 feet.
- Average fluctuation April – July is 3.06 feet.

DRAFT
DESKTOP FISH ENTRAINMENT STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

October 2013

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PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. Collaboration and cooperation is essential in the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) comprised of interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

The TWC determined that a desktop fish entrainment and mortality study should be conducted to determine the likely effects of Project-induced entrainment and impingement based on the physical characteristics of the Project. This study plan outlines the process for a desktop analysis.

2.0 BACKGROUND AND EXISTING INFORMATION

As noted, the Project is comprised of two developments. The Parr Hydro Development forms Parr Reservoir along the Broad River. The Development consists of a 37-foot-high, 200-foot-long concrete gravity spillway dam with a powerhouse housing generating units with a combined licensed capacity of 14.9 MW. Parr Hydro operates in a modified run-of-river mode and normally operates continuously to pass Broad River flow. Current minimum flow license articles require that 1,000 cubic feet-per-second (cfs), or average daily natural inflow to Parr Reservoir[1], whichever is less, be provided downstream of Parr Dam from March through May. During the remainder of the year, 800 cfs daily average flow and 150 cfs minimum flow, or natural inflow, whichever is less, are required downstream of the Parr Dam. The 13-mile-long Parr Reservoir has a surface area of 4,400 acres at full pool and serves as the lower reservoir for pumped-storage operations at the Fairfield Pumped Storage Development.

The Fairfield Pumped Storage Development is located directly off of the Broad River. Four earthen dams form the 6,800-acre upper reservoir, Monticello Reservoir. As noted, Parr Reservoir serves as the lower reservoir for pumped storage operations. The Fairfield Development has a licensed capacity of 511.2 MW and is primarily used for peaking operations, reserve generation, and power usage.

The Project area supports warmwater fish communities typical of impounded river reaches in the Piedmont of South Carolina. Recent survey work within the Project area has documented 30 species of fish occurring in Parr Reservoir and 24 species in Monticello Reservoir (Table 1). Although some seasonal variations in community structure have been documented, the fish communities are generally similar between the two reservoirs, with gizzard shad, blue catfish, bluegill, channel catfish and white perch being the dominant species (Normandeau 2007, 2008, 2009; SCANA 2013). No state or federally listed threatened or endangered species have been documented in Monticello or Parr reservoirs, although robust redhorse, which is considered a

[1] Evaporative loss from Parr and Monticello Reservoirs is subtracted from average daily natural inflow to determine flows downstream of Parr Dam.

species of highest conservation concern by the SCDNR (2005), has been documented in limited[2] numbers in both reservoirs.

TABLE 1 FISH SPECIES DOCUMENTED AT PARR AND MONTICELLO RESERVOIRS (SOURCE: NORMANDEAU 2007, 2008, 2009; SCANA 2013)

COMMON NAME	SCIENTIFIC NAME	PARR	MONTICELLO
black crappie	*Pomoxis nigromaculatus*	x	x
blue catfish	*Ictalurus furcatus*	x	x
bluegill	*Lepomis macrochirus*	x	x
channel catfish	*Ictalurus punctatus*	x	x
flat bullhead	*Ameiurus platycephalus*	x	x
flathead catfish	*Pylodictis olivaris*	x	
gizzard shad	*Dorosoma cepedianum*	x	x
golden shiner	*Notemigonus chrysoleucas*	x	x
highfin carpsucker	*Carpiodes velifer*	x	
largemouth bass	*Micropterus salmoides*	x	x
longnose gar	*Lepisosteus osseus*	x	
northern hogsucker	*Hypentelium nigricans*	x	x
notchlip redhorse	*Moxostoma collapsum*	x	x
pumpkinseed	*Lepomis gibbosus*	x	x
quillback	*Carpiodes cyprinus*	x	x
redbreast sunfish	*Lepomis auritus*	x	x
redear sunfish	*Lepomis microlophus*	x	x
robust redhorse	*Moxostoma robustum*	x	x
sandbar shiner	*Notropis scepticus*	x	
shorthead redhorse	*Moxostoma macrolepidotum*	x	x
smallmouth bass	*Micropterus dolomieu*	x	x
snail bullhead	*Ameiurus brunneus*		x
spottail shiner	*Notropis hudsonius*	x	x
threadfin shad	*Dorosoma petenense*	x	x
warmouth	*Lepomis gulosus*	x	
white bass	*Morone chrysops*	x	
white catfish	*Ameiurus catus*	x	x
white perch	*Morone americana*	x	x
whitefin shiner	*Cyprinella nivea*	x	x
yellow bullhead	*Amierus natalis*	x	x
yellow perch	*Perca flavescens*	x	x

[2] To date, 2 robust redhorse have been documented in Monticello Reservoir and 3 robust redhorse have been documented in Parr Reservoir.

3.0 STUDY GOALS AND OBJECTIVES

The goal of the desktop fish entrainment and mortality study is to develop additional information necessary to estimate potential fish entrainment and impingement at the Project. This will provide a basis for understanding the effects of entrainment, impingement and turbine mortality on fisheries resources in the Project area. The study objective is to characterize and provide an order-of-magnitude estimate of entrainment at both developments using existing literature and site-specific information.

4.0 PROJECT NEXUS

Fish that reside in the Project area could be susceptible to impingement on the Project trashracks or entrainment through the Project turbines. Evaluation of the physical characteristics of each Project development along with an evaluation of expected fish behavior at the intake structures utilizing existing information will help in the understanding of the potential for continued Project operations to affect the fishery.

5.0 GEOGRAPHIC SCOPE

As this analysis is a desktop exercise, no field reconnaissance will be implemented. Fish species present within the Project vicinity that are determined to be potentially susceptible to impingement and/or entrainment through the Project will be analyzed in this study.

6.0 METHODOLOGY

Comment [b1]: Include write-up of electrofishing in tailrace and forebay of Fairfield Pumped Storage. Include fish distribution from Parr studies as a line item.

Fish impingement and entrainment at the Project may occur when fish that elect to enter into the project intake flow field during periods of operation may become impinged on the trashracks or entrained through the turbines. Fish that are small enough to pass through the projects trashracks will be considered susceptible to entrainment while those physically excluded due to size (i.e. length, width, and/or depth) will be considered as potential candidates for impingement. Not all fish species occurring in the Project reservoirs may be equally susceptible to entrainment or impingement because of their habitat use, behavior and swimming abilities relative to the project intake velocity. As noted, fish entrainment at the Project developments will be assessed through a desktop study. The primary inputs for this analysis will be as follows:

1. Develop an entrainment and turbine mortality database that can be applied to the Parr and Monticello developments. Hold Point
2. Calculate and estimate fish entrainment rates, seasonally if possible, at each Project development. Entrainment rates are defined as: number of Fish/volume of water entrained.
3. Characterize the species composition of potential fish entrainment. Hold Point
4. Apply any physical or biological filters that may influence entrainment.
5. Estimate the total annual entrainment for the Project based on normal operation. Hold Point
6. Estimate potential turbine mortality for fish entrainment based on turbine mortality estimates from similar project studies.
7. Estimate impingement mortality for fish eliminated from entrainment estimates. Draft Report Review

These inputs are described in more detail below.

Development of an Entrainment Database

Comment [b2]: Include turbine mortality description.

Over seventy site-specific studies of resident fish entrainment at hydroelectric sites in the United States have been reported to date, which provide order-of-magnitude estimates of annual fish entrainment (FERC, 1995). Descriptive information will be gathered from available entrainment studies and will include:

- Location: geographic proximity (preference given to same river basin).
- Project size: discharge capacity and power production.
- Mode of operation - e.g., peaking, run-of-river, etc.
- Biological factors: fish species composition.
- Impoundment characteristics: general water quality, impoundment size, flow regime.
- Physical project characteristics: trash rack spacing, intake velocity, etc.

This information will be assembled into a "matrix" of data to be used as a database for the desktop study. After review of the "matrix", specific studies that are most applicable to the Project developments will be selected for use in the entrainment database. Key criteria to be used in acceptance of candidate studies may include:

- Similar geographic location, with preference given to projects located in the same river basin.

- Similar station hydraulic capacity.
- Similar station operation (peaking, run-of-river, etc.).
- Biological similarities: fish species, assemblage and water quality.
- Availability and type of entrainment data (netting vs hydroacoustic).

Estimation of Fish Entrainment

Fish entrainment by species for the proposed Project will be estimated on a monthly basis (if possible) to provide an order-of-magnitude fish entrainment estimate. As noted, the entrainment rates will be presented in fish entrained per hour of operation and fish per volume of water passed through project turbines (fish/million cubic feet). The data will be grouped by season, where appropriate, to determine an entrainment density for each season of the year. The seasonal data from each entrainment study will be averaged to develop a seasonal mean entrainment estimate at each Project development.

Species Composition Analysis

Species composition data from the accepted entrainment studies will be analyzed and compiled to determine the fish species typically entrained at other hydroelectric projects. This information will be grouped to yield predicted seasonal estimates of species-specific data for entrained fish to determine:

- Likelihood of entrainment by species.
- Expected relative abundance of each species identified as potentially entrained.
- Prediction of seasonal entrainment by species and size, if applicable.

Application of Physical or Biological Filters

Adjustment of fish entrainment rates based on site-specific characteristics of the Project may be appropriate. Factors potentially affecting entrainment rates that may warrant adjustment of estimates include:

- Trashrack spacing.
- Fish habitat available at the intakes.
- Other site specific factors as determined during the study.

Total Annual Entrainment Estimate

Total fish entrainment for each Project development will be estimated on an annual basis to provide an order of-magnitude entrainment estimate. The total fish entrainment estimate will be produced for a typical water and operating year.

Turbine Mortality

As fish move through hydroelectric turbines, a percentage are killed due to turbine mortality (i.e. blade strikes, shear forces, and pressure changes, etc.). Turbine passage survival studies have been performed at numerous hydroelectric projects throughout the country. Characteristics of these known project studies will be compared to the characteristics of the Parr and Monticello development turbines and appropriate studies will be selected for the transfer of turbine mortality data. Selected turbine survival rate data will also be obtained from the literature and used to estimate the number of fish lost due to turbine mortality. Important turbine characteristics viewed as general criteria for accepting turbine mortality studies will include but are not limited to:

- Turbine design type.
- Operating head.
- Turbine runner speed.
- Turbine diameter, and peripheral runner velocity.

Species specific turbine mortality rate data available from source studies will also be reviewed and consolidated. Where multiple tests are available for a given fish genus or family, a mean survival rate will be computed. For genus or families where no acceptable data can be identified, the survival rate data from surrogate genus and/or family groups will be utilized.

Once turbine mortality rates are developed from the study database, the rates will be applied to the fish entrainment estimates for the Project. This will be accomplished by multiplying fish entrainment estimates by the composite mortality rates for each family/genus group (where applicable).

Impingement Estimates

Fish eliminated from entrainment estimates due to their size in relation to the trashrack spacing will be considered susceptible to impingement. Swim speed information for these species and size groups will be compared to intake velocities to estimate the potential for impingement. Those species or size groups lacking the ability to avoid impingement will be considered

impinged and subsequently killed due to impingement mortality.

7.0 SCHEDULE AND PRODUCTS

This study will occur during 2015. Background research for entrainment and mortality analyses will occur early in the year. Data analysis and report writing are scheduled for later in the year. In an attempt to reach consensus during the entrainment desktop study, the following process steps will be reviewed with TWC members:

Comment [ACJ3]: We would like to discuss which steps the TWC would like to review during the desktop process.

- *[TBD]*
- *[TBD]*
- *[TBD]*

Comments from the TWC will be addressed during each phase of the analysis. Upon completion of the study, a draft report will be prepared and distributed to the TWC for review and comment. The draft report will summarize the results obtained in the study; will contain appropriate tables and figures depicting estimated fish entrainment; and will contain all supporting correspondence among the TWC members. After receipt of all comments, the draft report will be revised to address final comments by TWC members and will be resubmitted as the Final Report.

8.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the South Carolina Department of Natural Resources, USFWS, RT&E TWC, and other relicensing stakeholders.

9.0 REFERENCES

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Normandeau Associates (Normandeau). 2009. *Monticello and Parr Reservoir Fisheries Surveys: Summer Report.* Prepared for Tetra Tech NUS by Normandeau Associates, Bedford, NH. April 2009.

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South Carolina Department of Natural Resources (SCDNR). 2005. SC Comprehensive Wildlife Conservation Strategy.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Operations RCG Meeting

January 30, 2014

Final KDM 03-27-14

ATTENDEES:

Vivianne Vejdani (SCDNR)
Dick Christie (SCDNR)
Scott Harder (SCDNR)
Steve Summer (SCANA)
Gerrit Jobsis (American Rivers)
Fritz Rohde (NOAA) via Conf. Call
Joseph Wojcicki (By-PAS) via Conf. Call
J. Hagood Hamilton, Jr. (SCANA)
Byron Hamstead (USFWS) via Conf. Call
Bill Stangler (Congaree Riverkeeper)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Kelly Miller (Kleinschmidt)
Henry Mealing (Kleinschmidt)
Bill Marshall (SCDNR)
Bruce Halverson (Kleinschmidt) via Conf. Call
Bret Hoffman (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions and a review of the agenda. Comments on the Operations Model Study Plan were submitted by SCDNR prior to the meeting on January 15, 2014 via email and these comments, in addition to review of the Study Plan, served as the basis for discussion throughout the meeting. Comments are provided below, along with a summary of the group's corresponding discussion. The original email in which comments were submitted is attached to the end of these notes.

1. In a prior Parr-FF operations committee meeting, there was a discussion about determining the effects of the Parr Hydro on the Congaree National Park. However, from the draft report, models will only be used to assess operations to approximately 20 miles downstream. Is the study component to address Congaree NP still on the table?

Ray said that he believes the Congaree National Park (CNP) is outside of the area of Project effects. However any effects to the CNP will come when SCE&G spills water over the dam. Gerrit said there will be project effects downstream, even if they are muted by the other projects in the area. The group agreed that input was needed from representatives at the CNP to determine what flows might harm or benefit the park. The group estimated that the Project is approximately 45 miles upstream of the CNP. Bret said that the confluence of the Saluda River and two hydro projects between the Parr dam and the CNP presented so many variables that it would be difficult to accurately model. He said a statistical evaluation of flows within a range of Project effects at the CNP would be possible.

Ray pointed out that there is a storage limitation within Parr Reservoir, and so there is not much flexibility in terms of inundating the CNP. Additionally, through Article 39 of the current license, the Project cannot increase flow releases during a flood, which SCE&G has currently established as 40,000 cfs. Gerrit said there are incremental flooding levels that occur at CNP, starting at 8,000 cfs. Gerrit is concerned with how pulsing releases from Parr Shoals Dam may affect the park downstream. He also said effects to fish spawning near the confluence of the Broad and Saluda Rivers need to be examined.

Bret said that the Project Operations Model will include attenuation affects. He also said the operators of Columbia Hydro can absorb some of the smaller releases from Parr by fluctuating their storage reservoir, which is allowed in the current license for that project.

2. Refer to the discussion of metrics in section 2.4. Though we generally support the use of metrics to facilitate the reviews of various scenarios, metrics should be modified or added as needed during the scenario review process. As we have seen in other modeling efforts, defining initial metrics (or more appropriately when a given metric value denotes a significant change or impact) without reviewing the baseline and a few scenario outputs can be problematic. If metrics aren't defined carefully, then discerning the differences between two scenarios can be difficult.

Bret began discussion of this comment by saying that stakeholders can request specific metrics to be examined, and the model will be run to determine how these metrics may be affected by project operations. Scott asked if specific metrics can be identified initially with the option to go back and adjust those metrics for further or different analysis. Bret said that there will definitely be flexibility for adjustment to those requests.

Dick pointed out that information collected as part of the IFIM study, reservoir fluctuation study, navigational flows study, recreational flows study, and possibly others, will be used with the model. Gerrit said that the operations model will also be important for the Dual Flow analysis component of the IFIM study. He said that the compatibility of the Dual Flow analysis and the operations model output should be considered before the operations model is fully developed.

3. We are was pleased to see the Enoree Gages will be used to evaluate regional relationships between runoff and drainage area, as we would recommend use of these gages to help develop an inflow data set. Appropriate error analysis should accompany the determination of the regional alpha and gamma coefficients presented in section 4.1.

Bruce said that sensitivity or uncertainty analysis, also known as error analysis, will definitely be a part of the process. Scott said that he would like to see a report on the development of the inflow data set added as an appendix to the final operations study report. He would like to have enough information on the inflow data set used so that he may reproduce the data set for independently running the model. Bruce said that the hydrology data set would be developed as a separate task early in the process. A report will be developed and distributed to the RCG describing how the inflow data set was prepared.

The group then discussed what time stamp will be used with the model. Scott said that an hourly interval should be considered. Ray said the model should use hourly data to provide a finer look at project effects, especially considering the fluctuation schedule of the project. Bruce said that hourly data can be used for specific events so that more information is available, however for long term

statistics, daily data would be sufficient. The time interval used could be determined based on the specific metric being examined. Scott said that data should be collected from the various sources as far back as possible. The most current data collected should be used to calibrate the longer period of record. Scott raised the idea of developing hourly inflow data from USGS gages. Data availability for this would be considered, in addition to the potential usefulness for hourly model time stamps.

4. In section 4.1.2, it is unclear whether or not the back calculation of the inflow hydrograph will be done or not.

Bruce said that an inflow data set will be developed based upon upstream gages. The group agreed to remove section 4.1.2 from the Operations Model Study Plan, as back calculation would be limited to only a few years and much more difficult than using upstream gages.

5. There is no mention of incorporating water use projections in the modeling process. We would recommend water use projections be included. It may be possible to build on previous projections done for the basin by Duke Energy (and any projections done by North Carolina, if available).
Note: If Duke's projections were used they would need to be carefully reviewed and likely modified because -- (1) the projections are somewhat dated (2006), (2) experience with projections by Duke energy in the Catawba basin within the past 10 years indicate they tend to overestimate water use projections, and (3) changes in energy sources (and perhaps demand) over the past several years in the energy industry could have a large impact on future water needs for energy in the basin that may not be accounted for the in the Duke projections.

Bill A. said that it only matters what water is coming into the Project because what is occurring above the Project is outside of SCE&G control. However, there have been requests for a municipal water supply withdrawal from Monticello Reservoir. This will need to be examined as part of the operations model. Ray said that there are no intervening withdrawals between the Project and the gages that will be used in the Operations model.

Scott asked if the model will take into account future energy demands and how that will affect flows. He mentioned that Duke Energy did a study on the projected water uses for the area surrounding their projects. He said this study should be examined to see if it is applicable to the Parr Fairfield Project as it may offer some important insight into future water demands and how that may affect the Project. However, since this information is considered speculative, SCE&G will not base the entire operations study on it; it may be used to run a specific scenario. Internally SCE&G will be looking at the expected energy needs for Parr and Monticello for the next several years.

6. We request the SCDNR (and other stakeholders) be provided with the baseline HEC Res Sim operations model and the HEC-RAS hydraulic model and have the ability to independently run the models and review outputs. Any proposed scenarios should be carefully documented so that SCDNR staff can independently make appropriate edits to the model (or alternatively, the consultants can provide updated models with loaded scenarios on a periodic basis). In addition, we would request a one day seminar or training session be scheduled for stakeholders to introduce the baseline models and provide limited training on use and running of the models.

Before discussion began on this comment, Scott said that instead of a training session, he would like for there to be an introduction to the model and a demonstration, for those who are interested. Scott

said this will help him and others to determine what scenarios they would like to be run. Bruce said that an introduction to the model and a demonstration can definitely be scheduled after the model is complete, however an actual training session is not feasible. Scott said he is mostly interested in learning more about the HEC-Res model in particular, but would like to see a demonstration of HEC-RAS as well. Byron, Fritz and others agreed that they would be interested in attending the model demonstration.

The group agreed that a preliminary report including model rules and parameters will be developed and submitted to stakeholders for comment, and adjustments will then be made based on comments received. After adjustments are made, there will be a demonstration of the model for any interested stakeholders. The baseline model will then be finalized. Following finalization of the model, the requested scenarios will be run and a final report summarizing the results will be issued.

The group then discussed how the various scenarios will be compared to each other. Gerrit suggested that SCE&G could decide on a specific number of scenarios to be run and stakeholders and TWCs could request which scenarios they want to see. The information gathered from each scenario would then be distributed to the appropriate TWC and joint meetings may be scheduled to discuss the results.

7. Though we understand the challenges or producing an operations model that can mimic all historic operations, we would request the consultants to elaborate on any criteria used to determine whether the model is functioning adequately enough. For example, in section 4.3.1 at the end of the first paragraph, what is meant by the average expected system response?

The goal of the operations model is to establish rules that show how the Project is normally operated, and apply requests from stakeholders to determine how they can be balanced using the available resources. The model will be based on typical operating parameters, rather than unusual or emergency circumstances. Gerrit said that we should be most interested in the average, not necessarily outliers, such as outages. Scott said we need to make sure we have a baseline. He said that this Project is complex due to the pumpback operation and it will be difficult to match what is shown on the Alston gage. The best way to validate the model will be to look at a day when the Project is in a normal operating cycle so that information from the model and from Alston can be compared.

After the meeting, Gerrit submitted the following comments via email.

- In addition to project effects on the Park, it is important to understand the effects of project operations on sturgeon and striped bass spawning in the Columbia hydro project bypass reach and Congaree River. Shortnose sturgeon are known to occur and spawn in this vicinity.
- The operational model will be important for the Dual Flow analysis to be conducted under the IFIM study. How the Ops Model/output can be made compatible [to the] Dual Flow analysis should be determined before the model is fully developed.
- Existing and projected City of Columbia's water withdrawals and the same for any other downstream water withdrawals need to be taken into account in the Ops model and ultimately [in the] operational requirements.
- Future changes in upstream water use should be included in operational scenarios and adaptive management plans (i.e. low inflow protocol) for the new license.

Edits made to the Operations Model Study Plan were captured in track changes during the meeting and are attached to the end of these notes. Action items stemming from this meeting are included below.

ACTION ITEMS:

- SCE&G and Kleinschmidt will perform research to determine if there are any significant water withdraws planned for downstream of the Project.
- Kleinschmidt will make the requested changes to the Operations Model Study Plan and submit to the RCG for approval.
- Kleinschmidt will examine the availability of hourly USGS flow data for the upstream gages proposed in the Study Plan.

From:	Bill Marshall
To:	Kelly Miller
Cc:	Scott Harder
Subject:	Comments on Draft Hydraulic & Project Operations Model, Parr Hydro Project
Date:	Wednesday, January 15, 2014 3:04:37 PM

Hi Kelly,

DNR hydrology staff have reviewed the draft operations model study plan and we are providing comments and questions for consideration as the RCG continues developing the plan and prepares for meeting on Jan 30. DNR comments and questions are as follows:

1. In a prior Parr-FF operations committee meeting, there was a discussion about determining the effects of the Parr Hydro on the Congaree National Park. However, from the draft report, models will only be used to assess operations to approximately 20 miles downstream. Is the study component to address Congaree NP still on the table?

2. Refer to the discussion of metrics in section 2.4. Though we generally support the use of metrics to facilitate the reviews of various scenarios, metrics should be modified or added as needed during the scenario review process. As we have seen in other modeling efforts, defining initial metrics (or more appropriately when a given metric value denotes a significant change or impact) without reviewing the baseline and a few scenario outputs can be problematic. If metrics aren't defined carefully, then discerning the differences between two scenarios can be difficult.

3. We are was pleased to see the Enoree Gages will be used to evaluate regional relationships between runoff and drainage area, as we would recommend use of these gages to help develop an inflow data set. Appropriate error analysis should accompany the determination of the regional alpha and gamma coefficients presented in section 4.1.

4. In section 4.1.2, it is unclear whether or not the back calculation of the inflow hydrograph will be done or not.

5. There is no mention of incorporating water use projections in the modeling process. We would recommend water use projections be included. It may be possible to build on previous projections done for the basin by Duke Energy (and any projections done by North Carolina, if available).

Note: If Duke's projections were used they would need to be carefully reviewed and likely modified because -- (1) the projections are somewhat dated (2006), (2) experience with projections by Duke energy in the Catawba basin within the past 10 years indicate they tend to overestimate water use projections, and (3) changes in energy sources (and perhaps demand) over the past several years in the energy industry could have a large impact on future water needs for energy in the basin that may not be accounted for the in the Duke projections.

6. We request the SCDNR (and other stakeholders) be provided with the baseline HEC Res Sim operations model and the HEC-RAS hydraulic model and have the ability to independently run the models and review outputs. Any proposed scenarios should be carefully documented so that SCDNR

staff can independently make appropriate edits to the model (or alternatively, the consultants can provide updated models with loaded scenarios on a periodic basis). In addition, we would request a one day seminar or training session be scheduled for stakeholders to introduce the baseline models and provide limited training on use and running of the models.

7. Though we understand the challenges or producing an operations model that can mimic all historic operations, we would request the consultants to elaborate on any criteria used to determine whether the model is functioning adequately enough. For example, in section 4.3.1 at the end of the first paragraph, what is meant by the average expected system response?

Thank you for consideration of our comments and questions.

Bill Marshall
SCDNR

From: Kelly Miller [mailto:Kelly.Miller@KleinschmidtUSA.com]
Sent: Monday, December 16, 2013 8:56 AM
To: Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall; Bill Stangler (CRK@congareeriverkeeper.org); Bret Hoffman; Byron Hamstead (Byron_hamstead@fws.gov); Dick Christie (dchristie@comporium.net); Frank_Henning@nps.gov; Gerrit Jobsis (gjobsis@americanrivers.org); Henry Mealing; J. Hagood Hamilton Jr. (jhamilton@scana.com); Jay Maher; Joe Wojcicki; Kelly Miller; Malcolm Leaphart (mwleapjr@att.net); Pace Wilber (Pace.Wilber@noaa.gov); rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); Scott Harder; Steve Summer; Terri Hogan (terri_hogan@nps.gov); Tom McCoy (thomas_mccoy@fws.gov); Vivianne Vejdani; Wayne and Ginny Boland (wayneboland@bellsouth.net)
Subject: draft Project Operations Model Study Plan

All,

Attached for your review is the draft Project Operations Model Study Plan for the Parr/Fairfield Project. Please have any comments or edits back to me by Wednesday, January 15th. We will discuss this study plan at the upcoming Operations RCG meeting, scheduled for Thursday, January 30th.

Thanks,
Kelly

Kelly Miller
Regulatory Coordinator
Kleinschmidt
Office: 803.462.5633
www.KleinschmidtUSA.com

DRAFT
HYDRAULIC & PROJECT OPERATIONS MODEL

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

December 2013

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894)(Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

This document provides a detailed outline of the process proposed to complete a Hydrologic and Project Operations Model as part of the Parr and Fairfield relicensing project. These models will be used to assess ability to provide potential changes to project operations, and the resulting effects of potential modifications to operations of the projects. These models will primarily focus on the effects that may result from proposed changes in project operation on energy, capacity, water budget, and flood control. The intent of this effort is to develop a series of high-level fully functional modeling tools, which can be used to incorporate stakeholder requests as parameters to provide outputs and results that can be easily interpreted.

2.0 STUDY OBJECTIVES

2.1 HISTORIC INFLOW HYDROGRAPH DEVELOPMENT

Critical to the operations of hydroelectric projects is the hydrology, which generally requires using the best available gage data to determine local contributing flows. Unless there is a gage immediately upstream of the project headpond, the inflows can be derived by pro-rating available gages, to account for any ungaged drainage area between the respective gages and the site, and then summing the values. Alternatively, a downstream gage can be used to back-calculate inflow using the respective daily reservoir level and evaporation estimates. The goal of

this task is to create the best available historic inflow series, which will form the input to the operations models, energy models, and habit and recreational studies.

2.2 HYDRAULIC MODELING

The operations of Parr and Fairfield may affect recreational or habitat interests on the downstream reach of the river. Rapid changes in flow result in a wave (either positive or negative) that propagates downstream, potentially affecting habitat, stream channel stability, and recreational opportunities. The hydraulics of this wave are affected by both translation and attenuation as it progresses downstream. The impacts of existing and proposed modifications to operations (if any) can best be evaluated with a 1-D hydraulic model, which will allow the evaluation of the unsteady flow wave along the downstream reach under several different operating conditions. The goal of this study is to either construct a model (or utilize an existing model) that will evaluate stage (water level), discharge, and velocity with time, along the Broad River downstream of the Parr Dam.

2.3 OPERATIONS MODEL

The Parr-Fairfield project includes several components that need to be included in an operational model. These include the Parr Dam and powerhouse hydraulic capacities, the Fairfield Pumped Storage project operational parameters (for both pumping and generating), the Monticello Reservoir, and the Parr Reservoir. The operations of this system have historically been closely coordinated for the primary purpose of supporting the electrical grid (both demand and stability). SCE&G will need to maintain this coordination during future operating conditions. Additionally, any potential changes to operations in the future will need to be evaluated for effects on dam safety, and operating rules or limitations. This is best accomplished by developing a comprehensive operation model. The goal of this task is to assess and quantify historic operations and limits, and to incorporate these rules into a comprehensive and flexible operations model that can be easily modified to simulate proposed future operations. We propose using the HEC Res Sim model to investigate headpond fluctuations and associated hydro generation hours that SCE&G could have.

2.4 SCENARIO COMPARISON

2.4.1 A process will be developed through which TWCs/RCGs and various stakeholders will submit scenarios to be run and compared to evaluate potential future operations and their effects.

~~2.4~~

2.4.2 ~~Once models are constructed,~~ The operations model will be used to run scenarios proposed by various stakeholders and submitted through TWC's or RCG's. Results will be reviewed by the RCGs/TWCs during a series of meetings. Model results will be summarized and integrated into the final recommendations presented in the license application.

~~and different operating scenarios have been run, we will summarize the results into easily compared and intelligible metrics. Without this step, the results of a given scenario or study may be lost in the details and vast quantity of data.~~

2.4.1 2.4.3 SUMMARY STATISTICS

With several integrated modeling efforts, each including possibly several different scenarios, it is critical to develop summary tables and/or summary metrics for each scenario. The goal of this task is to consider each of the studies, and the potential set of results, and develop a standardized means of summarizing and quantifying the results. As an example, it may include the number or percent of flood days changed from baseline conditions, the change in habitat area, the change in streamflow variance, or the increase/decrease in potential MWh. Using the summary statistics, stakeholders and TWC members can prioritize their requests and work to minimize the negative aspects of operational changes.

3.0 STUDY DOMAIN

The focus of this study includes the Parr Reservoir (defined as the elevation of the top of the crest gates, or El. 266.0'), the Fairfield Pumped Storage facility and the Monticello Reservoir, and the Broad River downstream of Parr Shoals Dam extending to and including Frost Shoals, near Boatwright Island.

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4.0 METHODOLOGY

4.1 INFLOW HYDROGRAPH DEVELOPMENT

Development of the inflow hydrograph can be accomplished by two methods: the use of upstream gages prorated to the dam's drainage area, or the use of the gage immediately downstream with detailed information of the project's past operations. In the case of the Parr model, the upstream gage proration method will be used, due to the limited availability of detailed Project operation data. Historic data will be reviewed to determine the period of record and time increment to be used to represent project inflow. The proposed inflow data will be reviewed by the Operations RCG for agreement.

4.1.1 UPSTREAM GAGE PRORATION

Proration of streamflow gages, in order to account for ungaged drainage area, is not necessarily a linear relationship. In order to evaluate the regional relationship between runoff and drainage area, two unregulated stream gages on the same river with overlapping records is required. The only gages that meet this in the immediate Parr Dam watershed are two gages on the Enoree River. These two gages will be used to assess an appropriate proration coefficient (α) and exponent (γ), which may be used to regionally prorate all of the gages required in construction of an historic inflow series.

An equation that may be used with the fitted regional coefficients to determine inflow to Parr is below, where the values are the ratios of the total area to gaged area for each gage location. Additionally, these gages are at different distances from the Parr Reservoir, and drain through different channels, thus the arrival times should be adjusted accordingly. The angled brackets denote a routed hydrograph series.

$$Parr\ Inflow = \langle \alpha * BRC \left(\frac{3250.8}{2790}\right)^{\gamma} \rangle + \langle \alpha * TRD \left(\frac{807.9}{759}\right)^{\gamma} \rangle + \langle \alpha * ERW \left(\frac{731.3}{444}\right)^{\gamma} \rangle$$

where,

BRC – Broad River at Carlisle
TRD – Tyger River near Delta
ERW – Enoree River at Whitmire
α – Fitted Regional Coefficient
γ – Fitted Regional Exponent
⟨...⟩ - Routed Translation

Routing will be completed using a simplified Muskingum approach, and will allow for wave attenuation and travel time, which are more critical for shorter period flows. Daily flow rates would not require this routing, as the average daily flows can simply be summed.

~~4.1.2 Downstream Gage with Operational Information~~

~~Using the USGS gage at Alston, which is immediately below the dam, provides the simplest means of determining project releases. However, back-calculating an inflow hydrograph would require data from project operations, including releases and spills from Parr, generation and pumping information from the pumped storage (or Monticello Reservoir elevations), a stage-storage curve for the Parr Reservoir, and estimates for evaporation from the reservoir. Alternatively to the pumped storage generation and pumping information, Monticello Reservoir elevations could be used, but would also require a stage-storage curve and evaporation estimates.~~

Table 1 Summary of Available Hydrologic Data

Data Source	Period of Record	Data Type
Parr Reservoir (#02160990)	10-1-1984 to Current	Stage
Broad R. at Alston (#02161000)	10-1-1896 to Current	Stage & Discharge
Congaree R. at Congaree NP (#02169625)	10-1-1984 to 8-9-2013	Stage
Broad River at Blair (#02160750)	9-11-2010 to 3-7-2013	Discharge
Broad River near Carlisle (#02156500)	10-1-1938 to Current	Stage & Discharge
Broad River below Neal Shoals (#021564493)	3-27-2012 to 9-26-2013	Stage & Discharge
Broad River at Diversion Dam (#02162100)	10-1-1987 to 9-24-2012	Stage
Enoree River at Whitmire (#02160700)	10-1-1973 to Current	Stage & Discharge
Enoree River near Woodruff (#02160390)	2-9-1993 to Current	Stage & Discharge
Tyger River near Delta (#02160105)	10-1-1973 to Current	Stage & Discharge
Fairfield Pumped Storage Generation/Flow	TBD	Discharge
Monticello Reservoir	TBD	Stage

4.2 Hydraulic Modeling

The downstream reach of the Broad River below Parr Shoals Dam will be modeled using the Army Corps of Engineers' HEC-RAS v4.1, which is a 1-dimensional model that will allow correlation between flow releases from Parr Reservoir and resulting water level stage in the river downstream. Wave travel times, rates of rise, and stage recession times will also be available from this model. Readily available data will be used for developing the model. The model will

be developed to include the hydraulic affects of flow releases down to the Frost Shoals area near Boatwright Island (approximately 20 miles downstream of the Parr Shoals Dam). The results of the model will be used to determine flow estimates for other interests in the project, such as navigation, recreation, or habitat benefits.

4.3 OPERATIONS MODEL

Development of the operations model includes two major tasks: develop the rules and patterns from historical operations, and secondly use these rules to construct a model for testing alternative scenarios. Success of this task can be measured by the ability of the model to replicate historical operations, but can also be measured by the ease and flexibility of testing future scenarios that produce easily interpreted results by stakeholders and TWC members (i.e. important information is not lost in modeling details). The operations model can become quite complicated very quickly, thus to successfully accomplish both of these goals, an appropriate model framework using the best available data is required early in the process.

4.3.1 OPERATION RULES & REGULATIONS

Not only is hydrology a stochastic process, but operating history and generation (pumping/generating) can also be stochastic as a response to weather patterns, random outages, increased grid demand, changes to grid support via addition of other generators, low flow periods, or even differences in decisions between operators using forecast data. Therefore, it is impossible to state explicit rules that define the operating regime for any of the projects, but both extreme limits (i.e. minimum/maximum pond levels, or minimum/maximum flow rates, rates of change, etc.) may be extracted from specified rules, curves, or observations of the system. Additionally, subjective operational patterns may be inferred from historic operations (i.e. typical pumping volumes in June are a certain amount, generating is typically highest during a given period of the week, etc.). Both the hard and soft rules are important for developing an understanding of conjunctive project operations. Although the rules may not exactly depict the operations at any given point in time, from either the past or the future, they should be able to depict the ~~average~~ expected system response.

Several key components of data will be concurrently analyzed:

- Pond Operating Levels (Parr Dam & Monticello Reservoir)

- Spillway gate operating guidelines
- Pumping Rates (Fairfield)
- Generation Rates (Parr & Fairfield)
- Rates of Change from Generation Flows
- Typical Generation Periods (time of day, weekday, months)
- Seasonal Influences
- Influence of low river flow conditions boundary
- Influence of high river flow conditions boundary
- Influence of water withdrawals from Monticello Reservoir
- Potential impacts of future upstream and downstream water withdrawals on Project inflow and downstream effects.

In order to appropriately define typical system responses, detailed historic information is required. This includes as available:

- Hourly (or finer) generation records for Parr & Fairfield
- Parr and Monticello Reservoir stage records
- Meteorological Data (precipitation, temperature)
- River Flow gage records

These records will be reviewed, plotted, regressed and inferred upon to develop an understanding of 'typical' system responses. Again, exact operations for a complicated system are impossible due to the stochastic nature of all influences, but typical rules may be inferred.

4.3.2 OPERATIONS MODEL FRAMEWORK

Once a comprehensive understanding and documentation of typical operating rules has been developed, they may be used within a modeling framework to replicate historic operations (validation process), and then test future or altered operating conditions.

The model will be constructed at hourly time steps to allow testing of different release rates and spilling events from the Parr Dam, and/or operating conditions at Fairfield. Longer durations may miss critical operating responses, and unnecessarily short time steps would be excessive and not add additional value. The duration of the validation period will vary based on the available data, but should cover as many sequential years as manageable.

The operations model will be developed using the Army Corps of Engineers HEC-ResSIM software package. This package is freely available, easily integrates with other models (such as

HEC-RAS), and has the capacity to model multiple projects (including the Fairfield pumped-storage) with a range of complex and even contradictory operating rules. Results of the model are easily viewed either within HEC-ResSIM, or externally using the HEC-DSSVue software package.

4.4 SCENARIO COMPARISON

From the early development of the study plan, model runs should be sufficiently detailed to outline how the projects' operations will be tested. For example, what river flows are critical (low flows to high flows) and should be emphasized? What rates of generation are important, and how quickly can they be changed? A matrix defining each scenario, and how each component of the project is being operated, should be developed. This will naturally confine modeling efforts, and maintain focused efforts for comparison by the TWC members and stakeholders.

4.4.1 STATISTICS

Statistics are valuable for concisely summarizing the nature or property of a random or stochastic variable. For example, the sample mean is commonly used to describe a set of data, but additional information may be obtained from higher order moments (variance, skew, kurtosis). The critical statistic (metric) should be determined early in the study process for each study or model output. For example, the total habitat area may be critical, the average generating rate, the 1% exceedance flow rate, the variance in water levels during a critical period, the maximum headpond level, the 7Q10 flow rate, etc. are all examples of summary statistics. These should be discussed early, and concurrence with working groups or stakeholders should be achieved early in the process to determine what is considered critical.

Additional examples of potential flow statistics include:

- Rise-Fall Rates
- Mean, Median, Quartile Flow Rates
- Variance, skew, kurtosis
- Autocorrelation Function & Partial Autocorrelation Function lags
- Flow-Duration Curves
- Excess Distribution Functions and Conditional Excess Distribution Functions
- 7Q10 flow
- 5,10,50,100-year peak flows
- Stage-Duration Curves (Parr Reservoir)

5.0 REPORTING

A preliminary report documenting the development of the operations model will be provided to the TWC for review prior to the completion of the model. This preliminary report will include the methods and information as follows:

- Discussion of model data acquisition
- Inflow hydrograph development
- Development of future inflow hydrograph(s)
- Hydraulic 1D Model Development & Calibration
- Operations Model Development & Verification
  - Parr Operations
  - Fairfield Pumping/Generating

Following a comment period, a demonstration session will be conducted to familiarize interested stakeholders with the implementation of the HEC-RES SIM and HEC RAS models for this Project. During this session, the input data and Project parameters will be reviewed, and a "hands-on" session can be conducted to allow stakeholders to learn how to run the model. After the demonstration session is conducted, the final model will be ~~development~~developed and used to analyze operations scenarios. ~~will conclude, and the implementation of the model will be conducted~~.

~~Scenarios proposed by various stakeholders and submitted through TWC's or RCG's will be incorporated into the model to determine the statistical implications of each set of parameters.~~

A final report will document methods and results as encountered in the modeling effort, including:

- Scenario Results
- Hydraulic Routing Model
- Operations Model
- Energy Modeling
- Scenario Comparison Matrices & Statistics

6.0 SCHEDULE

Data collection and model development will begin no later than the spring of 2015, with a preliminary report documenting the development of the model completed by the end of 2015. The methodology for this modeling effort may be revised or supplemented based on consultation with TWCs and other interested stakeholders. Model results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the SCDNR, USFWS, RT&E TWC and other relicensing stakeholders. The final report, which will include the scenario results, will be completed for filing with the final license application.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality TWC Meeting

February 4, 2014

Final KDM 3-14-14

ATTENDEES:

Bill Marshall (SCDNR)
Milton Quattlebaum (SCANA)
Rusty Wenerick (SCDHEC)
Henry Mealing (Kleinschmidt)
Kelly Miller (Kleinschmidt)
David Eargle (SCDHEC)
Kerry Castle (SCDNR)
Bill Argentieri (SCE&G)
Randy Mahan (SCANA)
Steve Summer (SCANA)
Byron Hamstead (USFWS)
Gerrit Jobsis (American Rivers)
Bill Stangler (Congaree Riverkeeper)
Jaclyn Daly (NOAA) via conference call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Kelly opened the meeting by reviewing the changes that were made to the Baseline Water Quality Report, based on comments submitted by USFWS and SCDHEC following the September 2013 meeting of the Water Quality TWC. These edits consisted of the following:

- Regarding the vertical profile data collected by SCANA for Parr and Monticello Reservoirs, tables were added summarizing the max, min and mean values for temperature, pH, dissolved oxygen, and conductivity.
- Data was added from all base and random SCDHEC monitoring sites within the Project Boundary. Parameters include water temperature, dissolved oxygen, pH, turbidity, total phosphorus and total nitrogen, chlorophyll-a, and metals.
- Information on SCDHEC sites listed on the 2012 303(d) list was included.
- USGS data from the Carlisle gage was included.
- Turbidity data collected by SCDNR was included.
- Data from four SCDHEC monitoring sites located at various points throughout the Project Boundary were graphically compared.
- Appendix B was added, which consists of the Thermal Mixing Zone Evaluation at VC Summer Nuclear Station.

Steve noted that an addendum is currently being added to the Thermal Mixing Zone Evaluation, and this information will be added to Appendix B of the Baseline Water Quality Report once the addendum is filed with SCDHEC. Also, all of the raw data used in the report is available to any stakeholder who is interested. Byron and Bill S. requested a copy of the raw data.

Kelly then asked the group for any additional comments or edits to the report. Byron asked about the vertical profile data for Parr Reservoir. Vertical profile data included in the report for Parr

Reservoir was collected from January 2011 through July 2013 so some of the graphs only included two years of averaged data, while others included three years. The data that has been collected from July 2013 through December 2013 is now available and will be included in the updated version of the report.

Bill S. asked why the SCDHEC data from 2004 was used for the comparison of upstream and downstream water quality. Kelly explained that this was the only year that had a complete set of data available for the comparison. There was discussion about the seasonal temperature shift in the reservoir. Steve noted that Monticello stays warmer in the winter and cooler in the summer, which may result in some slight temperature changes in the reservoir. The group then discussed using USGS data to compare water quality upstream and downstream of the Project. Everyone agreed that temperature and dissolved oxygen (DO) data from the USGS gages at Carlisle, Parr Dam, Tyger River and Enoree River should be analyzed to detect potential project effects. Bill A. pulled up available data on the USGS website for the group to view. The Parr Dam data showed events when DO levels in the tailrace dropped below 4.0 mg/l. The group also noted that there was a seasonal temperature shift in the reservoir. The group agreed that data from the gages listed above would be gathered from 2004 through 2013 and graphically compared to identify low DO events, determine how often, when, how long those events occurred and to see if there are common events related to the low DO. Flow data will also be collected to determine if there is a correlation between low or high flows and low or high dissolved oxygen. All of these analyses will be included in an addendum to the Baseline Water Quality Report.

Several stakeholders said they were not comfortable with some of the conclusions made in the report, including that the reservoirs are healthy and that the Project doesn't appear to cause significant impacts to water quality downstream. This wording will be removed from the report.

Gerrit asked which sites were listed on the 303(d) list. Kelly said that SCDHEC monitoring site B-346 was listed for a total phosphorus excursion, site B-236 was listed for a copper excursion, and sites RL-04370, RL-04374 and RL-11031 were listed for pH excursions.

Byron asked that section 3.1.5 include wording that explains data presented in this section was collected on a monthly basis.

Byron asked about the metals data collected by SCANA and the detection limits listed by SCANA versus the state standards. Steve stated that SCANA was performing screening tests to determine presence or absence of specific metals.

Bill M. noted that the map on page 2-2 did not show the location of SCDHEC monitoring site B-236. Kelly will correct this and include the updated map in the updated version of the report.

David and Rusty then requested a macroinvertebrate study to be performed, in addition to the Baseline Macroinvertebrate and Mussel Report that has already been prepared and is available at the Project website www.parrfairfieldrelicense.com. David would like SCE&G to perform a rapid bioassessment at three sites within the Project Vicinity over two or three years. The three sites identified by David were as follows: a site located within a one-mile shoal section immediately below Henderson Island, at the upstream reach of Parr Reservoir; a site located immediately below Parr Shoals Dam; and a site about 8.1 river miles below Parr Shoals Dam near the upstream end of Haltiwanger Island in an area known as Freshly Shoals. Rusty said that this additional

macroinvertebrate study is necessary for SCE&G to obtain the 401 water quality certification for the Parr Fairfield Project. David said that SCDHEC has already collected macroinvertebrate data from the area near Haltiwanger Island and he will provide that data to SCE&G and Kleinschmidt to include in the Macroinvertebrate Report.

Bill S. asked if aquatic invasive species management is being addressed through any of the TWCs or RCGs. This issue will be addressed in the Shoreline Management Plans that will be developed for Parr Reservoir and Monticello Reservoir by the Lake and Land Management TWC.

Edits to the Baseline Water Quality Report discussed during the meeting will be completed and the report will be resubmitted to the TWC for approval. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Kelly will provide Byron and Bill S. with a CD containing the raw data used in the Baseline Water Quality Report.
- Kelly will incorporate all edits discussed in the meeting into the Baseline Water Quality Report and will perform all additional analyses to include in an addendum to the report.
- SCE&G and Kleinschmidt will pull together the USGS data and perform the analysis discussed during the meeting.
- Kerry will send Kelly additional SCDNR turbidity data.
- Kleinschmidt will develop a Macroinvertebrate Study Plan and submit to the TWC for approval.
- David will send Kelly the macroinvertebrate data collected by SCDHEC at Haltiwanger Island.
- Steve Summer will send Kelly the Addendum to the Thermal Mixing Zone Evaluation for VCSNS unit 1 when it becomes available.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Instream Flows TWC Meeting

March 5, 2014

Final KDM 04-8-14

ATTENDEES:

Bill Marshall (SCDNR)
Ron Ahle (SCDNR)
Gerrit Jobsis (American Rivers)
Shane Boring (Kleinschmidt)
Henry Mealing (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Bill Stangler (Congaree Riverkeeper)
Vivianne Vejdani (SCDNR)
Bill Argentieri (SCE&G)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Brandon Kulik (Kleinschmidt) via conf. call
Dick Christie (SCDNR)
Randy Mahan (SCANA)
Byron Hamstead (USFWS)
Fritz Rhode (NOAA) via conf. call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions and then Shane lead the group in a review of the Mesohabitat Assessment Report. Shane explained the intent of the study and reviewed the results, including an overview of the maps. Ron asked to see an individual breakdown of maps 2a, 2b and 2c and Shane said he will provide these maps to the group.

Bill M. asked if we learned anything new from the study. Shane said that the most restricted point on the river for fish passage and boat navigation was identified. This area is right above the Bookman Shoals complex. This area is identified in the IFIM Study Plan as an area that needs further study. Shane said they also did a survey for Robust Redhorse spawning areas during the mesohabitat study. Two areas were identified including a location right downstream of Parr Shoals Dam and another location upstream of Bookman Shoals. Shane said that Scott Lamprecht agreed that these spots seemed ideal for Robust Redhorse spawning. Milton said he also went out on the river with Scott and they identified another area near the Bookman Shoals complex and Hickory Island. A spot near Haltiwanger Island was also identified. Shane will develop a memo summarizing all of this information on Robust Redhorse spawning sites and will distribute this memo to the group. He will also append the memo to the final IFIM report. Shane will edit the IFIM Study Plan so it mentions that the Robust Redhorse memo will be appended to the final IFIM report.

Shane also said that during the mesohabitat assessment they learned that Bookman Island is very complex with lot of cross channels, braiding and varying elevations. He said that at least seven channels had been identified in the area. Fritz added that seams of bedrock add complexity because they act as weirs, moving the water in different directions depending on flow. He said it is good that 2D modeling will be performed in this area during the IFIM study. Byron asked if the 2D

modeling will include the two Robust Redhorse sites identified in the Bookman Island complex and Shane said yes. Shane added that the upstream site at Haltiwanger Island will be studied using PHABSIM along with the site right below Parr Shoals Dam at Hampton Island. Ron said that the area just downstream of the Parr Shoals Dam is good for Robust Redhorse because there seems to be a dike formed by the rock with a gravel bed, covered by deep water. Ron said suckers are often found in this area.

Ron said that the Broad River downstream of Parr Shoals Dam is very complex, and that the maps included in the Mesohabitat Assessment Report are generalized. But he believes they are fairly accurate and that the proportions of the various mesohabitat types found in the river are accurate. Shane agreed and said that sometimes while looking at a cross section of the river, one side of the river may have a run and the other side may have a backwater pool. Shane said this was hard to convey in the maps, but that overall the map delineations and the report are very accurate.

Byron asked if areas of constriction throughout the river have been mapped out. Shane said GPS points have been taken and can be provided to the group, but cross sections detailing depth and other information has not been mapped out yet and will be completed as part of the IFIM study. Shane showed the group, using Bing maps, two areas in the river where fish passage and navigation may be possible. These areas will be studied in more detail during the IFIM study.

The group began reviewing the IFIM Study Plan and Shane mentioned that the Mesohabitat Assessment Report will be added as an appendix to the final IFIM Report. Byron wanted to know how the information collected in the IFIM study would be used for determining suitable crayfish habitat. Will the amount and type of cover available at various depths be examined? Henry said this will not be done using PHABSIM, but this information can be collected as part of the general description of the study area. Gerrit asked if when determining cover types, isn't it typical to not only look at the transect, but upstream as well? Brandon said yes because at the upstream/ downstream cell boundary level, the area is reasonably homogenous but within the cross section localized substrate variations can be like a mosaic, so it is typical to look upstream and downstream a reasonable distance to characterize the substrates assigned to a particular vertical. Brandon said that in regards to crayfish, the group can establish what the important cover types are for a particular species beforehand so that the field crews know what to look for during data collection. Byron said he will do some additional research to identify the preferred covers for the spiny crayfish. He is interested in determining how much cover is available and how much is exposed at varying water levels. Henry said that this may be possible with rocky substrates since they are fairly permanent, but that the abundance and distribution of woody debris can change from year to year so only general qualitative observations can be made. Henry said that if large woody debris is located at a PHABSIM transect, it will be surveyed in depth, otherwise just general descriptions of what is located upstream and downstream will be recorded to characterize conditions and where it is located relative to water levels. Brandon said that photos and possibly videos will also be taken to document the substrate and cover types in the area. If Byron develops a specific list of the type of substrate and cover that is important for crayfish, including a description of the types of woody debris preferred (approximate size and position in the water column), it will make it easier to document these during the study. Brandon said they can look at what is exposed during low flows and also record how high flows mobilize these substrates. Ron said that in his experience the large woody debris found in the central portion of the river is usually located in areas of accumulating sand and is typically transient and moving. All other woody debris tends to be found along the shorelines. Byron said that the wetted perimeter study will provide a lot of information on the

woody debris found throughout the river. He will determine what the specific habitat requirements are for the spiny crayfish, an at risk species which is currently under candidate review, and provide these to the group prior to the IFIM study.

In section 3.2.2 of the IFIM Study Plan, Shane added in a description of the downstream ledge which may be a possible navigation site.

Bill S. asked why the river directionality is positioned looking upstream. Shane said that it just depends on how the biologist is trained. The group agrees to change all direction references to looking downstream.

Prior to the meeting, Gerrit submitted a comment regarding the inclusion of a Dual Flow analysis (DFA) into the IFIM Study Plan. Brandon explained to the group what a DFA is and his description is attached to the end of these notes. He said the goal of a DFA is to assess Project generating flows and how various operating scenarios affect habitat suitability. Base flow and generating flow couplets of interest are identified, along with selection of key species and lifestages. Effectively available habitat for a particular study site is calculated at pair of stream flows. A comparison of the amount of units of WUA available at the base flow versus the units of WUA at the generating flow is completed. DFA only records WUA corresponding to the lower of the two paired values regardless of whether the lower WUA occurs at the low or high flow. The assumption is that the lower WUA value represents the level of suitability persisting under both conditions For example, if the habitat value is zero at the low or high flow, then the value for that pairing is zero. Shane said this can be done as a desktop exercise and doesn't require any extra field effort however a basic PHABSIM analysis must be completed and reviewed first since this step establishes the quantification basis.

Gerrit said DFA can also be done to mitigate the effects of peak flows by changing the base flow. He said you can iteratively move the base flow up or peak flow down to mitigate and lessen the affect on habitat to assess different operating scenarios. The idea is that if the higher the habitat suitability is a majority of the time, then the episodes of lower habitat suitability are less stressful to the aquatic species . Bill A. asked if base flows would be changed during certain times of the day or seasonally. Gerrit said this is a seasonal change. Brandon said spatially peaking effects attenuate going downstream so that the effect is most pronounced nearest the tailrace. The group would have to decide if the analysis should focus on the upstream reaches of the river or the downstream reaches.

The group decided that the study plan needs to include information on process steps regarding the DFA. The TWC will review initial WUA output and then meet to determine the DFA scope. No additional field work will be needed. Shane will add a few paragraphs to the IFIM Study Plan describing the DFA process. Kelly will send these paragraphs out to the TWC for review and comment.

Other additions to the IFIM Study Plan include mentioning the Robust Redhorse memo, adding in crayfish habitat suitability information (provided by Byron) and adding wording on the identification of substrates for crayfish during the IFIM study. Ron mentioned he would like to see a more specific schedule for when the IFIM study will take place because he would like to help. He would like to see the schedule already included in the IFIM Study Plan expanded to include more specifics. He would also like to see qualifiers added in to account for bad weather or flows that

might inhibit data collection. All of these changes will be made to the study plan in track changes and sent out to the TWC for review and approval.

Dick asked the group if they want to specify the goals of the analyses in the study plan. For example, SCDNR's recommendation is to identify a minimum flow that would provide 80 percent of maximum WUA. The group decided to add a list or table outlining the process of the study, which will include an expanded section on TWC consultation.

Gerrit asked if there will be demonstration flows scheduled following the results of the IFIM study regarding navigation and fish passage. Bill A. said that there can be demonstration flows and Shane will add this into the process schedule.

Dick mentioned the navigation component of the IFIM Study Plan and said that it was not consistent with the Navigational Flows Study Plan, which is discussed in the Recreation TWC. The Navigational Flows Study Plan needs to be changed to include a description of the two-way navigation requirement. This study will still only focus on one way navigation, but a description of two-way navigation needs to be included. This study plan will be re-circulated to the Recreation TWC for approval and then finalized.

Shane then gave the group an overview of the 2014 field season efforts for the IFIM study. Level loggers will be deployed in late March or early April in 12 different locations from the Parr Shoals Dam to the Columbia Dam pool, near the rowing facility. Level logger data is being collected to examine travel time for flows and to develop stage discharge relationships. Additionally, 2-D data collection will be completed in the Bookman Shoals area (Study Site 10), which includes latitude, longitude and elevation data for the entire two mile study area. At Study Site 1, a terrain model for quantifying pools and fish passage will be created. Cross sectional profiles including bed elevations and water surface elevations will also be collected at Study Site 4. Bill S. asked how many points will be examined at Study Site 10. Shane said he isn't sure yet, but it will be a good idea to look at existing LiDAR data and DEM data to make sure they establish an adequate number of points. This should give clarity to the density of points needed for the model. Densities could be as tight at every three meters. Shane said that the TWC is welcome to help with these efforts this year as well. Emails will be sent to the group to notify them as soon as possible when the work will be done.

The IFIM Study Plan will be updated to reflect the items discussed at the meeting and sent back out to the TWC for approval. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Byron will identify the preferred habitat substrates for the spiny crayfish and provide this information to the group for use during the IFIM study.

- Shane will change the language in the IFIM Study Plan to reflect a "looking downstream" perspective.

- Shane will add in a section describing the process steps of the IFIM study with an expanded section on TWC consultation. He will also expand the schedule to include more specific dates and times which will include demonstration flows if possible. He will also add qualifiers to account for bad weather or flows that might inhibit data collection.

- Shane will add in a section to the IFIM Study Plan discussing Dual Flow Analysis. He will also add in a few sentences discussing the information collection on Robust Redhorse spawning areas. Additionally, once Byron provides the information regarding preferred spiny crayfish habitat substrates, Shane will include this in the IFIM Study Plan.

- Kleinschmidt will update the Navigational Flows Study Plan with information on two-way navigation and redistribute to the Recreation TWC.

DUAL FLOW ANALYSIS

- The basic WUA/flow relationship is the foundation
- Base flow/generating flow couplets of interest are identified
- Key species/lifestages (or guilds) are strategically selected
- Effectively available habitat for a study site[1] is calculated at pairs of stream flows: (base) non-peaking and a (generation) peaking flow.
- Dual Flow analysis only records WUA corresponding to the lower (*"effectively available"*) of the two paired values. If the habitat value is zero at either the low or high flow, then the value for that pairing is zero.
-

Example:

basic WUA/flow relationship (*example from Chippewa River, WI*):

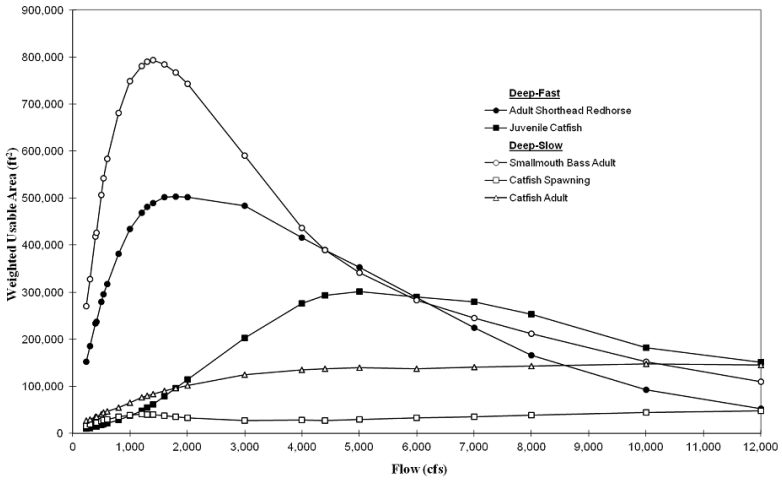
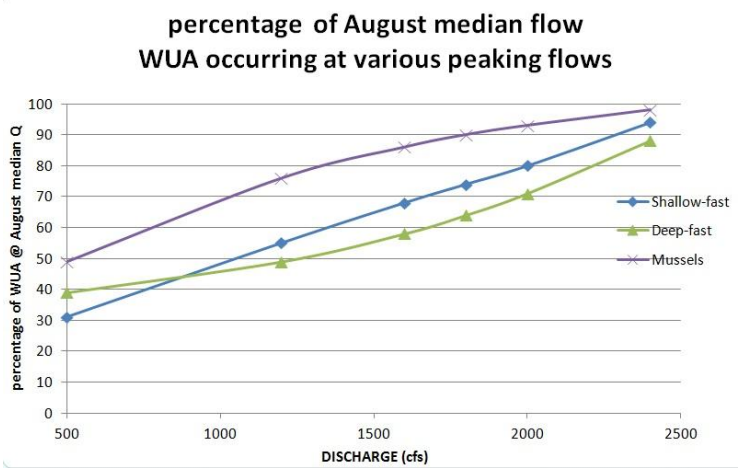


Figure 4. Habitat-discharge relations for fishes in Deep-Fast and Deep-Slow habitat guilds within the Cornell Project instream flow study area.

Effective Habitat WUA of generation vs. base flow condition plotted



[1] For non-mobile life stages such as macroinvertebrates or nest spawning, calculations can optionally be performed at the cell level using the "HABEF" routine in PHABSIM

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Fisheries TWC Meeting

April 1, 2014

Final KDM 05-06-14

ATTENDEES:

Bill Marshall (SCDNR)
Milton Quattlebaum (SCANA)
Steve Summer (SCANA)
Henry Mealing (Kleinschmidt)
Dick Christie (SCDNR)
Kelly Miller (Kleinschmidt)
Byron Hamstead (USFWS)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Randy Mahan (SCANA)
Hal Beard (SCDNR)
Fritz Rohde (NOAA) via conference call
Vivianne Vejdani (SCDNR)
Gerrit Jobsis (American Rivers)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions. Ray then gave the group a presentation on lake level fluctuations. This presentation was an updated version of the one given at the last Fisheries TWC meeting, held on December 19, 2013. Ray addressed the stakeholder requests to examine wet and dry years and how they might affect fluctuations. He also added in data collected in 2013. The updated presentation is included at the end of these notes.

After Ray's presentation, the group reviewed the comments received from SCDNR on the Fluctuation Study Plan. Dick mentioned that some of the comments submitted may not be applicable anymore, after discussion with members of the TWC. Henry said that many of SCDNR's comments were actually related to the addition of more information on the fish that could be affected by the fluctuations.

In Section 2.0, information is included on the percentage of shoreline that is affected by the fluctuations at Parr and Monticello Reservoir. SCDNR mentioned that this information was very important to them. Henry said that mitigation efforts at Monticello Reservoir should be focused on areas with gentle slopes (less than 25% slope), which are typically found in the upstream portions of the reservoir. There is a higher potential for habitat enhancement in these areas. Dick said that collecting elevations at study sites needs to be listed in the study objectives section. He said that elevation of habitat enhancements (spawning benches, gravel beds, ect.) is critical to their successfulness. Largemouth bass are obviously spawning in Monticello Reservoir, most likely in deeper waters, because that is the more stable habitat in relation to water levels. Therefore, having a spawning bench that is located 1-2 feet below low pool (which is covered by approximately 5 feet during high pool) would be expected to be used by fish. Dick mentioned the need to evaluate the feasibility of various enhancement measures so that accurate recommendations can be made. He suggested evaluating centrarchids, which spawn in summer months in Monticello Reservoir.

SCDNR submitted a comment on the study plan requesting the use of the Recreation Lake as a control to help evaluate the impacts in Monticello Reservoir. The group decided that this was unnecessary since the objective of the study at Monticello Reservoir is more qualitative. Dick said that since we already have determined how much shoreline can be exposed in Monticello Reservoir during fluctuations (approximately 333 acres), it is more important to focus on enhancement measures than to spend a lot of effort on quantifying impacts.

SCDNR is less interested in exploring habitat enhancements on Parr Reservoir because the potential for making meaningful habitat enhancements on Parr would be difficult due to of the magnitude of fluctuations. Monticello Reservoir has a lower magnitude of fluctuation where habitat enhancement has a better chance of benefitting the aquatic resource. Gerrit said that American Rivers isn't interested in skipping to mitigation without considering the possibility of adjusting the fluctuation range. He said that it is state law to maintain navigable waters, which isn't always something that can be mitigated. Gerrit said he has heard many people say it is difficult to navigate Parr Reservoir and so we need to determine what the navigation hindrance is and quantify it. Henry said this is why a quantification element was included in the study plan. Henry said if Gerrit has specific information from boaters and anglers on locations where navigation is difficult, he should share this information so that it can be considered during the study. Milton and Steve identified a few areas in Parr Reservoir where navigation could possibly be an issue, and so transects will be established in these areas during the study. The group discussed the state navigation criteria for rivers. There are no state-established navigation criteria for reservoirs. Hal said that the navigability of a reservoir or river also depends on the experience of the navigator. Bill M. said that it is important that people can get in and out of the boat ramps on Parr Reservoir. This information will be collected during the proposed Recreation Use and Needs Study that will be included in the PAD. Viviane shared that SCDHEC has a general "guideline" that no more than one-third the waterway should be obstructed for navigation by a proposed structure. This relates to building a structure in the waterway but could be interpreted that one-third the waterway should be left open for public navigation. The group continued to discuss the possibility of establishing navigation criteria for reservoirs. Byron asked the TWC if determining navigation criteria is necessary before approving the proposed methodology in the study plan. Should we focus on finalizing the methodology proposed in the study plan and discuss navigation criteria later? Henry mentioned that one way to improve navigation in Parr Reservoir is to increase signage and create maps that display the best navigation routes.

The group decided to amend the study plan so that the study objectives are listed separately for Parr and Monticello Reservoirs. It was also discussed that the Parr study would include data that would help qualify how reservoir fluctuations may affect navigation in the reservoir. For example what happens when there is a 5 ft or 9 ft drawdown? What portions of the reservoir are potentially impacted in relation to dewatering of aquatic habitat and constricted channel (navigation).

Henry reminded the group that the fluctuation study will not include the same methodology as an IFIM study. This study will focus more on documenting the reservoirs at various pool elevations through pictures and some transect data. Henry said that TWC members are welcome to help choose the transects for each reservoir. Byron said that identifying slope (bed topography) and documenting habitat type along each transect will address the USFWS's concerns regarding impacted habitat.

Gerrit mentioned that the polygons on the maps included in the study plan need to extend from shoreline to shoreline. Milton said he would change the maps to show this.

The group then discussed the methodology for studying Monticello Reservoir. The group decided that pictures will be taken along the shoreline to document effects. Henry also said that the group can pick two characteristic areas, such as a cove or an island, to document for use in determining appropriate mitigation measures. The group then looked at some pictures Dick pulled together displaying the various types of habitat enhancements that could be used at Monticello. Hal asked how much area is going to be covered with enhancements and is this only going to be done one time. Dick said that all of those terms will be negotiated later in the process. Vivianne said that an Army Corps of Engineers permit may be required before installing any fish attractors. This is something the group needs to keep in mind later in the process.

Bill M. asked if the group foresees any habitat enhancement at Parr. Henry said that enhancement measures could possibly be implemented in backwater areas. Hal said that he believes enhancement efforts should be focused on areas that are more likely to get a response from fish, such as in Monticello Reservoir. The group decided to focus on identifying areas in Parr Reservoir to study and evaluate the potential for enhancement measures pending the results of the study.

Edits will be made to the study plan including separating the objectives section into two subsections for Parr and Monticello. The edited objectives section will be distributed to the TWC for approval via email. A complete draft version of the study plan will then be sent out to the TWC and a meeting will be scheduled to discuss the edits. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Kleinschmidt will revise the study plan to include comments and edits discussed at the meeting. The revised draft study plan will be sent to TWC members for further review and a Fisheries TWC meeting will be scheduled to discuss the revised plan.

- Milton will redo the maps in the study plan to ensure the polygons extend from shoreline to shoreline.

Parr & Monticello Reservoir Fluctuation Update

Parr Hydroelectric Project Relicensing

Fisheries Technical Working Committee

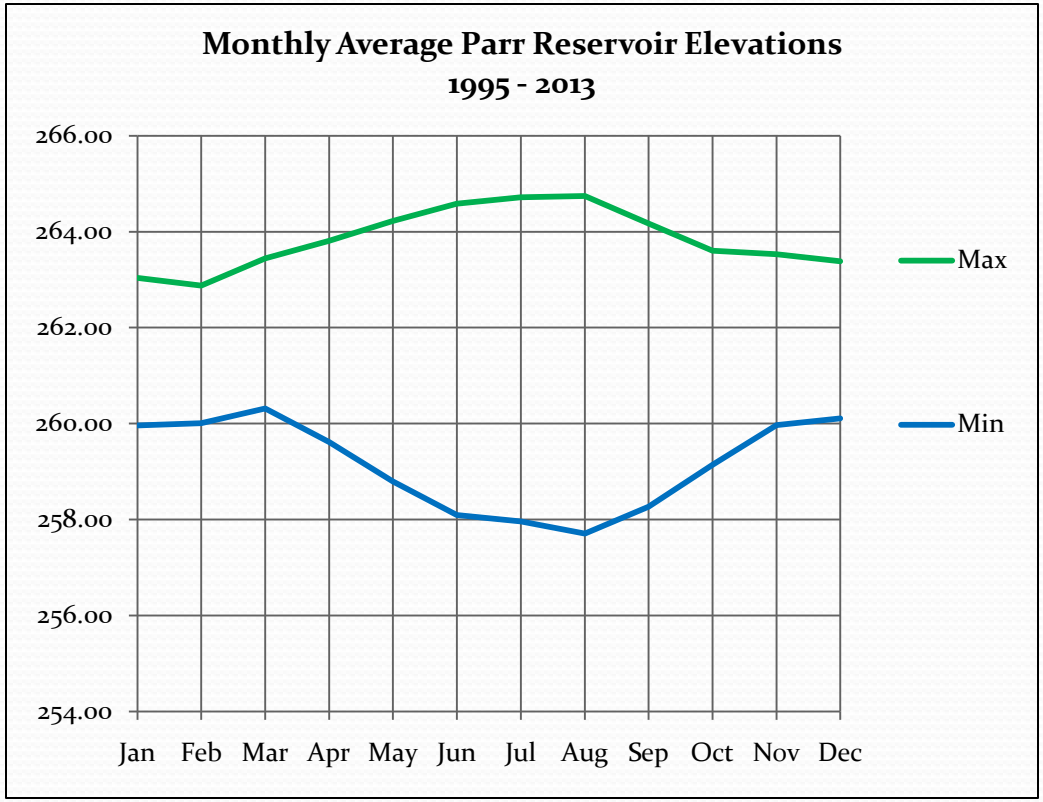
April 1, 2014

Reservoir Data

- Daily minimum and maximum Parr Reservoir levels from USGS station 02160990, Parr Shoals Reservoir at Parr, SC; period of record 1995-2013.
- Daily minimum and maximum Monticello Reservoir levels from SCE&G data; period of record 2005-2013.

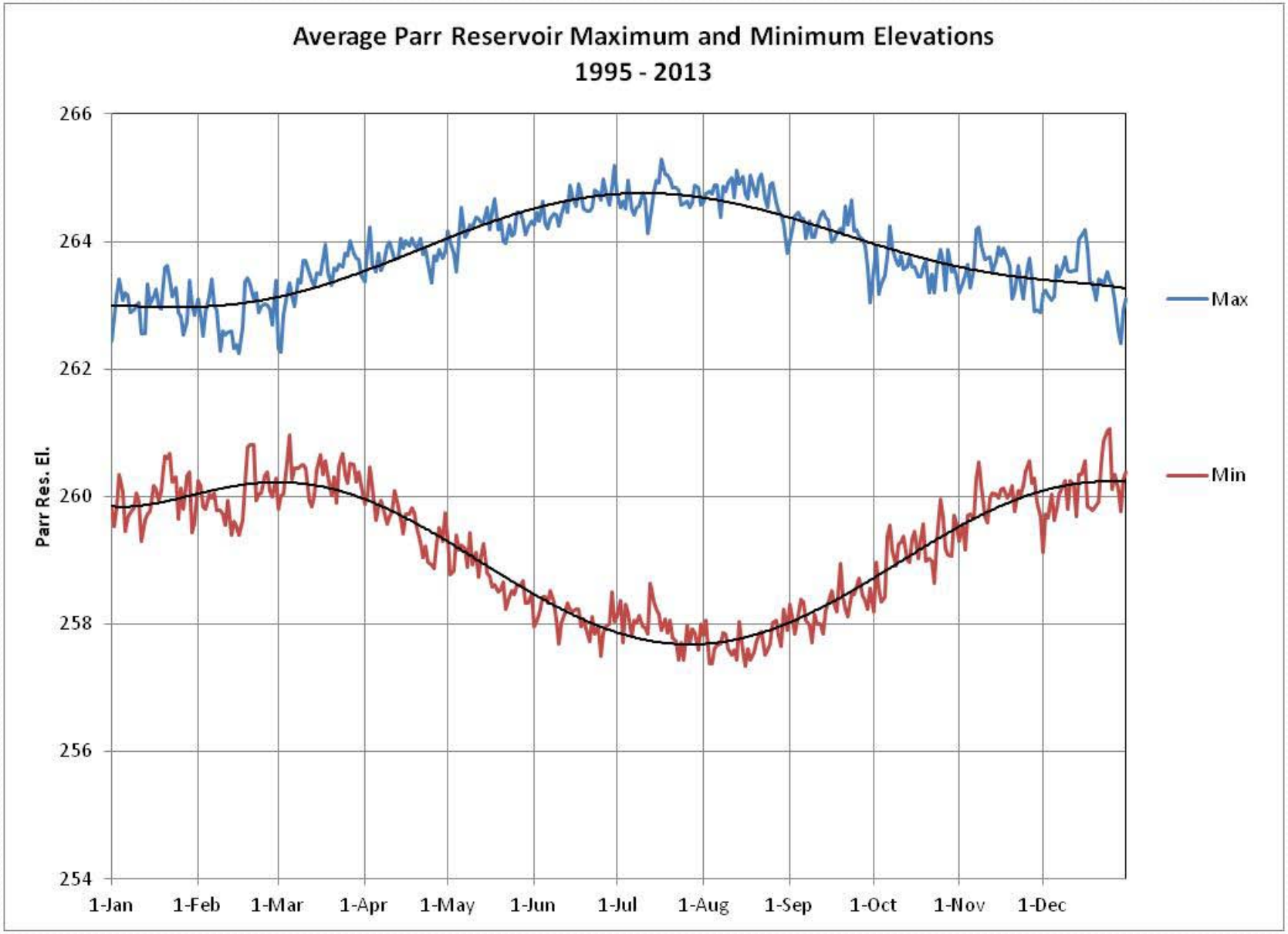
Parr Reservoir Monthly Data 1995-2013

Monthly Average Res. Elev.			
	Max	**Min**	**Range**
Jan	263.04	259.96	3.08
Feb	262.88	260.01	2.87
Mar	263.44	260.32	3.13
Apr	263.81	259.61	4.20
May	264.22	258.79	5.43
Jun	264.59	258.09	6.49
Jul	264.72	257.96	6.75
Aug	264.74	257.71	7.03
Sep	264.17	258.27	5.90
Oct	263.60	259.14	4.46
Nov	263.53	259.97	3.56
Dec	263.38	260.11	3.28
Average	**263.84**	**259.16**	**4.68**



Parr Reservoir Average Daily Fluctuation 1995-2013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.63	2.85	2.51	3.49	4.83	6.29	6.63	6.80	5.69	5.38	3.92	4.17
2	3.27	2.64	2.25	3.87	5.21	6.42	6.17	6.69	6.08	4.96	3.76	3.56
3	3.33	2.67	2.80	3.77	4.99	6.16	6.92	7.39	6.56	4.63	4.29	3.56
4	3.06	3.10	2.64	3.49	4.13	6.21	6.22	7.37	6.31	5.00	3.93	3.06
5	3.00	3.10	2.38	3.88	4.85	5.85	6.79	7.26	5.98	5.04	3.55	3.55
6	3.74	3.44	2.89	3.97	5.29	5.86	6.72	7.23	6.01	4.41	3.92	3.81
7	3.48	2.93	2.53	3.60	4.89	5.85	6.36	6.70	6.01	4.70	3.91	3.46
8	3.14	3.13	2.98	3.84	5.23	6.08	6.52	6.99	6.33	4.76	3.68	3.53
9	3.11	2.51	2.87	4.35	4.82	6.37	6.43	6.95	6.35	4.79	3.77	3.61
10	2.97	2.87	3.20	4.30	5.29	6.56	6.80	7.31	5.93	4.38	4.03	3.78
11	3.11	2.99	3.25	4.08	5.26	6.40	6.71	7.48	6.25	4.50	4.16	3.43
12	3.26	2.64	3.57	3.62	5.62	6.46	6.30	7.10	6.43	4.21	3.78	3.50
13	2.92	3.22	3.55	3.90	5.25	6.13	5.75	7.69	6.63	4.61	3.48	3.88
14	3.61	2.72	3.28	4.40	5.05	6.65	6.44	6.87	6.16	4.79	3.66	3.79
15	3.26	2.85	3.09	4.46	5.74	6.52	6.72	7.44	6.01	4.27	3.94	3.82
16	2.96	2.86	2.83	4.28	5.43	6.32	6.77	7.42	5.46	4.14	3.66	3.72
17	3.14	3.03	3.37	4.21	5.90	6.68	7.38	7.05	5.74	4.42	3.76	4.20
18	3.04	3.17	3.39	4.22	6.05	6.79	7.00	7.60	5.92	4.10	3.77	3.64
19	2.88	2.65	3.21	4.22	5.67	6.44	7.17	7.28	5.25	4.04	3.58	3.61
20	2.95	2.51	3.30	4.38	5.79	6.61	6.92	6.99	5.69	4.72	2.92	3.28
21	3.03	2.30	3.29	4.77	5.35	6.76	7.05	7.14	6.32	4.16	3.47	3.60
22	2.73	3.27	3.65	4.75	5.74	6.43	7.13	7.17	6.15	4.50	3.53	2.86
23	2.91	2.85	3.16	4.67	5.84	6.98	7.39	7.16	6.18	4.56	3.31	2.42
24	2.98	2.92	2.93	4.71	5.57	6.82	6.86	6.93	5.71	4.31	2.93	2.55
25	3.23	2.71	3.47	4.42	5.65	7.16	7.16	7.19	5.60	3.92	3.04	2.39
26	2.69	2.61	3.56	4.92	5.85	7.11	6.66	6.91	5.37	4.00	3.28	3.16
27	2.74	2.86	3.50	4.44	5.85	6.82	6.84	6.56	5.58	4.05	3.11	2.81
28	2.44	2.70	3.32	4.36	5.65	6.58	6.70	6.66	5.55	4.80	2.65	2.61
29	3.01	3.11	3.51	4.44	5.78	6.34	7.03	6.76	5.38	4.46	3.08	2.72
30	3.59		3.34	4.09	5.90	7.15	7.26	6.05	4.47	3.88	3.31	2.76
31	3.26		3.29		5.86		6.57	5.92		3.87		2.78
Average	**3.08**	**2.87**	**3.13**	**4.20**	**5.43**	**6.49**	**6.75**	**7.03**	**5.90**	**4.46**	**3.57**	**3.34**

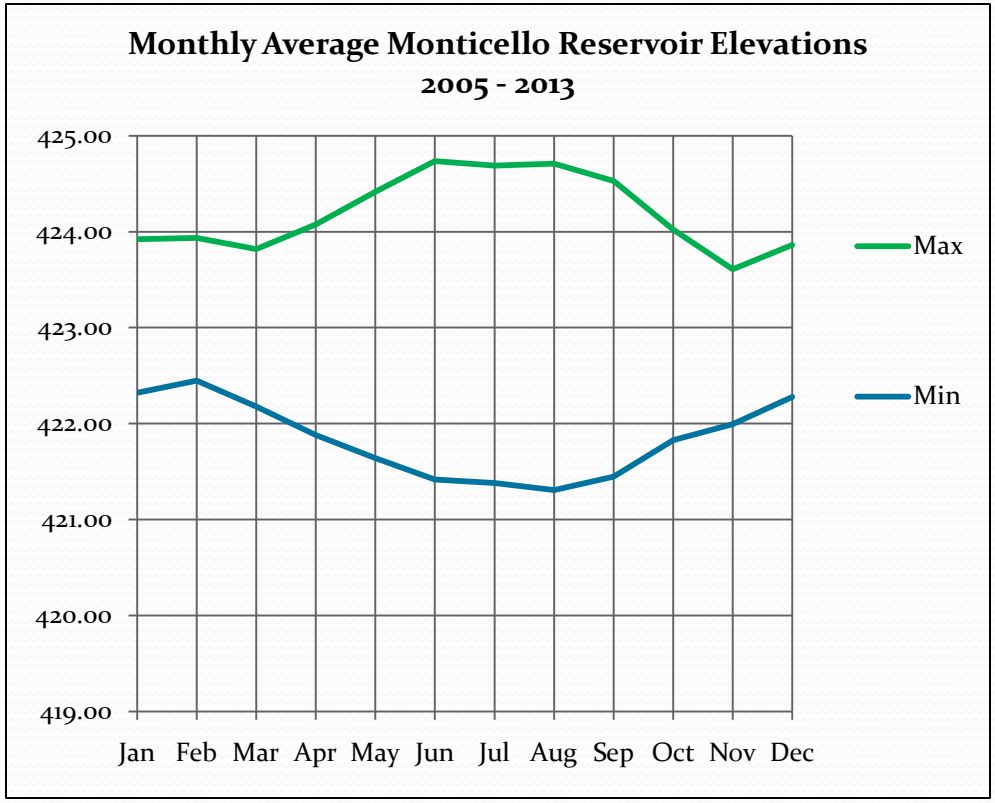

Average Parr Reservoir Maximum and Minimum Elevations
1995 - 2013
Parr Res. El.
266
264
262
260
258
256
254
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Max
Min

Parr Reservoir Summary

- February has smallest average fluctuation – 2.87 feet.
- August has largest average fluctuation – 7.03 feet.
- Average fluctuation for year is 4.68 feet.
- Average fluctuation March – May is 4.25 feet.
- Average fluctuation April – July is 5.72 feet.

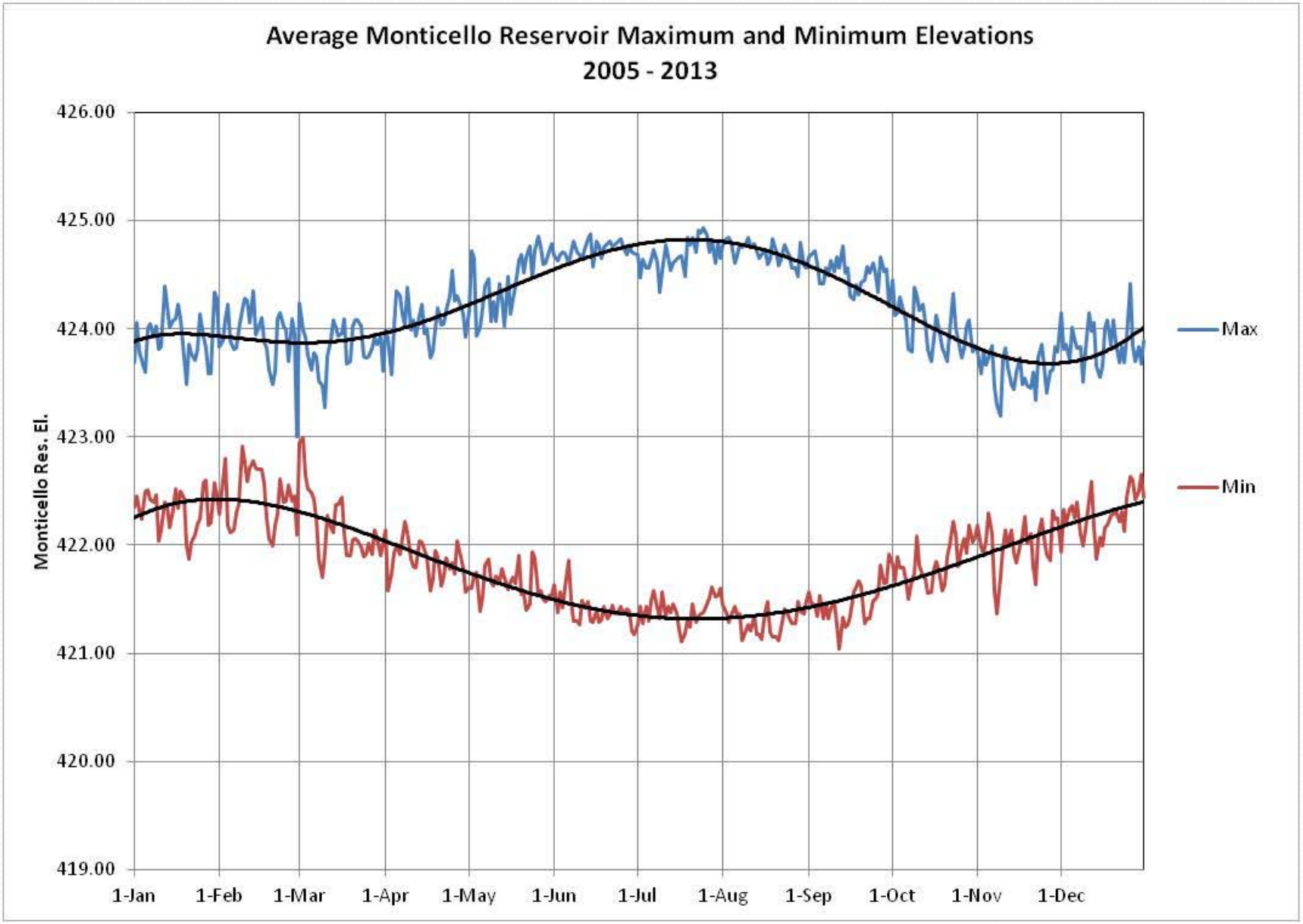
Monticello Reservoir Monthly Data 2005-2013

Monthly Average Res. Elev.			
	Max	**Min**	**Range**
Jan	423.92	422.32	1.60
Feb	423.93	422.45	1.49
Mar	423.82	422.18	1.66
Apr	424.08	421.88	2.22
May	424.42	421.64	2.80
Jun	424.74	421.42	3.33
Jul	424.69	421.38	3.29
Aug	424.71	421.31	3.40
Sep	424.53	421.45	3.06
Oct	424.02	421.83	2.18
Nov	423.61	422.00	1.61
Dec	423.86	422.28	1.58
Average	**424.19**	**421.84**	**2.35**



Monticello Reservoir Average Daily Fluctuation 2005-2013

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.33	1.54	1.29	1.84	2.56	3.04	3.42	3.33	3.10	2.63	1.60	2.21
2	1.60	1.29	1.00	2.33	3.12	3.26	3.04	3.45	3.22	2.46	1.61	1.48
3	1.47	1.29	1.28	1.84	2.93	3.12	3.37	3.56	3.28	2.26	1.87	1.64
4	1.47	2.03	1.23	2.09	2.19	3.29	3.13	3.44	3.26	2.50	1.63	1.38
5	1.10	1.77	1.13	2.37	2.62	3.09	3.27	3.18	2.89	2.37	1.43	1.64
6	1.49	1.67	1.36	2.39	2.67	2.76	3.16	3.34	3.10	2.40	1.73	1.64
7	1.62	1.52	1.50	2.06	2.59	3.22	3.16	3.41	3.10	2.31	1.89	1.42
8	1.52	1.61	1.66	1.81	2.59	3.51	3.20	3.63	3.18	2.11	1.93	1.73
9	1.56	1.27	1.78	2.27	2.41	3.41	3.01	3.58	3.22	2.66	1.48	1.52
10	1.78	1.51	1.34	2.12	2.62	3.42	2.97	3.58	3.06	2.22	1.74	1.66
11	1.69	1.67	1.47	2.28	2.36	3.16	3.43	3.54	3.40	2.36	1.68	1.72
12	2.00	1.34	1.73	2.14	2.76	3.31	3.23	3.44	3.52	2.51	1.66	1.39
13	1.84	1.57	1.96	2.09	2.49	3.36	3.17	3.54	3.43	2.37	1.34	1.89
14	1.84	1.23	1.63	2.20	2.32	3.58	3.16	3.48	3.28	2.26	1.52	1.79
15	1.74	1.30	1.56	2.00	2.90	3.29	3.27	3.56	3.30	2.13	1.77	1.49
16	1.57	1.40	1.51	2.11	2.48	3.41	3.44	3.34	2.96	2.14	1.74	1.67
17	1.88	1.31	1.98	2.16	2.57	3.48	3.57	3.12	2.70	2.28	1.41	1.83
18	1.59	1.57	1.78	2.11	2.76	3.34	3.30	3.44	2.80	2.24	1.28	1.89
19	1.30	1.57	1.80	2.06	2.73	3.32	3.52	3.68	2.64	2.24	1.47	1.57
20	1.50	1.50	1.98	2.30	3.14	3.47	3.53	3.57	2.81	2.13	1.34	1.79
21	1.99	1.42	2.02	2.41	2.98	3.46	3.39	3.47	3.18	1.81	1.81	1.56
22	1.74	1.80	2.04	2.33	3.27	3.32	3.42	3.41	3.26	1.98	1.71	1.47
23	1.61	1.53	2.04	2.29	3.31	3.41	3.57	3.37	3.20	2.10	1.66	1.52
24	1.61	1.62	1.86	2.52	2.54	3.42	3.52	3.34	3.12	1.90	1.61	1.56
25	1.89	1.58	1.82	2.71	2.84	3.40	3.56	3.36	3.01	2.10	1.59	1.48
26	1.34	1.15	1.73	2.52	3.31	3.39	3.41	3.29	2.79	1.76	1.50	1.79
27	1.22	1.68	1.91	2.27	3.18	3.28	3.20	3.29	2.86	1.77	1.76	1.24
28	1.40	1.50	1.78	2.32	3.10	3.39	3.21	3.01	2.89	2.10	1.30	1.28
29	1.38	0.90	1.80	2.34	3.13	3.50	3.09	3.41	2.90	1.89	1.59	1.33
30	1.76		2.02	2.36	3.19	3.52	3.27	3.22	2.29	1.77	1.53	1.02
31	1.81		1.60		3.26		3.06	3.08		1.78		1.44
Average	**1.60**	**1.49**	**1.66**	**2.22**	**2.80**	**3.33**	**3.29**	**3.40**	**3.06**	**2.18**	**1.61**	**1.58**


Average Monticello Reservoir Maximum and Minimum Elevations
2005 - 2013
Monticello Res. El.
426.00
425.00
424.00
423.00
422.00
421.00
420.00
419.00
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Max
Min

Monticello Reservoir Summary

- February has smallest average fluctuation: 1.49 feet.
- August has largest average fluctuation: 3.40 feet.
- Average fluctuation for year is 2.35 feet.
- Average fluctuation March – May is 2.23 feet.
- Average fluctuation April – July is 2.91 feet.

Annual Comparison Graphs

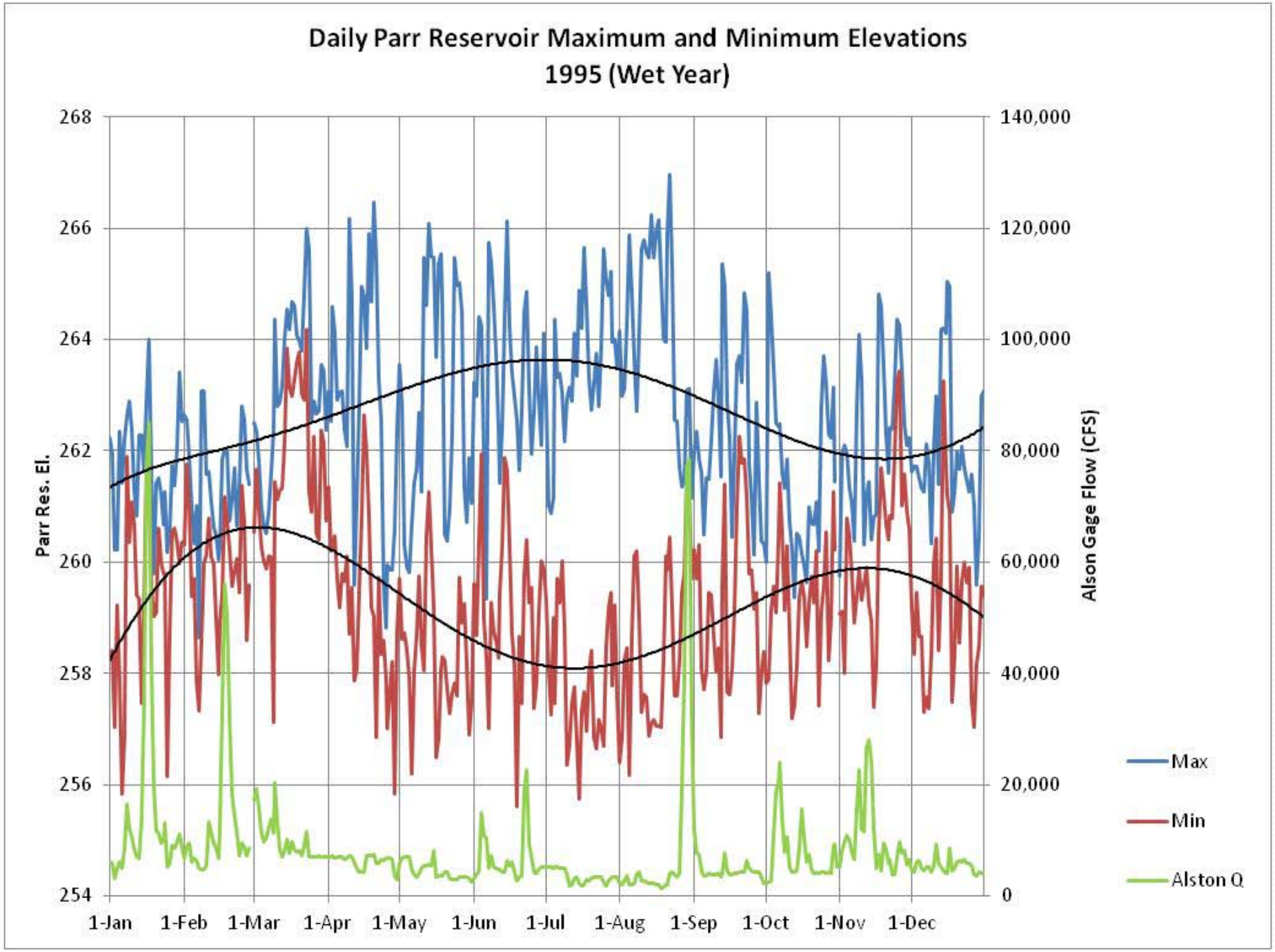
- Pairs of graphs for each year, one each for Parr Reservoir and Monticello Reservoir.
- Years are denoted as “Dry”, “Normal”, or “Wet” based on percentile rank of annual average flow at Alston gage site for each year during the period 1981 – 2013.
  - < 25th Percentile Rank = “Dry”, or Low Flow
  - 25th to 75th Percentile Rank = “Normal”
  - > 75th Percentile Rank = “Wet”, or High Flow
- Similar to USGS stream flow ranges.
- Added a polynomial best fit line to show overall trend.

Flow Rankings by Year

Year	Annual Mean Flow	P-Rank	Flow Range
1981	3313	29%	Normal
1982	6076	65%	Normal
1983	7399	84%	High
1984	7743	94%	High
1985	5295	48%	Normal
1986	4002	35%	Normal
1987	5795	58%	Normal
1988	2897	13%	Low
1989	5536	55%	Normal
1990	7203	81%	High
1991	6530	71%	Normal
1992	6821	74%	Normal
1993	7558	90%	High
1994	6091	68%	Normal
1995	8187	97%	High
1996	6917	77%	High
1997	5949	61%	Normal

Year	Annual Mean Flow	P-Rank	Flow Range
1998	7482	87%	High
1999	3350	32%	Normal
2000	3015	19%	Low
2001	2418	3%	Low
2002	3164	23%	Low
2003	8791	100%	High
2004	5146	45%	Normal
2005	5490	52%	Normal
2006	3186	26%	Normal/Low
2007	2922	16%	Low
2008	2115	0%	Low
2009	4718	42%	Normal
2010	4538	39%	Normal
2011	2483	6%	Low
2012	2499	10%	Low
2013	6459	69%	Normal

Red years were graphed for Parr Reservoir only. Green years were graphed for both Parr and Monticello Reservoirs.


Daily Parr Reservoir Maximum and Minimum Elevations
1995 (Wet Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1-Jan
1-Feb
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1-Jun
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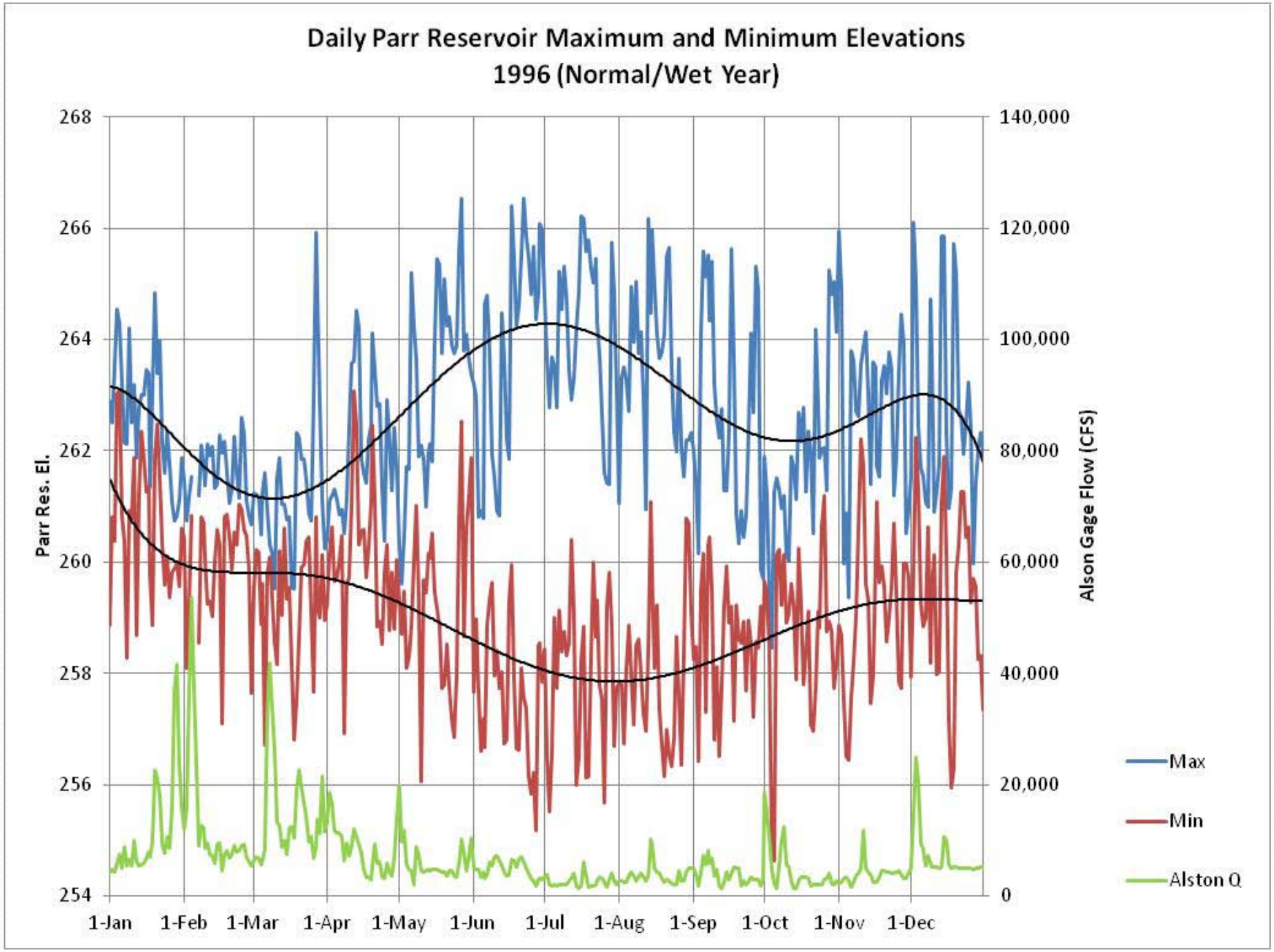
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
1996 (Normal/Wet Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
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0
1-Jan
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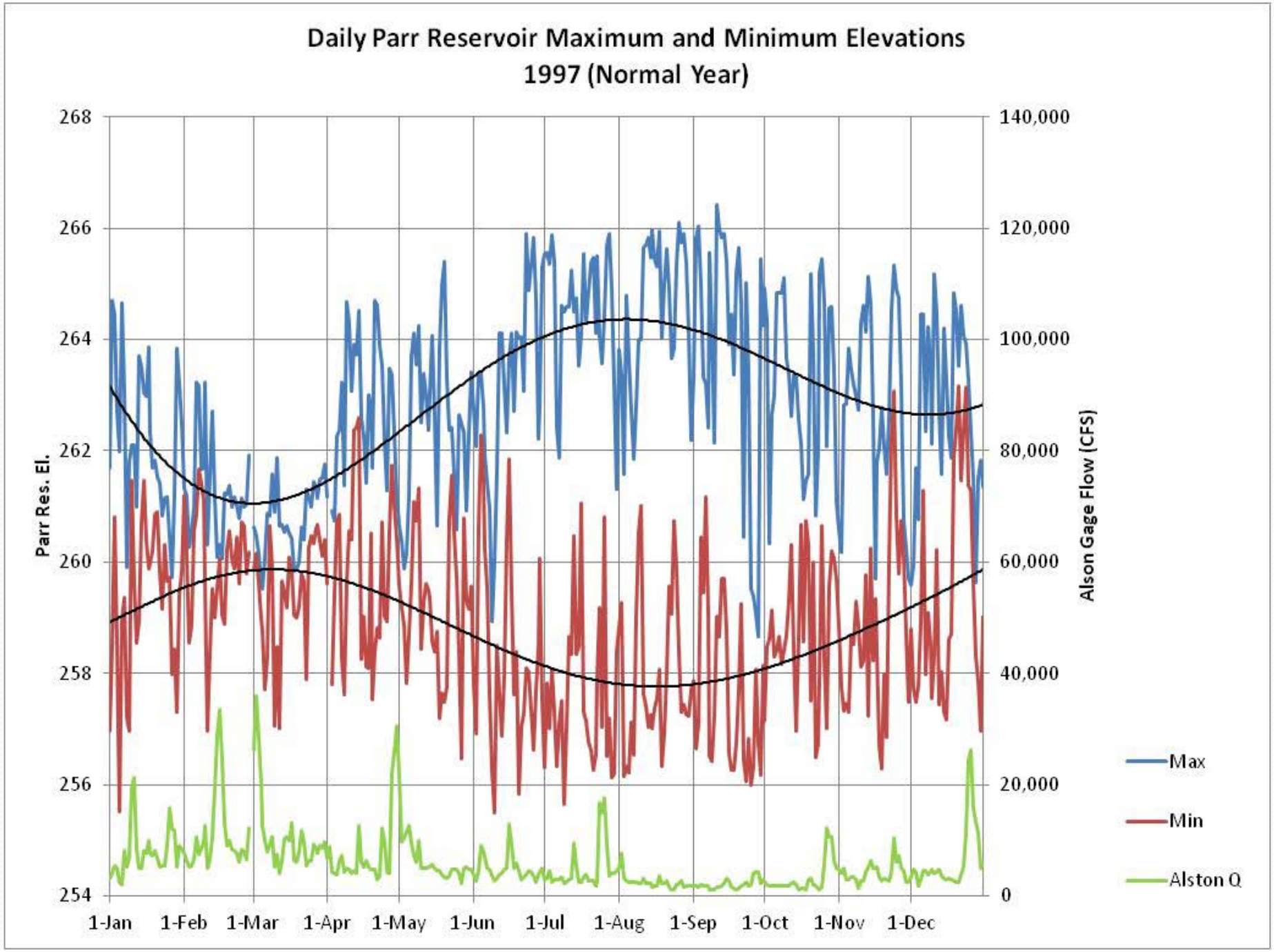
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
1997 (Normal Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
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0
1-Jan
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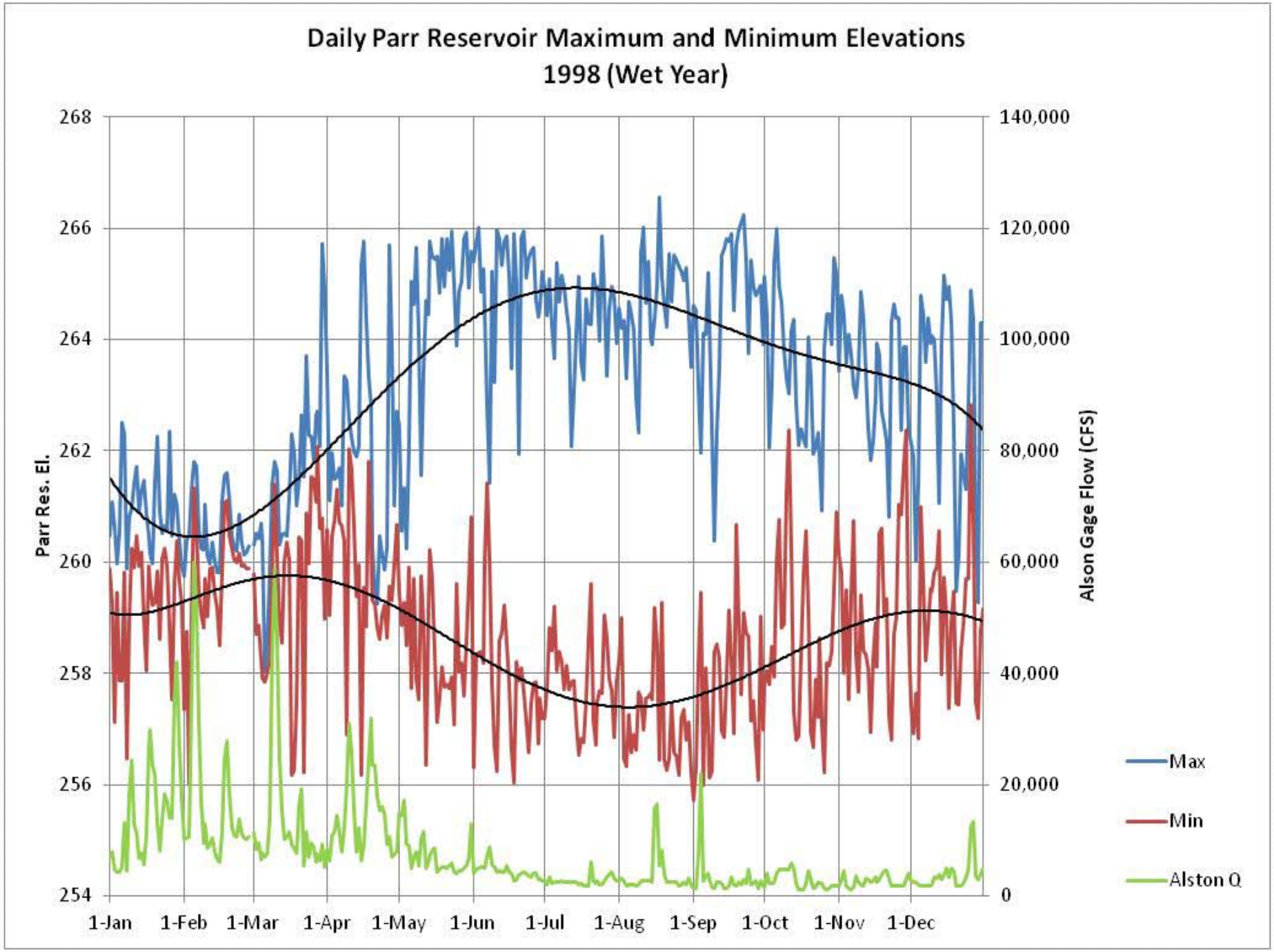
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
1998 (Wet Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
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264
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254
140,000
120,000
100,000
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1-Jan
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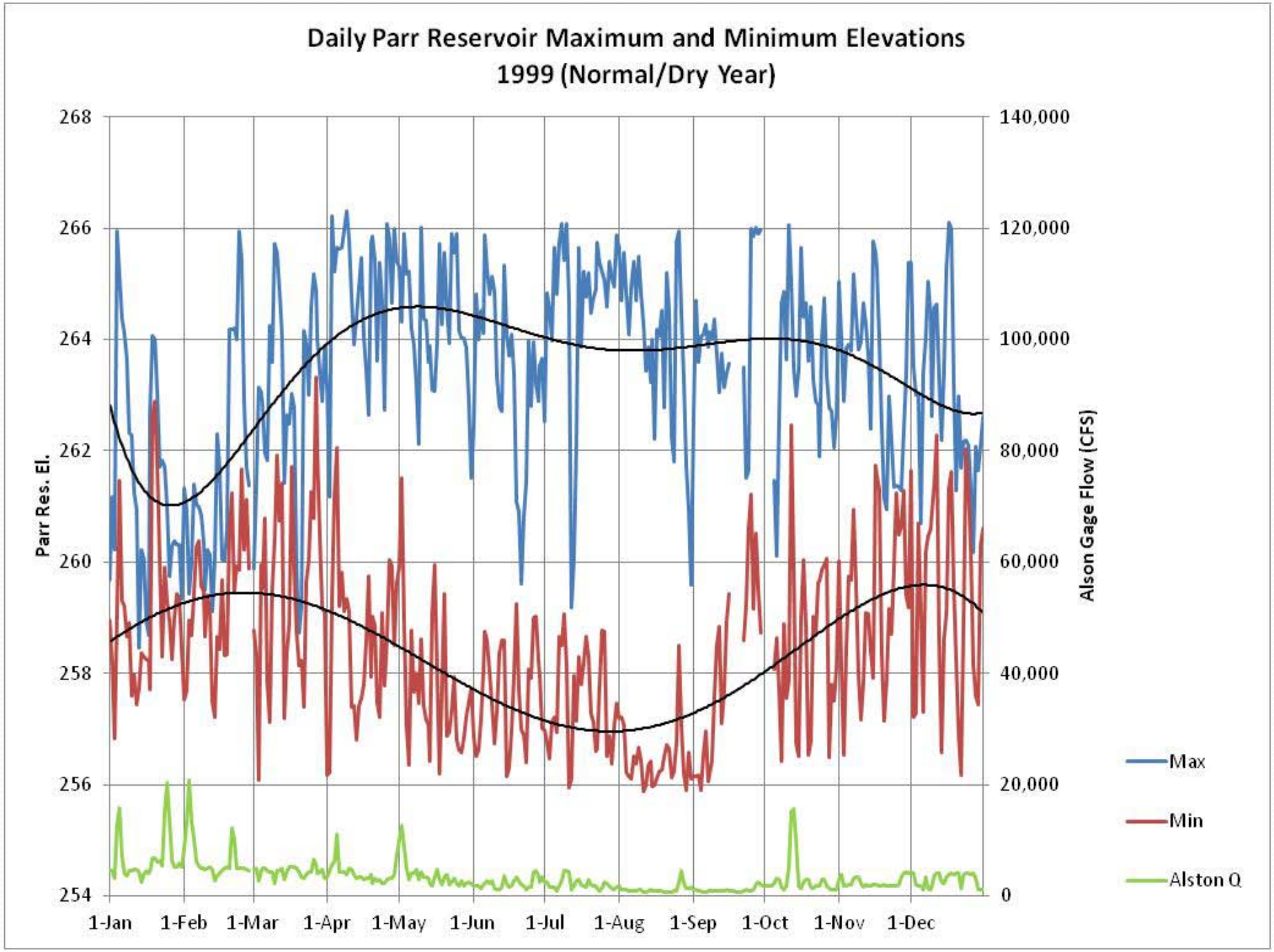
1-Nov
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
1999 (Normal/Dry Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1-Jan
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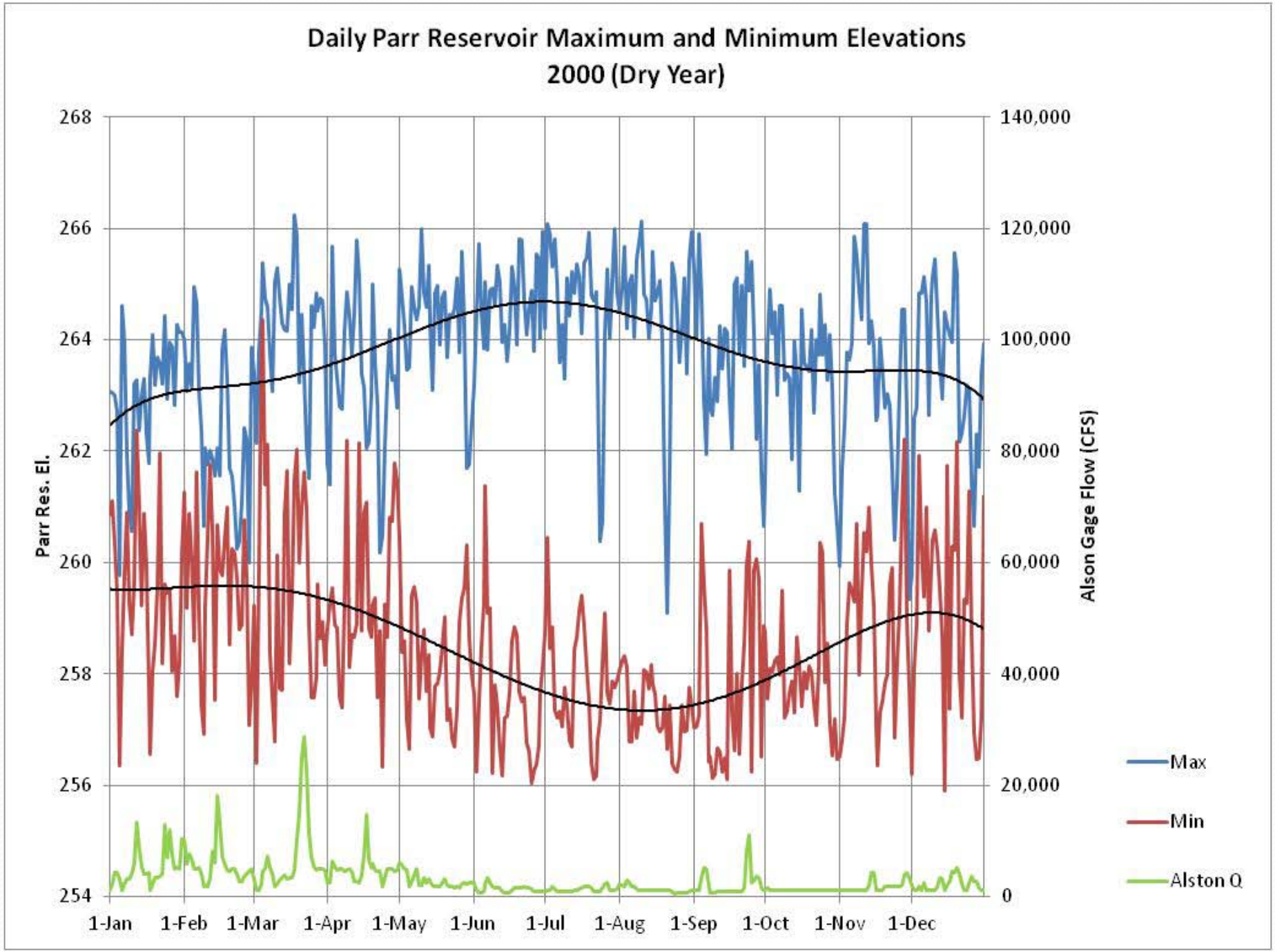
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2000 (Dry Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
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260
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254
140,000
120,000
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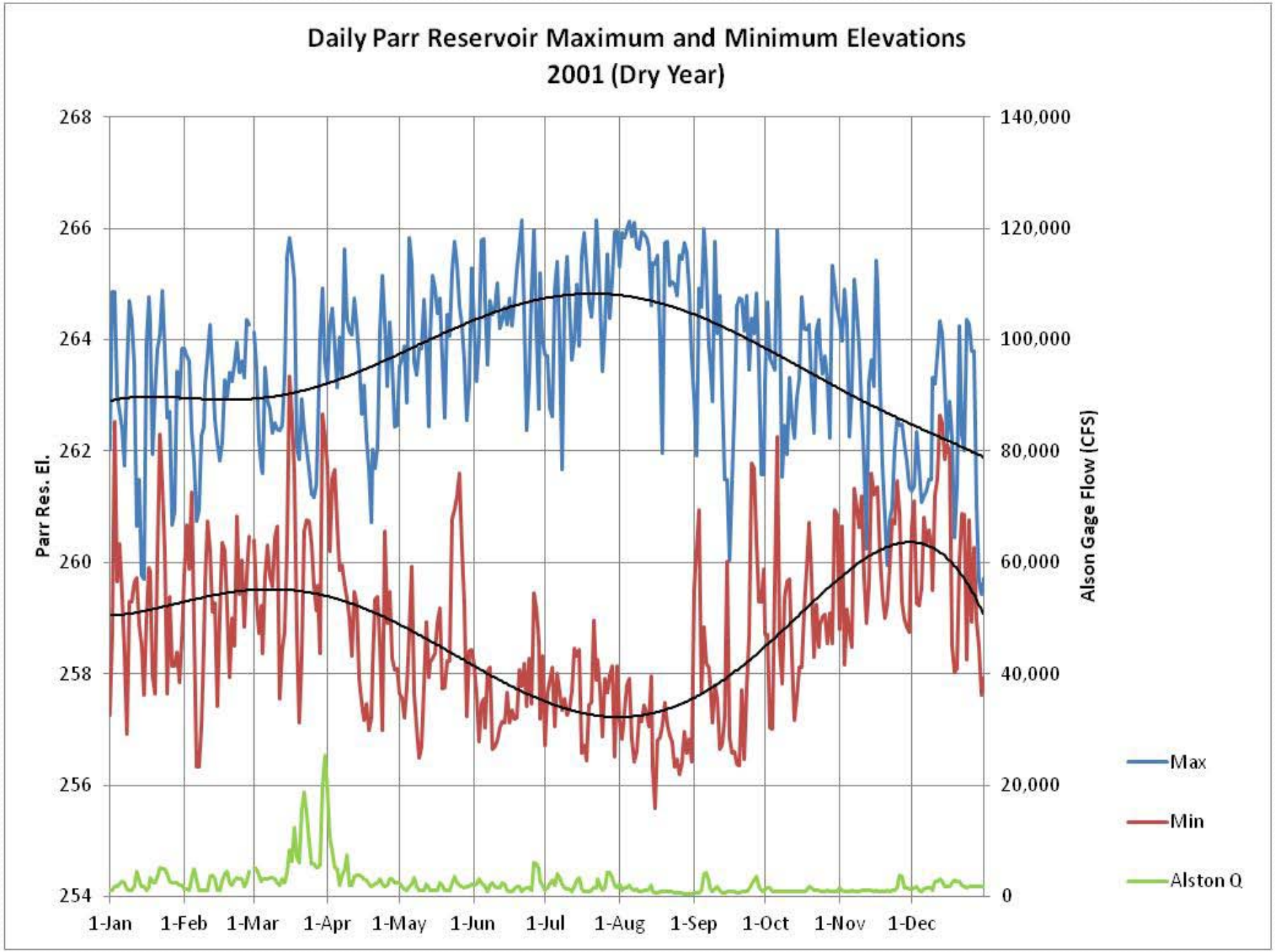
1-Nov
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2001 (Dry Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
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1-Jan
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1-Nov
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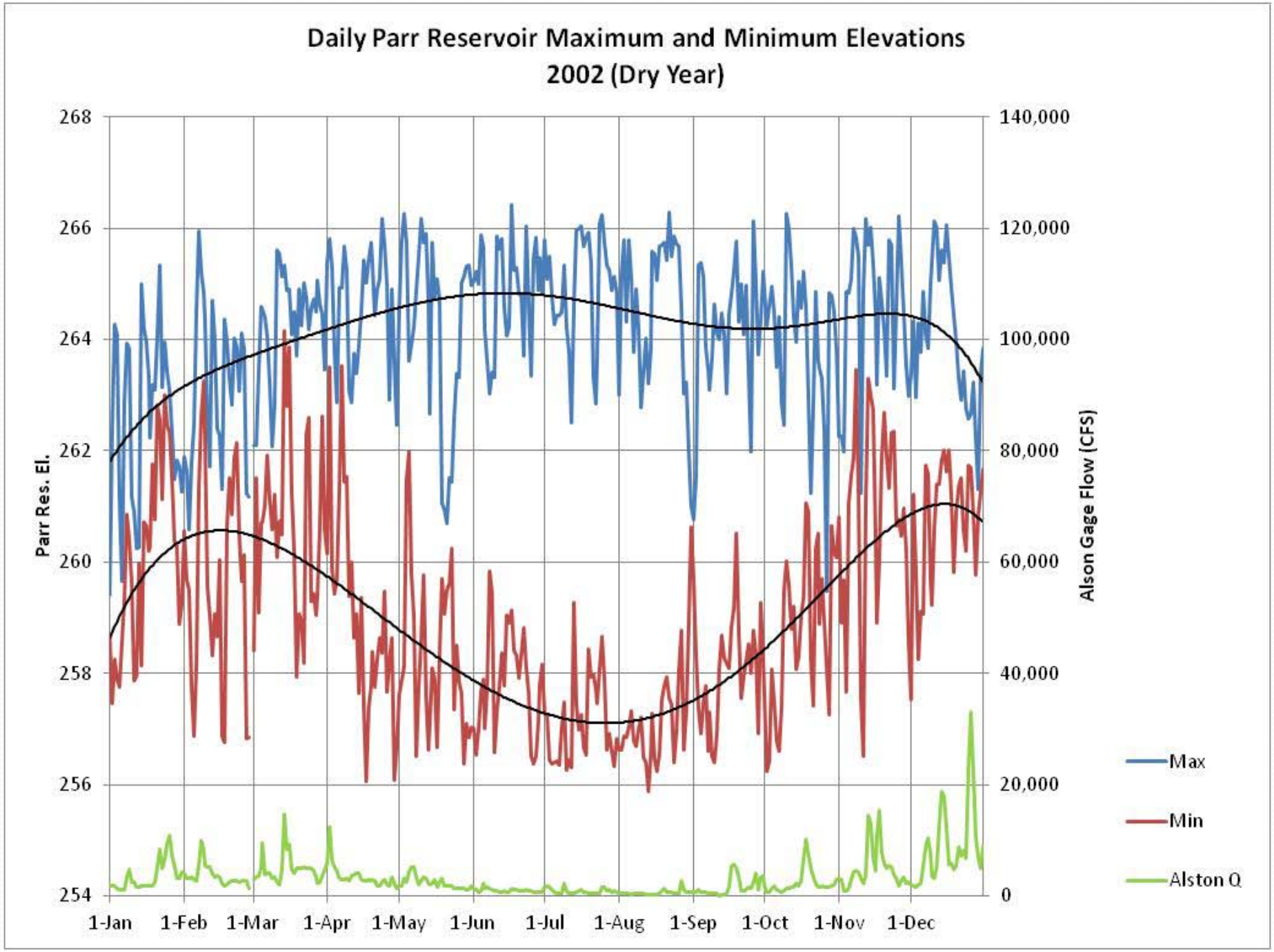
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2002 (Dry Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
60,000
40,000
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0
1-Jan
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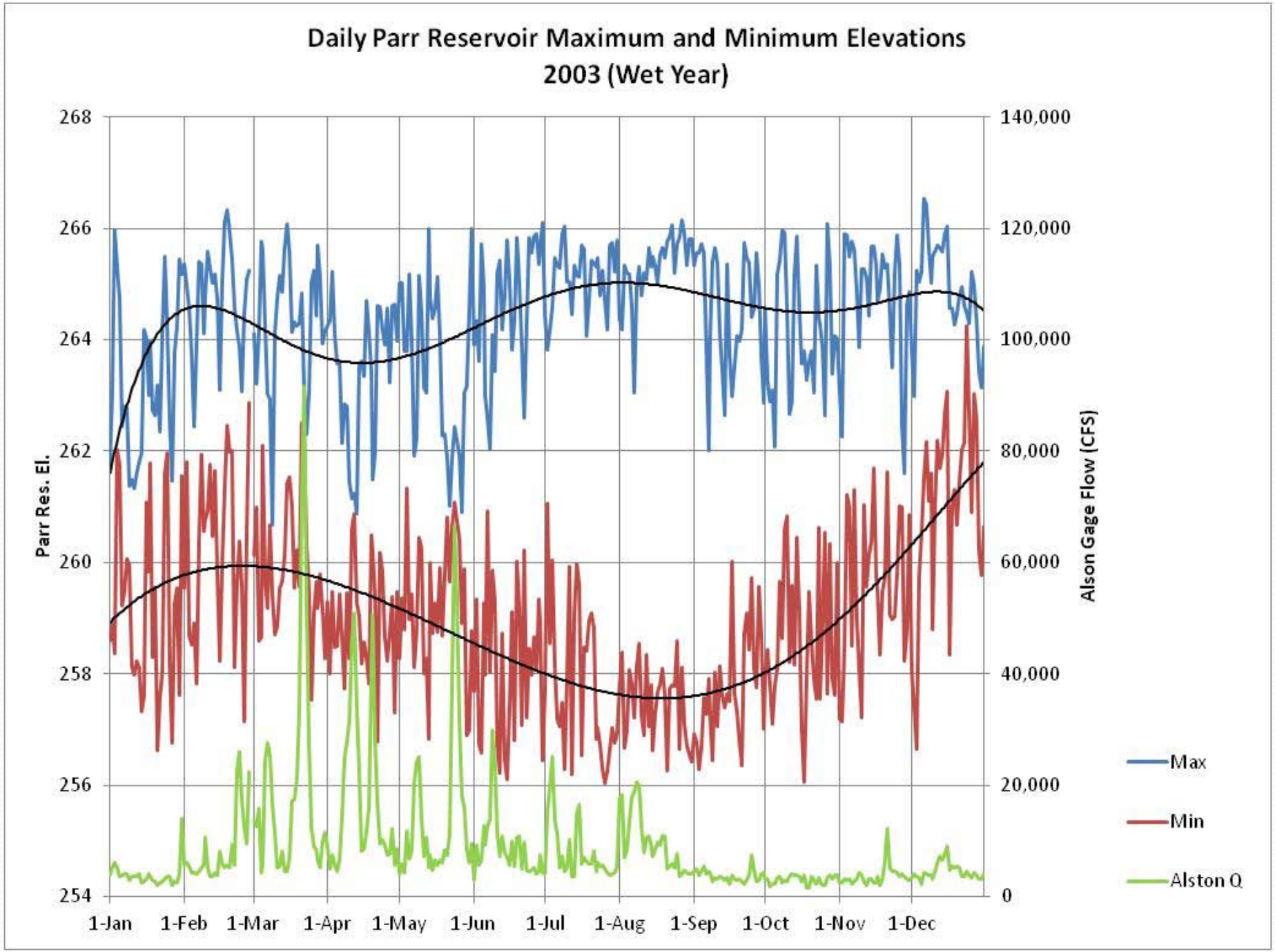
1-Oct
1-Nov
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2003 (Wet Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
60,000
40,000
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0
1-Jan
1-Feb
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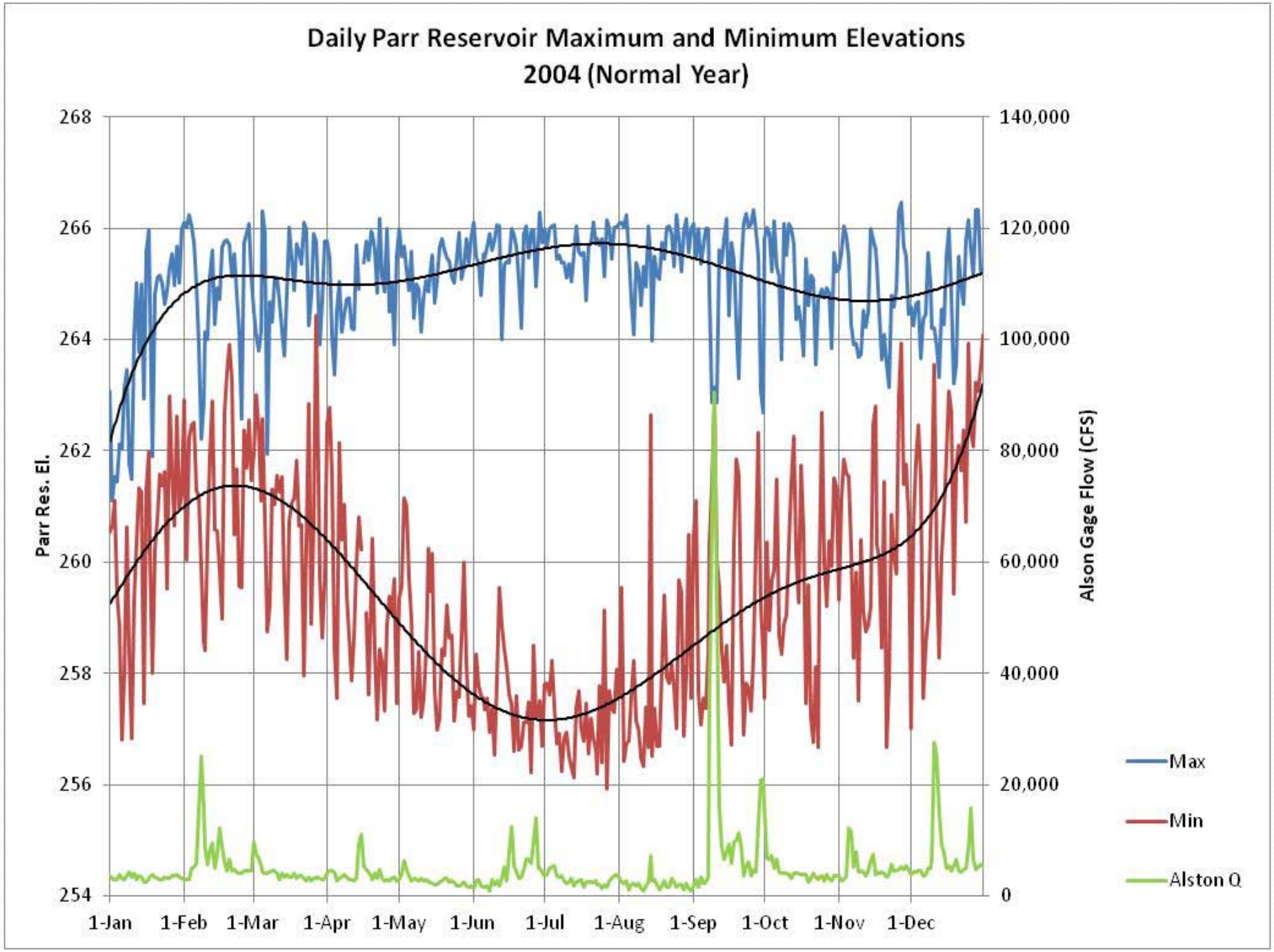
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2004 (Normal Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
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0
1-Jan
1-Feb
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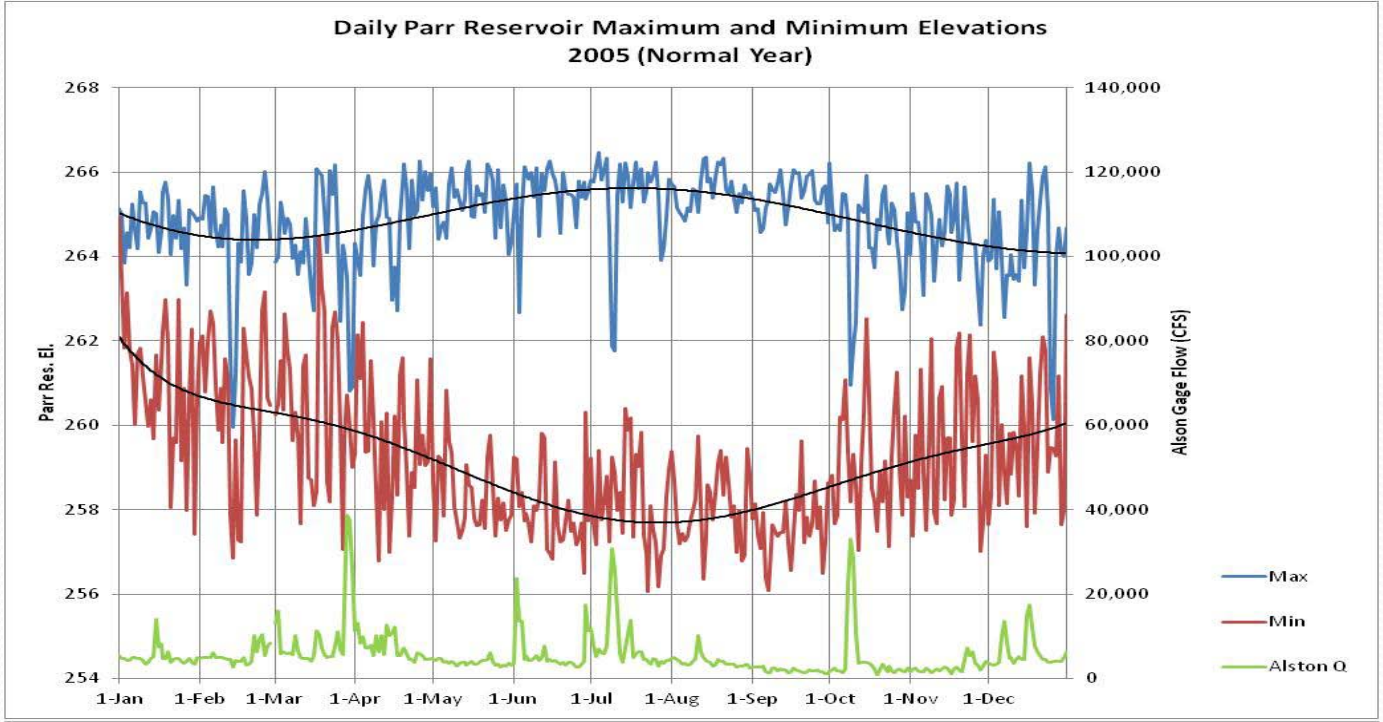
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2005 (Normal Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
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256
254
140,000
120,000
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1-Jan
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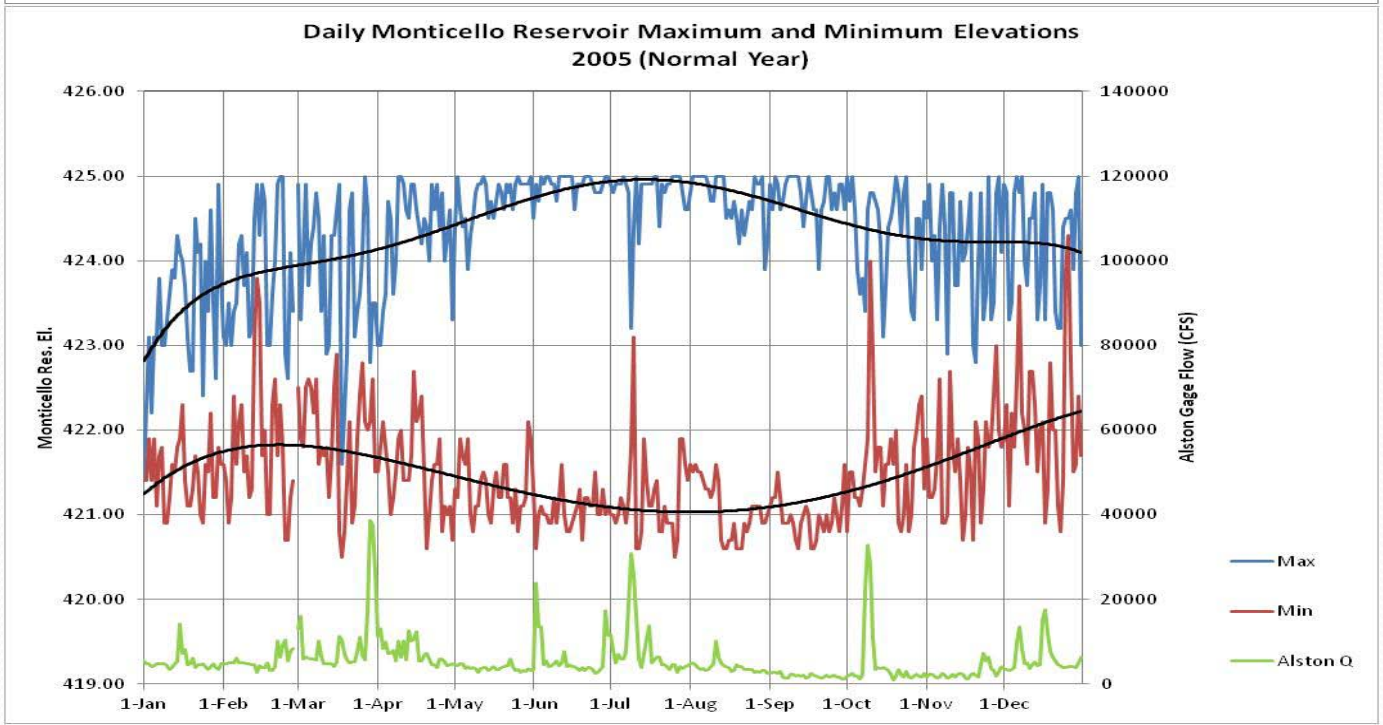
Max
Min
Alston Q


Daily Monticello Reservoir Maximum and Minimum Elevations
2005 (Normal Year)
Monticello Res. El.
Alson Gage Flow (CFS)
426.00
425.00
424.00
423.00
422.00
421.00
420.00
419.00
140000
120000
100000
80000
60000
40000
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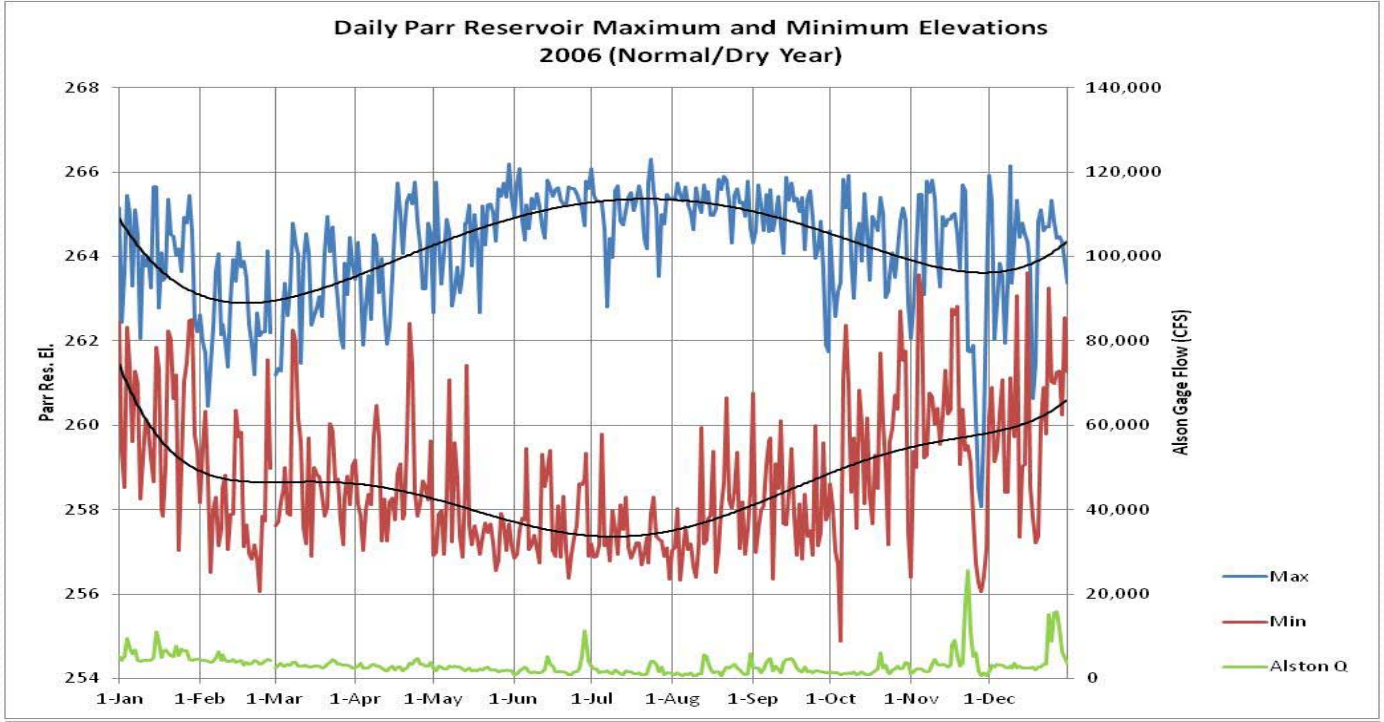
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Max
Min
Alston Q


Daily Parr Reservoir Maximum and Minimum Elevations
2006 (Normal/Dry Year)
Parr Res. El.
Alson Gage Flow (CFS)
268
266
264
262
260
258
256
254
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
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1-Nov
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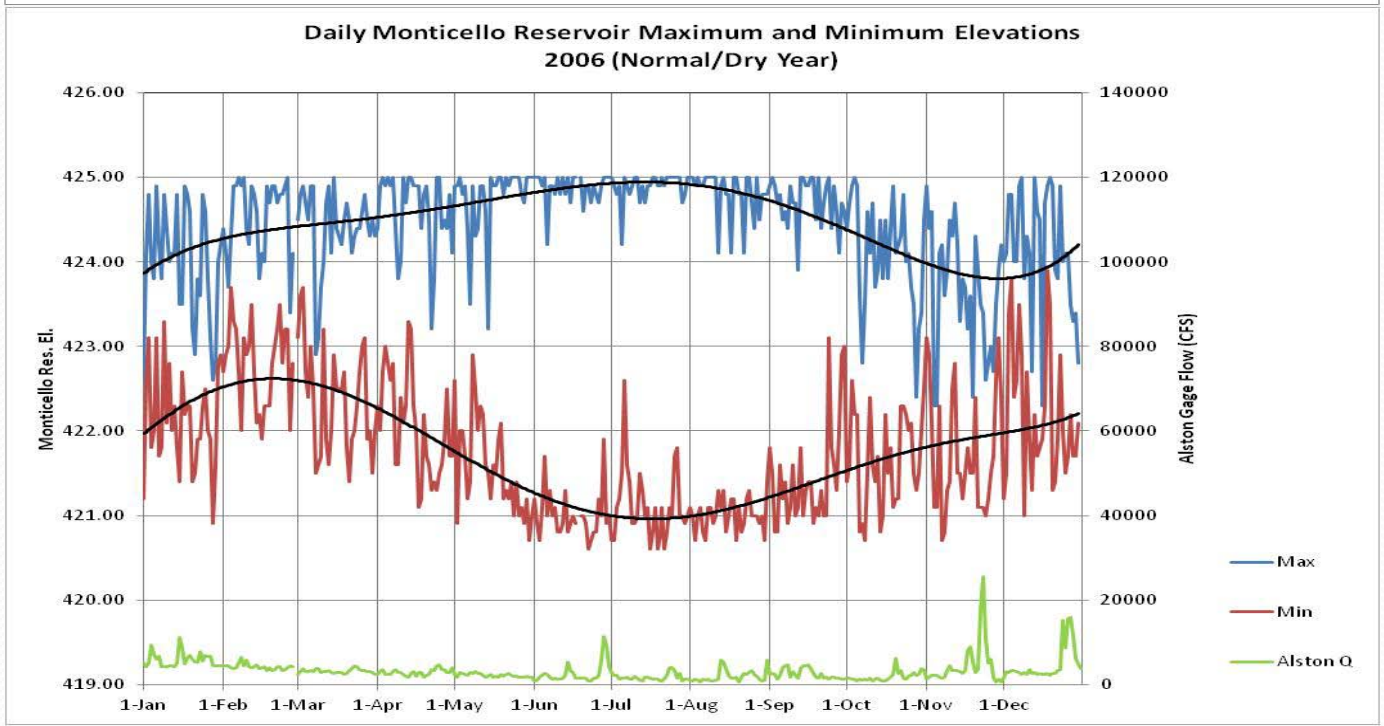
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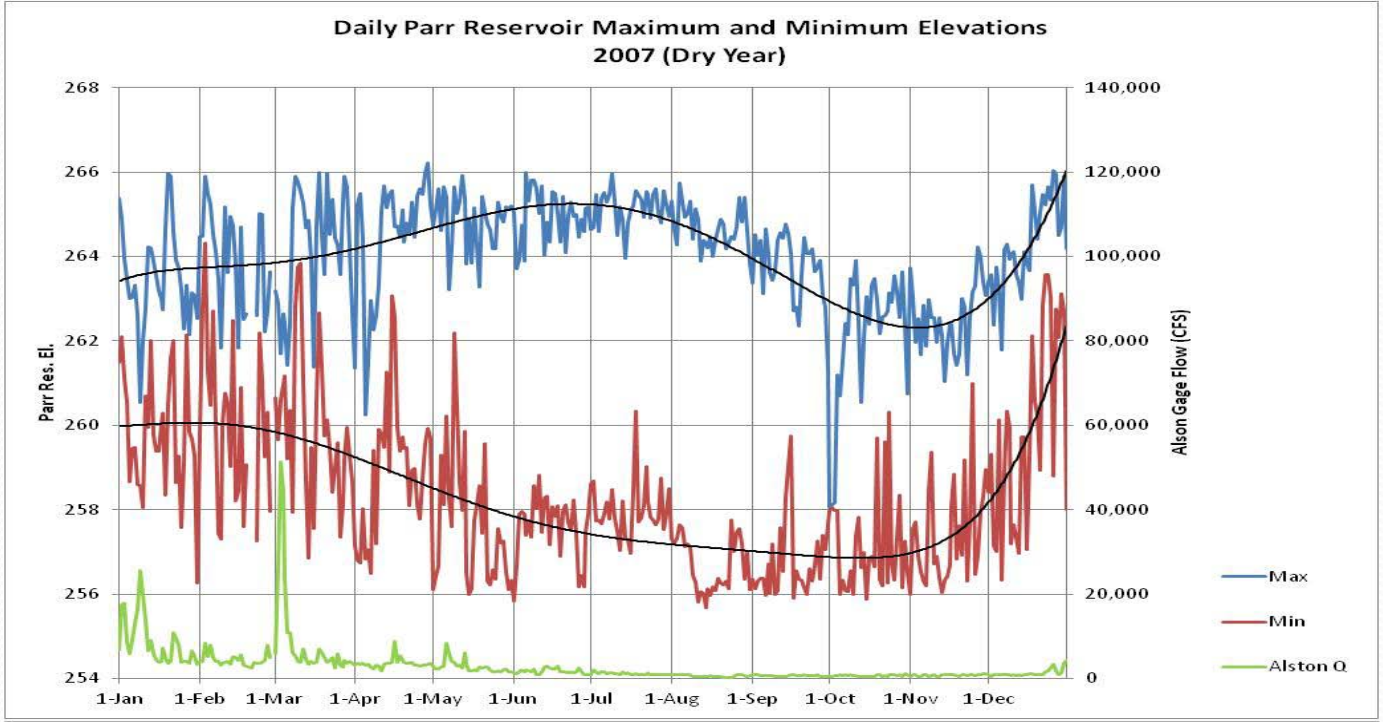
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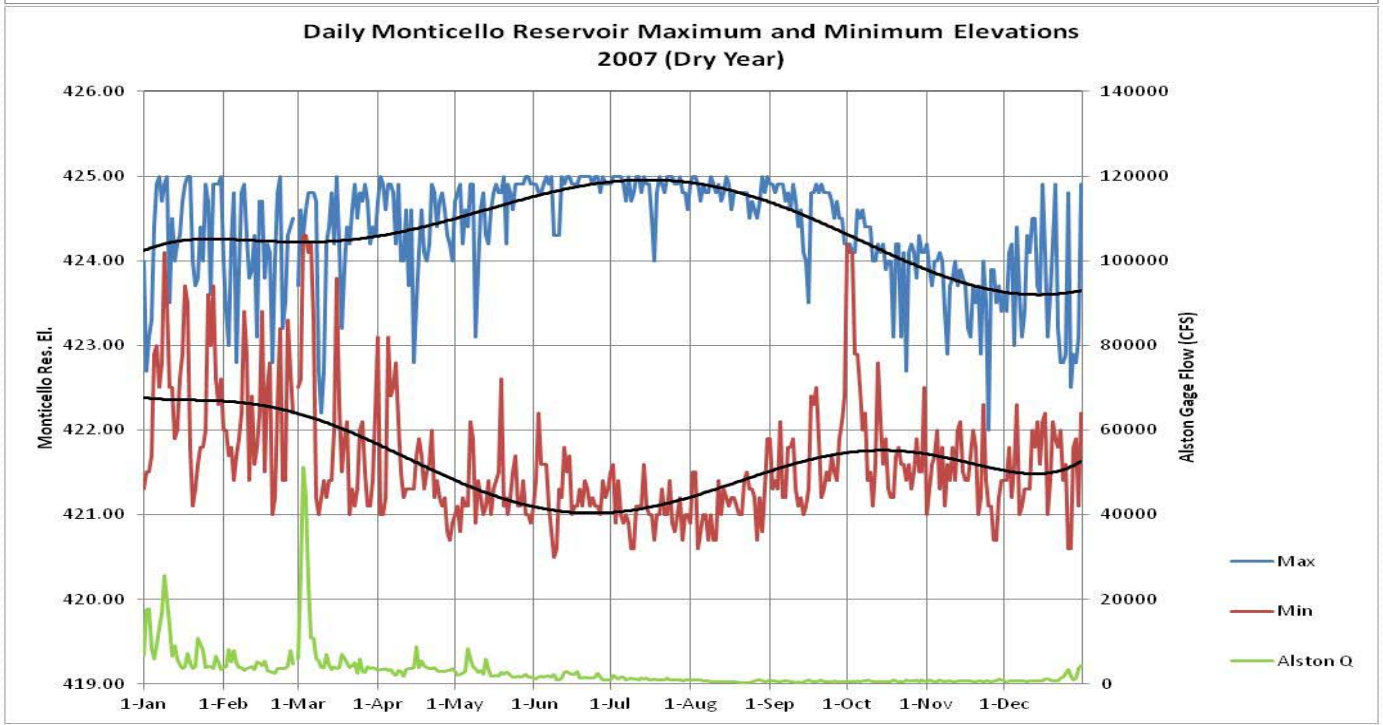
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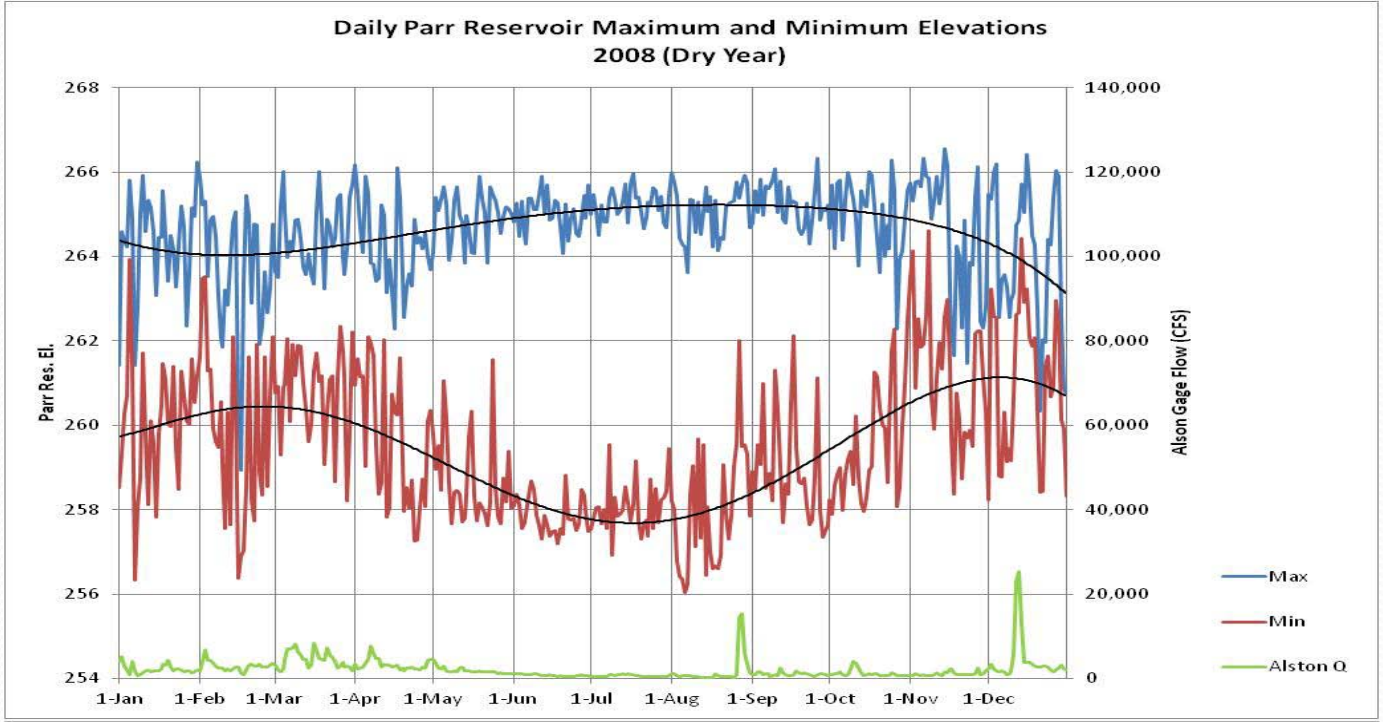
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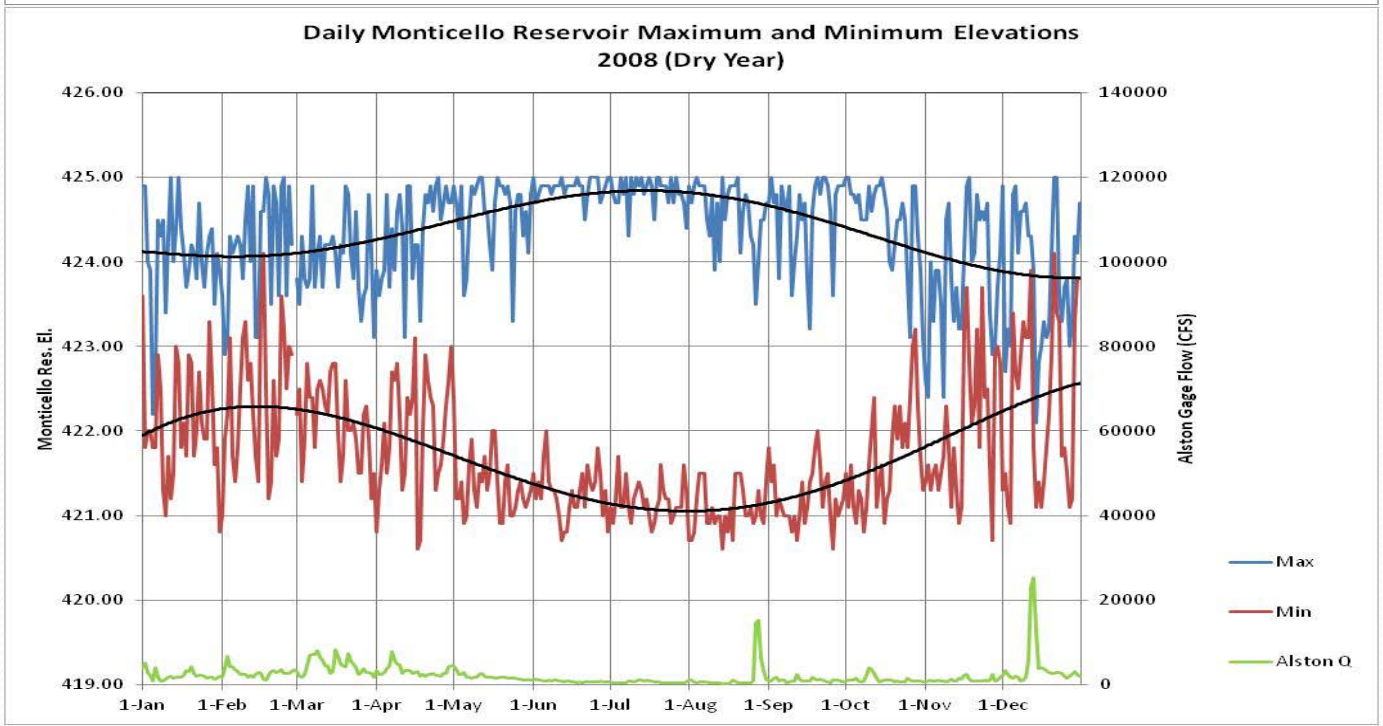
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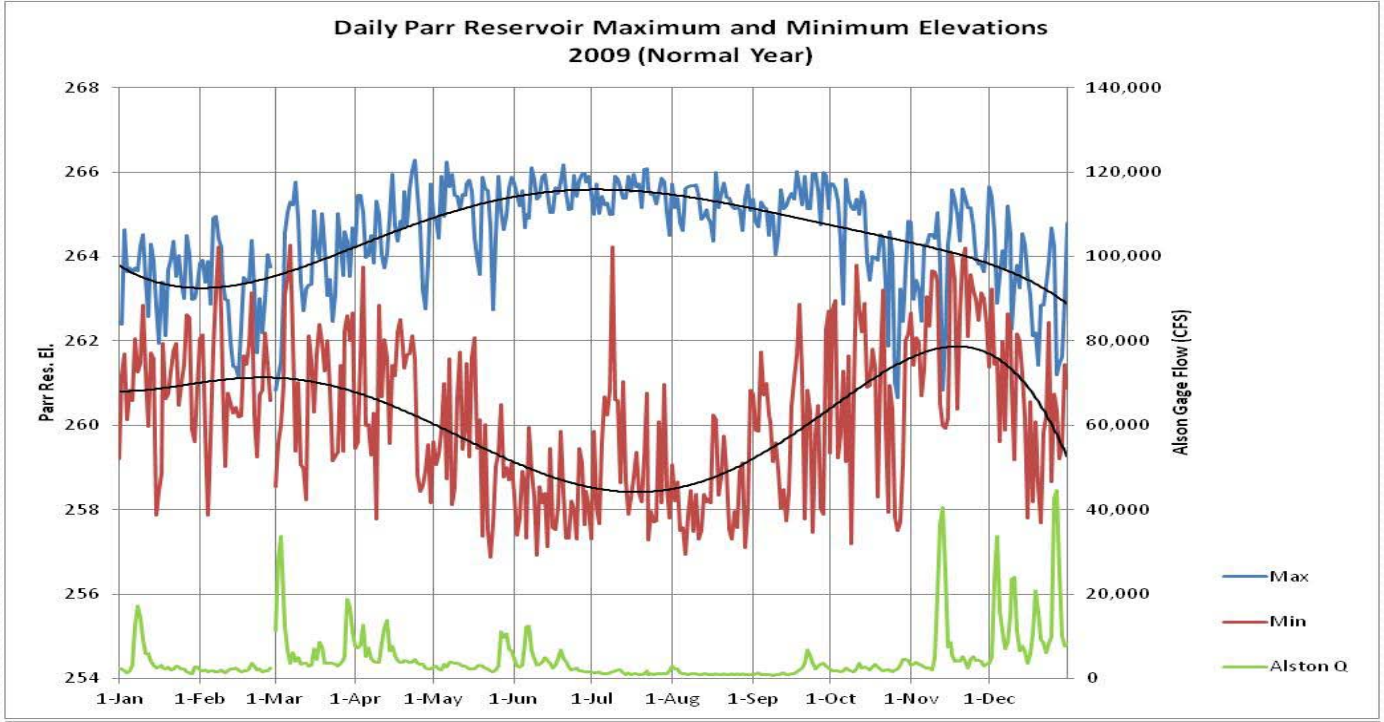
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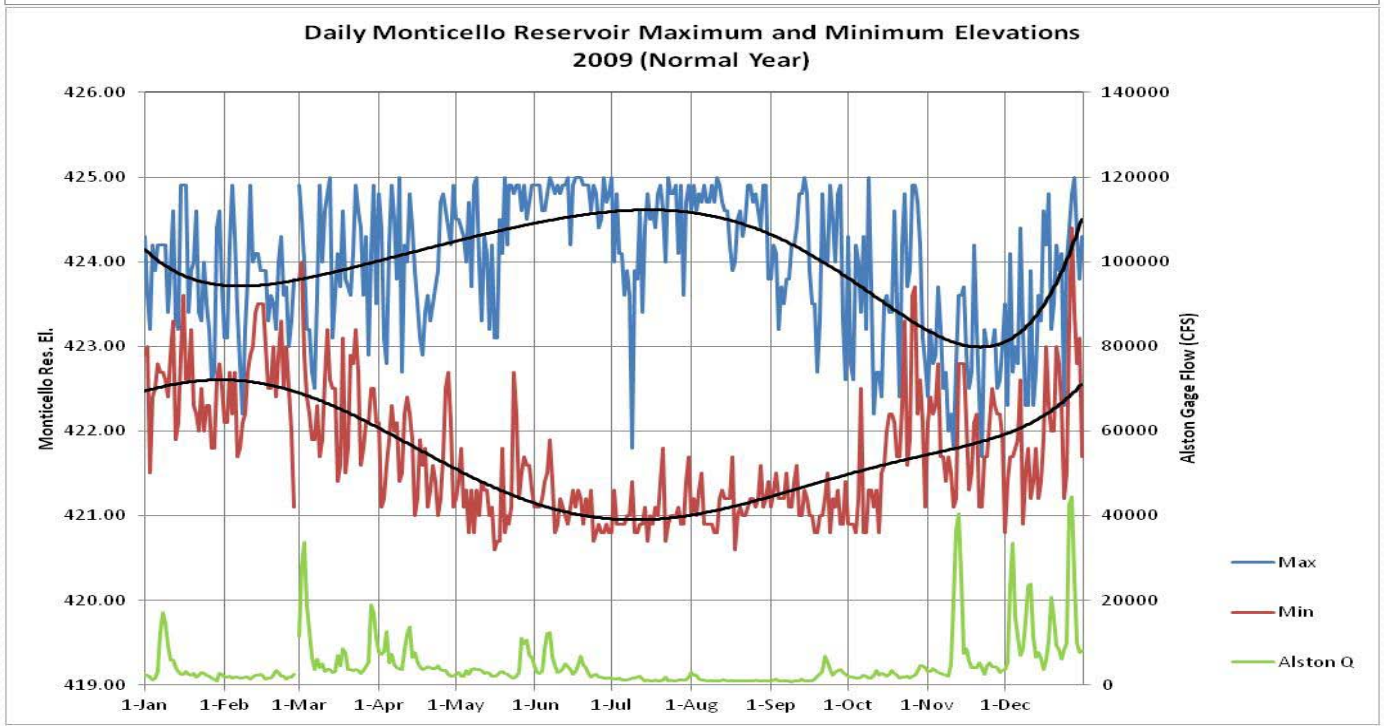
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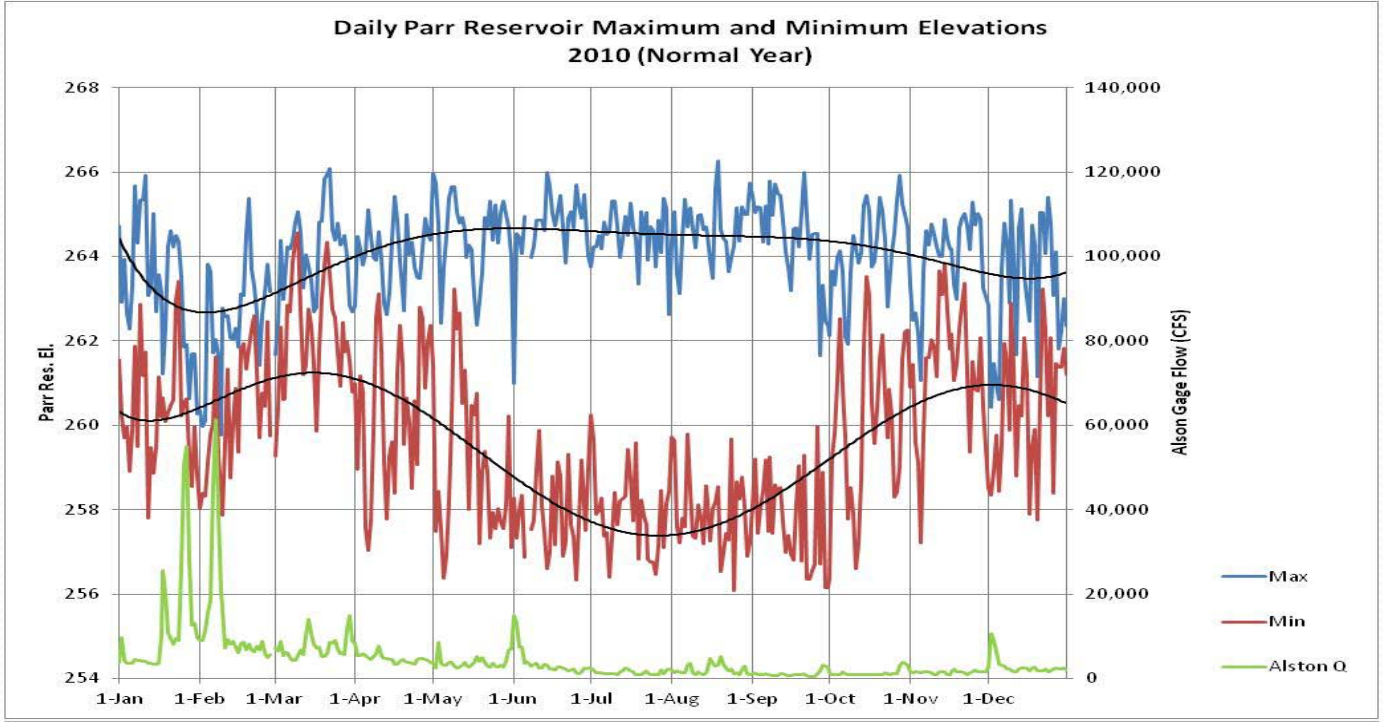
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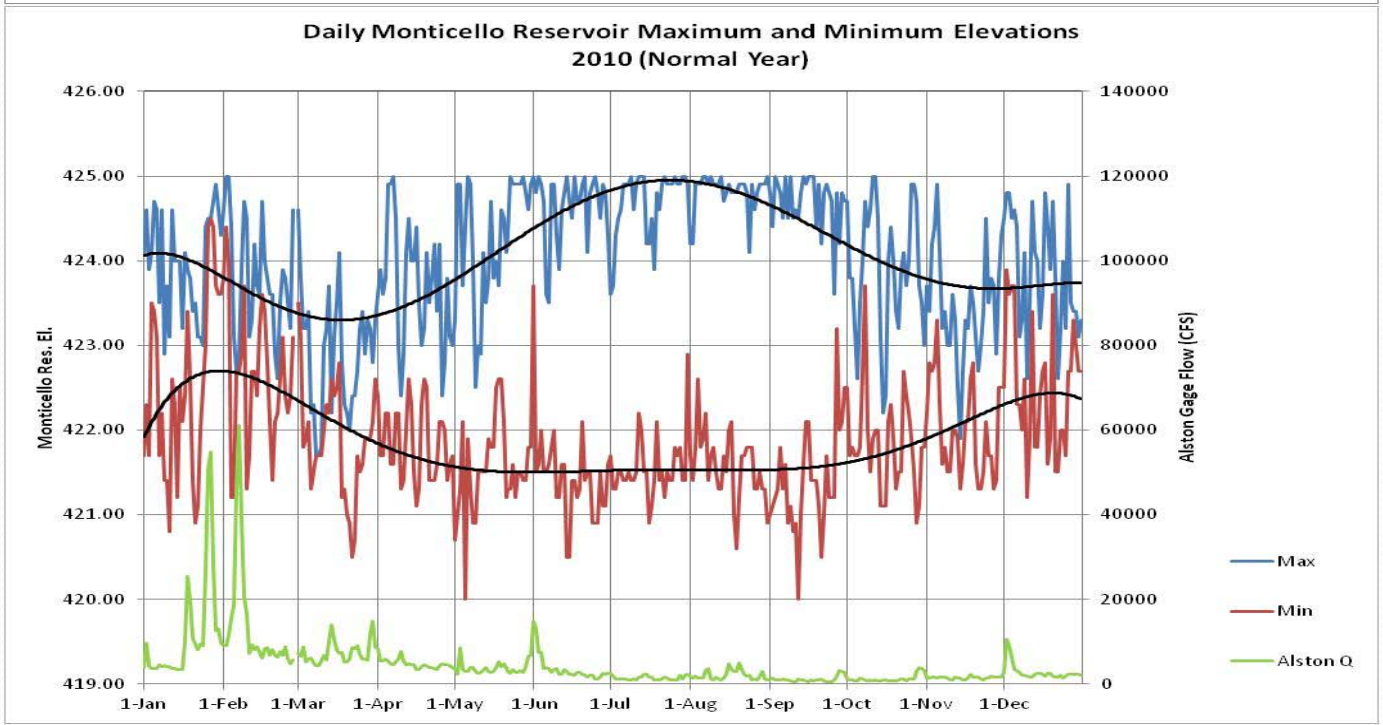
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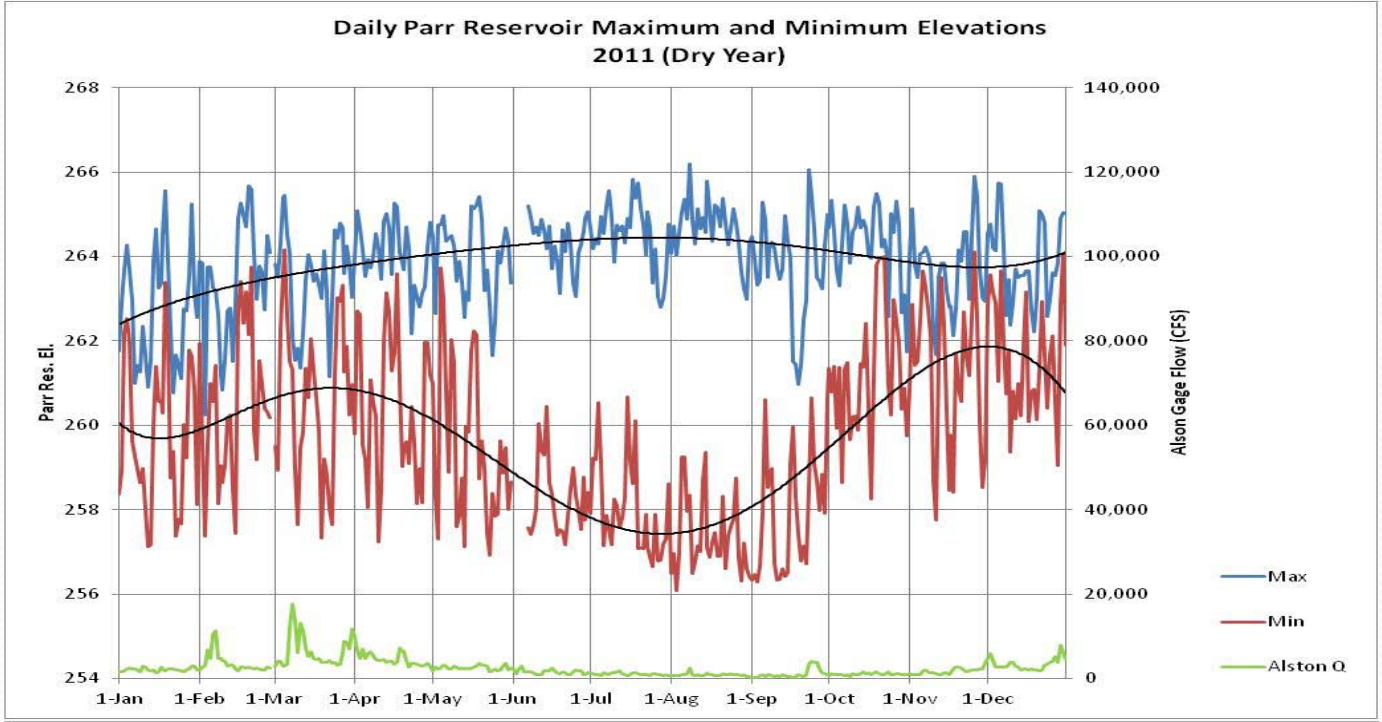
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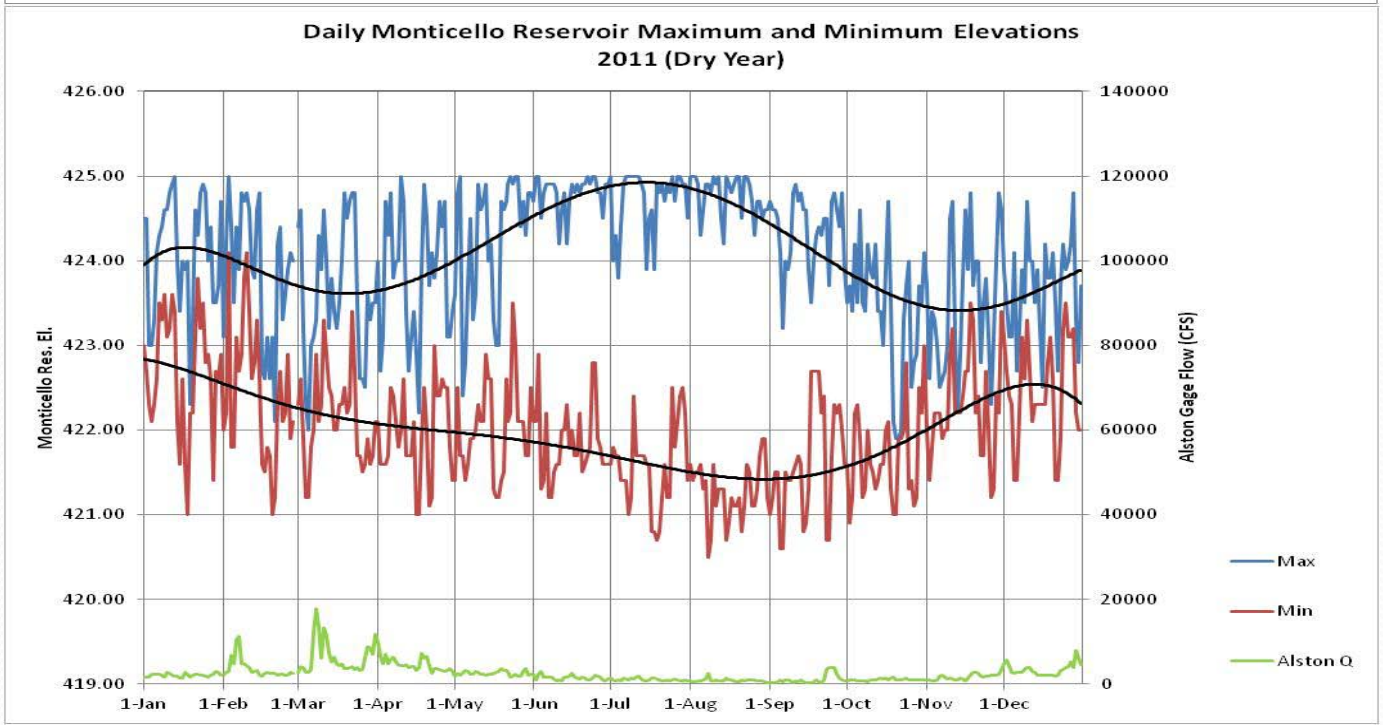
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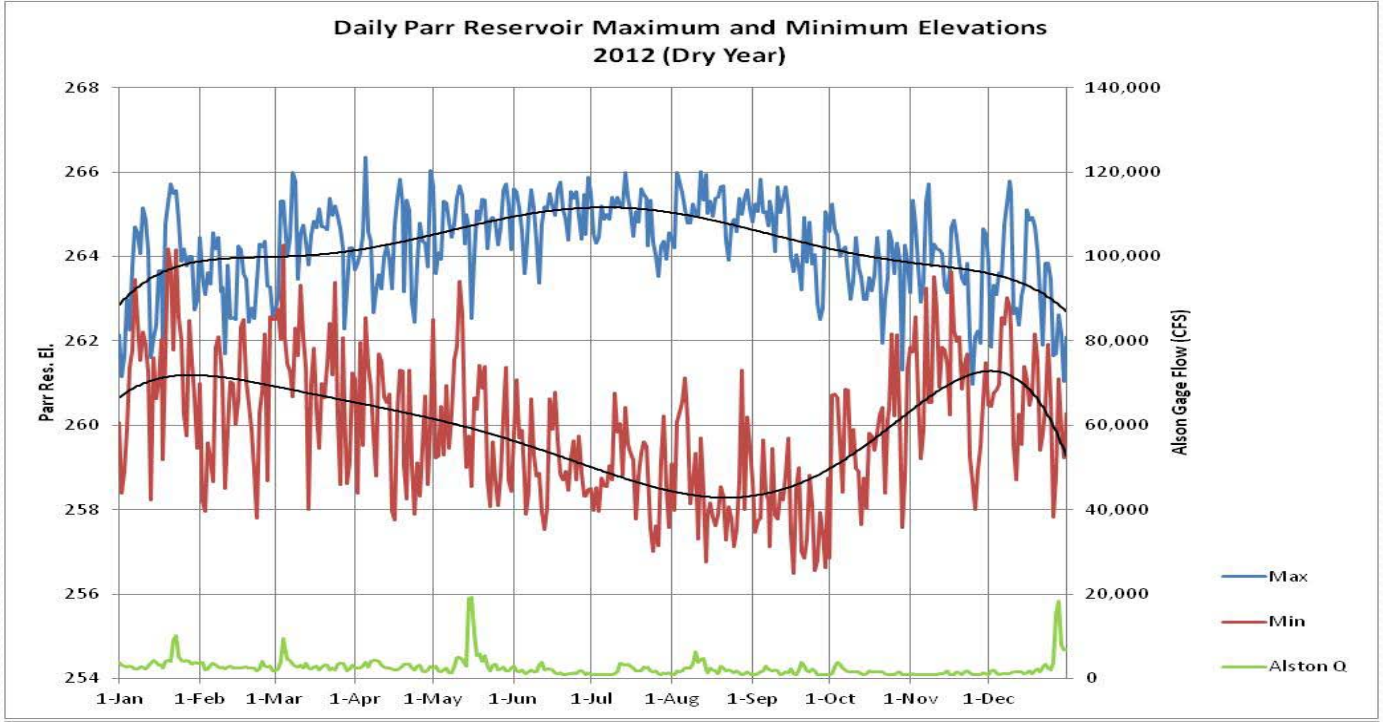
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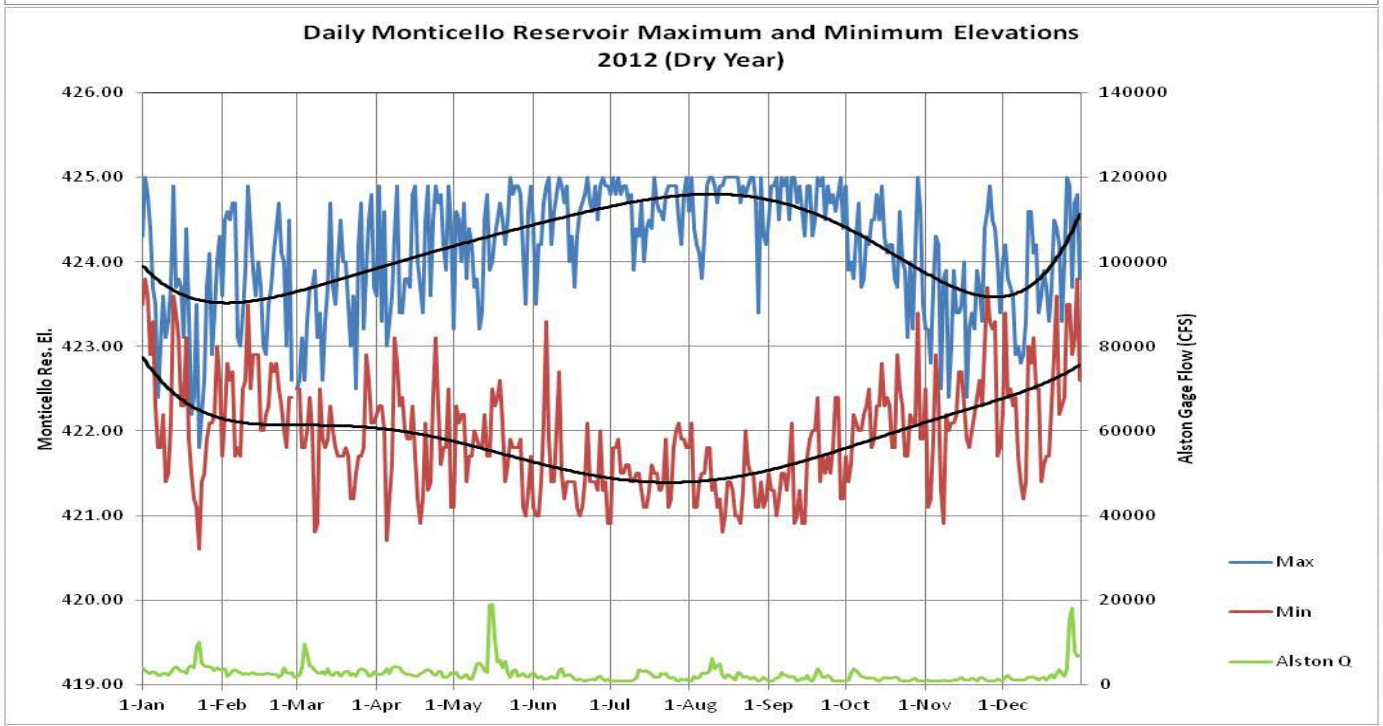
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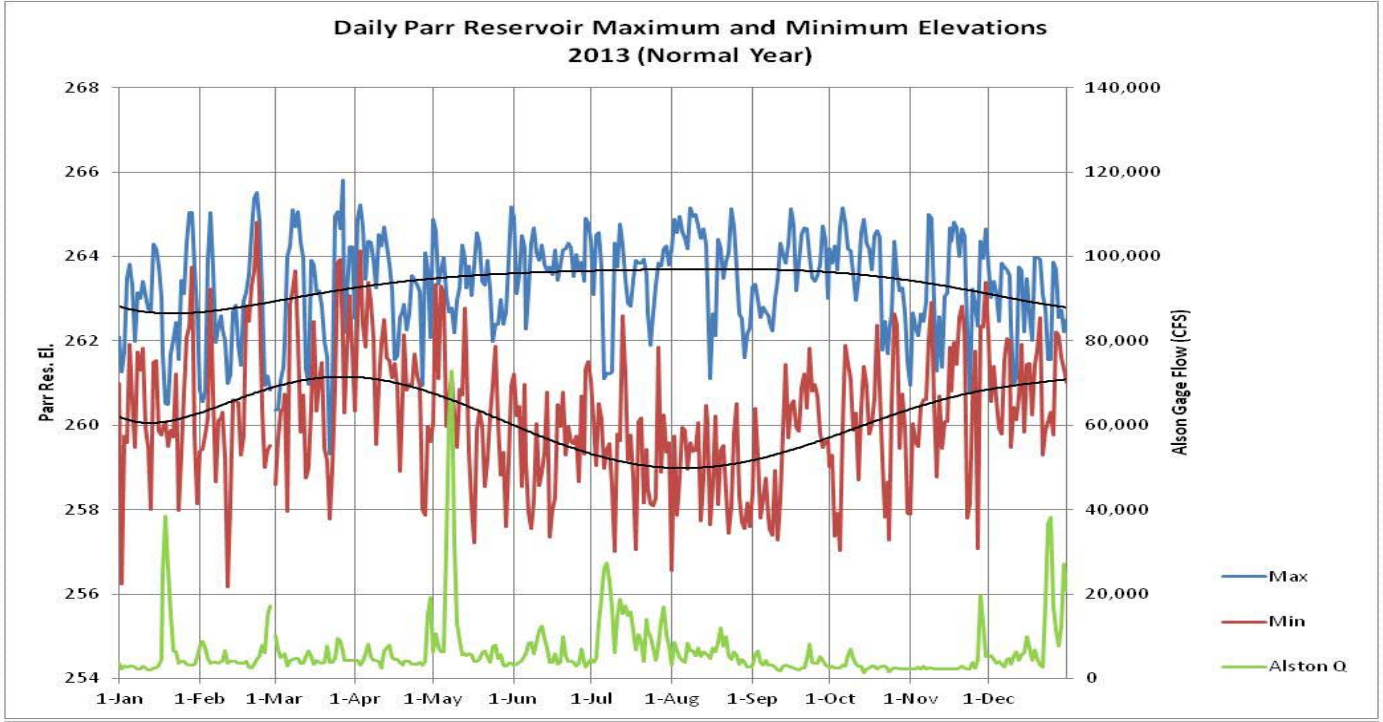
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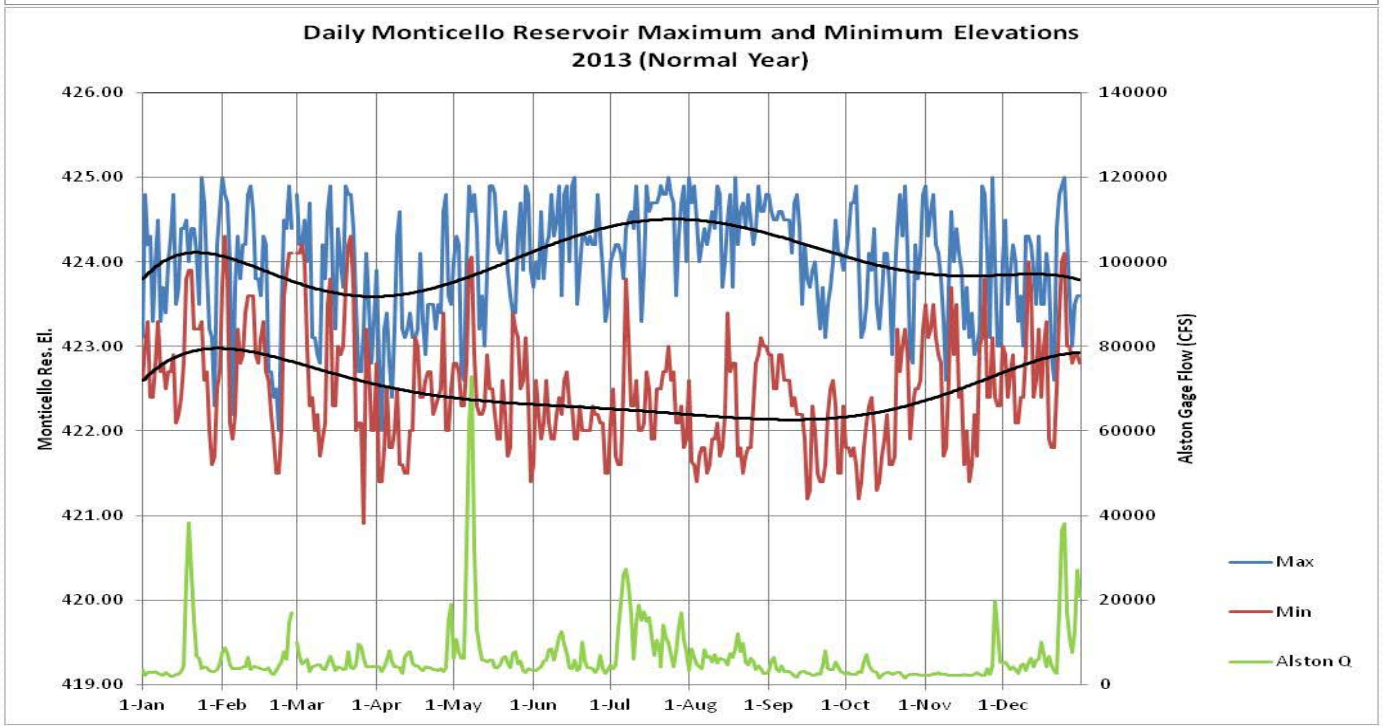
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Observations

- For both reservoirs, average annual fluctuation correlates closely with Fairfield generation and pumping MWHs, but not with flow at Alston gage site.
- Parr generation correlates closely with Alston flow.
- No obvious differences in pattern of fluctuation in wet vs. dry years.

DRAFT
RESERVOIR FLUCTUATION STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

February 2014

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DRAFT RESERVOIR FLUCTUATION STUDY PLAN

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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DRAFT RESERVOIR FLUCTUATION STUDY PLAN

PARR HYDROELECTRIC PROJECT (FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894) (Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

- During issues scoping, the Fisheries TWC identified the potential need for a Reservoir Fluctuation Study on the Parr and Monticello Reservoirs. The operating regime for the Project consists of a lowering and a refilling of the Project's two reservoirs on a daily basis. Although the amount at which the Project reservoirs fluctuate varies based on load demands and system needs, Monticello Reservoir is currently permitted by the FERC license to fluctuate up to 4.5 feet, while Parr Reservoir is permitted to fluctuate up to 10 feet. The magnitude of daily fluctuations varies seasonally in both impoundments. The largest daily fluctuations generally occur in June, July and August in both reservoirs (insert tables from Argentieri presentation). During February through April, when many fish species are spawning in shallow water habitat, average daily fluctuations range from

1.6-2.4 feet in Lake Monticello and from 2.9-4.2 feet in Parr Reservoir (Argentieri presentation 12-19-13). Resource agencies and stakeholders have expressed concerns of how these daily and seasonal fluctuations are affecting aquatic habitat along the shorelines of the reservoirs.

2.0 EXISTING INFORMATION

Fisheries

The Project area supports warmwater fish communities typical of impounded river reaches in the Piedmont of South Carolina. Recent survey work within the Project area documented 30 species of fish occurring in Parr Reservoir and 24 species in Monticello Reservoir. Although some seasonal variations in community structure have been documented, the fish communities are generally similar between the two reservoirs, with gizzard shad, blue catfish, bluegill, channel catfish and white perch often being the dominant species (Normandeau 2007, 2008, 2009; SCANA 2013). Important game fish species such as largemouth bass, black crappie, and smallmouth bass (to a ~~lessor~~lesser extent) are also abundant in the two reservoirs. Life history and spawning preferences can influence the extent to which fish species are affected by reservoir fluctuations. Habitat and spawning preferences of the dominant fish species are briefly considered below.

Comment [WU1]: add table(s) of fish species for each reservoir

Comment [WU2]: - this section focuses on the effects of pool level fluctuations on the "dominant" fish species. Please include other fish species such as largemouth bass, bluegill, redear sunfish, redbreast sunfish, and black and white crappie.

Gizzard shad are a pelagic species that generally occupy the limnetic zone as well as feed along the littoral zone. Spawning typically occurs in the spring, associated with rapidly rising water levels. Gizzard shad typically spawn in shallow waters, 5 feet deep or less, and prefer recently inundated habitats, when available (Williams and Nelson, 1985). Blue and channel catfish typically occupy deep, protected areas, spawning at sites 6.5 to 13 ft deep (McMahon and Terrell, 1982). Bluegill typically inhabit and spawn within shallow, back-water habitats, at depths of 1-3 meters (Stuber et. al., 1982). White perch also spawn in relatively shallow habitat within reservoirs (0-5 feet). Adult white perch exhibit seasonal movements, utilizing both shallow and deep water habitat (Stanley and Danie, 1983). *Comment: Add language for largemouth bass, smallmouth bass and black crappie*

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Small fishes, such as shiners, juvenile sunfish~~minnows~~, and small suckers serve as the food base for larger, piscivorous species. In general, these species typically have high fecundity rates and

will utilize a variety of habitat types for spawning, cover, and resting. These species are typically ~~generalists; however, all of these species are generally~~ found within or in the vicinity of aquatic vegetation or other cover. When inundated, the shallow areas may be frequented by these species for forage and cover.

Pool Elevations

During the construction of Monticello Reservoir and the Fairfield Development in 1974, crest gates were added to Parr Shoals Dam, allowing for a full operating range of 266 ft to 256 ft at Parr Reservoir. Monticello Reservoir was constructed to allow for a full operating range of 425 ft to 420.5 ft.

SCE&G submitted surface area and capacity curves as part of the Final Environmental Impact Statement for Parr Hydroelectric Project, conducted in March 1974, after the crest gates were added to Parr Shoals Dam. In Monticello Reservoir, a change in elevation from 425 feet to 420.5 feet will reduce the surface area of the reservoir from 6,800 acres to 6,467 acres (95% of full pool surface area), resulting in a difference of 333 acres of shoreline exposed. The exposed shoreline is generally included in a narrow band that extends around the reservoir. A change in elevation on Parr reservoir from 266 ft to 256 ft will reduce the surface area of the reservoir from 4,369 acres to 1,375 acres (31.5% of the ~~normal~~ full pool surface area), resulting in a difference of 2,994 acres of exposed lake bottom~~shoreline~~. Prior to the construction of the crest gates and reservoir expansion, the approximately 3,000 acres was not inundated or available as aquatic habitat in Parr Reservoir.

3.0 STUDY OBJECTIVES

The primary objective of this study is to provide a qualitative assessment of the potential effects of operational reservoir fluctuations on aquatic habitat and navigation within the Project Area. As noted in Section 2.0, areas of shoreline are exposed during impoundment fluctuations, but the type and quality (mud flats, shoals, vegetated littoral zones? *(Comment: development of vegetated littoral zones is incumbent on stable pool elevations, therefore this measurement will surely be very low and not representative of project resources without pool fluctuations.* ~~*What would be more valuable is to use a reference lake such as the sub-impoundment to determine project impacts, although using the sub-impoundment might be problematic because it was recently stocked with grass carp)*~~, etc.) of those areas are currently unknown. This study will provide information to characterize habitats within areas exposed during lake-level fluctuations and identify areas with potential navigation issues caused by fluctuations. A secondary objective of this study is to identify appropriate Protection, Mitigation and Enhancement (PM&E)

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measures that might offset potential effects of daily fluctuations which could be considered as part of the Final License Application.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

The study will focus on Parr and Monticello Reservoirs during maximum normal pool and minimum normal pool. Several transects will be established at representative locations along Parr and Monticello Reservoirs, where information such as slope and elevation will be gathered. Members of the Fisheries TWC will select these transect locations prior to the study being performed, which will be no later than the summer of 2015. The study will commence after transect locations are selected.

After fluctuation data is collected and analyzed, the TWC will meet to discuss potential PM&E measures that could be considered for each reservoir.

5.0 METHODOLOGY

The study area will include both Parr and Monticello reservoirs. ~~(*Comment: Need a transect in the sub-impoundment as a control for determining potential habitat without fluctuation. Lake Murray could be another option.)*~~ A maximum of four Priority Areas will be identified in Parr Reservoir by the Fisheries TWC members. Potential Priority Areas in Parr Reservoir have been identified and are depicted in Figure 1~~Figure 1~~ and Figure 2~~Figure 2~~. These Priority Areas will be representative locations within the reservoir that will best depict a variety of aquatic habitat types. Within each Priority Area, 3 to 5 transects will be identified across the wetted area. At each transect, elevations will be collected at full pool via GPS (GeoExplorer 6000 paired with an external Zephyr antenna) or survey methods, as well as at 1 foot increments as the reservoir level is lowered during a fluctuation cycle. Surveys will be performed during a low inflow and high energy demand period (August/September) so that as much of the full operating range of 10 ft as possible, from 266 ft to 256 ft can be observed. From this information an estimate of how much ~~bank~~ reservoir area is dewatered at each 1 foot contour will be estimated. At or near the minimum normal pool elevation (256 ft), slope and habitat type will also be photographed. Prior to the field study, locations that may present potential navigation issues during low fluctuations in Parr Reservoir will be identified (or included as a Priority Area). While aquatic habitat information is being collected in Parr Reservoir, field workers will also examine these areas

during a fluctuation cycle. Any areas that appear to have navigation issues will be documented and photographed.

FIGURE 1 POTENTIAL PRIORITY AREAS IN UPPER PORTION OF PARR RESERVOIR

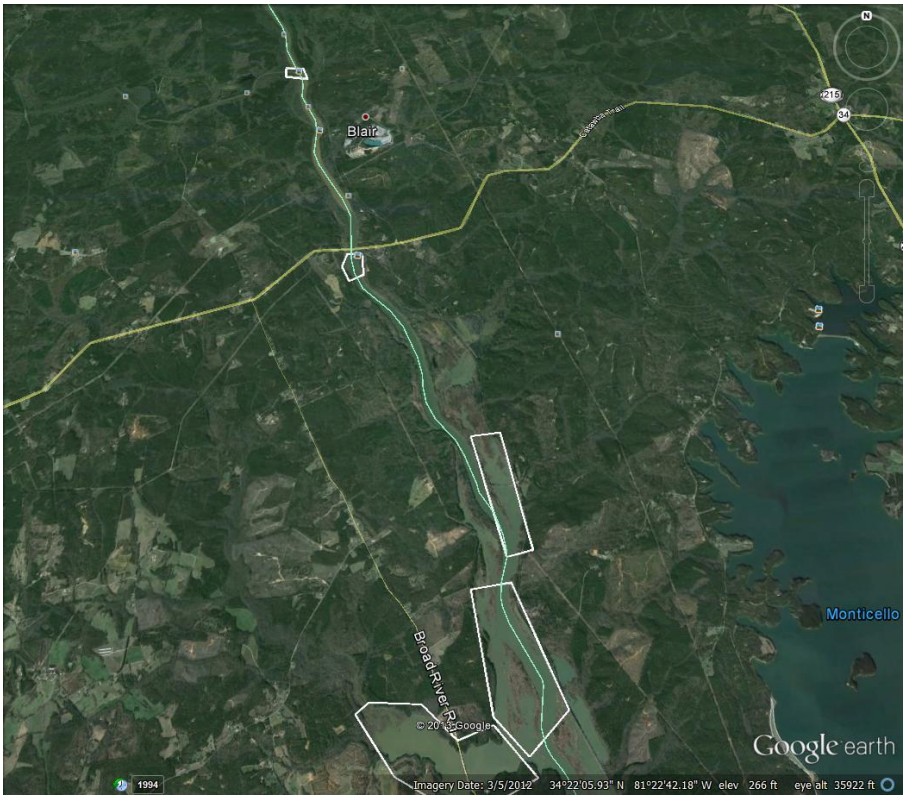

FIGURE 2 POTENTIAL PRIORITY AREAS IN LOWER PORTION OF PARR RESERVOIR

In Monticello Reservoir, a minimum of two Priority Areas will be identified that represent potential critical aquatic habitat areas. At each of these locations slope and habitat type will be measured and photographed at each 1 ft increment from 425 ft to approximately 420.5 ft.

The collected data will be consolidated into a report for the Fisheries TWC review and comment. This report will be the basis for the Fisheries TWC to determine potential PM&E measures that could be implemented at each reservoir. Typical PM&E measures may include aquatic habitat enhancements that could enhance fish spawning and/or recruitment.

6.0 SCHEDULE

Selection of Priority Areas will be completed no later than July of 2015. Field collections will be completed no later than the fall of 2015. After field data collection have been summarized in a report and distributed for review, the Fisheries TWC will meet to discuss PM&E measures that are appropriate for each reservoir. A final report summarizing the study findings and potential PM&E measures that could be considered as part of the Final License Application will be issued in or around July 2016. Study methodology, timing and duration may be adjusted based on weather and consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the South Carolina Department of Natural Resources, USFWS, Fisheries TWC, and other relicensing stakeholders.

8.0 REFERENCES

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MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality TWC Meeting

June 25, 2014

Final KDM 7-17-14

ATTENDEES:

Bill Marshall (SCDNR)
Milton Quattlebaum (SCANA)
Rusty Wenerick (SCDHEC)
Henry Mealing (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Ron Ahle (SCDNR)
Bill Argentieri (SCE&G)
Randy Mahan (SCANA)
Steve Summer (SCANA)
Byron Hamstead (USFWS)
Bill Stangler (Congaree Riverkeeper)
Vivianne Vejdani (SCDNR)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting by reviewing the agenda and action items from the Water Quality TWC meeting held on February 4, 2014. At that meeting, everyone agreed that Kleinschmidt and SCE&G would examine temperature and dissolved oxygen (DO) data from the USGS gages at Carlisle (02156500), Jenkinsville (02160991), Tyger River (02160105), and Enoree River (02160700); and flow data from the Alston gage (0216100) to determine potential project effects on low DO events. At the February 4th meeting, the group agreed that data from the gages listed above would be gathered from 2004 through 2013 and graphically compared to identify low DO events, determine how often, when, and how long those events occurred and to see if there are common events related to the low DO. Flow data would also be collected to determine if there is a correlation between low or high flows and low or high dissolved oxygen. These analyses were completed and summarized in an addendum to the Baseline Water Quality Report, which is attached to the end of these notes. CDs with the USGS data from the gages listed above were distributed to the TWC members attending the meeting, and are available upon request.

Henry discussed the results of the data review, as detailed in the Water Quality Report Addendum, which mainly focused on the data from the Jenkinsville gage and flow data from the Alston gage. Henry told the group that the data showed a trend of low DOs early in the morning, during periods of low generation, and during the summer months. Bill A. explained that he contacted USGS and found out that they replaced the monitoring probe located at Jenkinsville in 2011. Henry suggested that the gage may be located in a bad spot, where back flow may be occurring. If the units running are far away from the monitor the water near the monitor could become stagnant. To determine if this is true, SCE&G is planning to collect a series of water quality readings along the downstream side of Parr Shoals Dam and near the USGS gage. Milton will access the river through the windows in the powerhouse. Byron asked if flow data can also be collected. Henry said we can calculate the flow. Henry said that Milton can note which turbines are running when he is collecting the data to see if unit location is having an effect. While Milton is collecting data during July and August, he

will request the operators to run different units to see if this affects the DO readings at the USGS gage.

Byron asked to look at specific DO excursions in the USGS data at Jenkinsville. From July 18-21, 2010, the DO at the Jenkinsville gage was below 4.0mg/L. The flow data at Alston shows that only one unit is running, which might possibly be the furthest unit from the gage. During the meeting, Bill checked the online operation records, but was unable to find records of which Unit was operating during that event. Bill will continue to look for historical unit operating data for Parr.

Ron suggested we look at the flows that are occurring during the low DO excursions to determine a pattern. Although there doesn't appear to be a pattern, the excursions could correlate to which units are running.

Rusty asked if the excursions could be related to the operation of Fairfield Pumped Storage Development. The group asked if Monticello stratifies and Steve explained how the reservoir acts as three separate reservoirs, with the upper portion of the reservoir stratifying. Rusty suggested that FPS operations (through higher water levels in the Parr Reservoir) are periodically pushing low DO water towards the dam.

Henry suggested that we collect data to verify the USGS gage first, since this seems to be the easiest next step toward identifying or ruling out the cause of the DO excursions. Bill S. asked what the next step would be if the gage is determined to be in a bad location. Henry said we will talk with USGS about relocating the gage.

Kelly told the group about the turbidity information that Kerry Castle with SCDNR sent following the February 4th Water Quality TWC meeting. The data shows how turbidity increases as one moves downstream in the Broad River. Kelly will send Kerry's data to the TWC.

Henry said that although there are occasional DO excursions, there is still high biodiversity downstream of Parr Shoals Dam. Henry stated that if low DO levels were a true problem below Parr Shoals Dam, the diversity and abundance of mussels and snails should not be as high.

Byron asked how difficult it would be to start keeping track of operations at Parr Hydro, such as which unit or units are running. Bill said that SCE&G can try to keep track of this information. Milton said he will take measurements as close to each unit as possible and as close to the USGS gage as possible.

Byron asked if there was a pattern for operating the units, or a first on, last off protocol. Steve said he thought that the operators most likely just rotate units to prevent wear on a particular unit. Bill spoke with an operator at Parr Hydro and found that there was no pattern or first on, last off protocol at the plant.

Steve asked if there is a gage that records the stage in Parr Reservoir. Bill said that stage data is collected at Parr Reservoir. Steve said this information would give us an indication of what is going on at Fairfield and if the operation of the development has any correlation to the USGS data. Rusty said that if Fairfield is transferring enough water from Monticello Reservoir to raise the level of Parr Reservoir, this action is having an effect on temperature in Parr Reservoir as well. The group examined stage data from Parr Reservoir and saw a possible correlation between low DO and stage.

Steve pointed out that we don't know if Fairfield is the cause of low DO occurrences, although they appear to be correlated. However, operation of Fairfield is related to system load which is in turn related to the sunrise and sunset.

Bill asked that if anyone sees a trend in the water quality data once they start looking at the data that was distributed during the meeting, to let the rest of the TWC know. The group will meet again once Milton has collected the data downstream of the Parr Shoals Dam – starting in July and extending into August if needed. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Milton and Kelly will collect water quality data below Parr Shoals Dam during July and August, making sure to record which units are operating while measurements are being taken. They will report their findings back to the TWC.
- Kelly will distribute Kerry Castle's turbidity data to the group.
- Kelly will finalize the Water Quality Report Addendum, send it to the TWC and post it to the website.
- Bill will look for historical unit operating data for Parr and FPS.

At the Water Quality TWC meeting on February 4, 2014, the TWC noted that the Parr Water Quality Report identified multiple dissolved oxygen (DO) levels below 4.0 mg/l in the Parr Shoals Dam tailrace. The TWC agreed that SCE&G would consolidate historic USGS data to examine those excursions and to provide any operations that might be associated with the data. SCE&G requested hourly DO, temperature and river flow data from 2004 through 2013 for the following USGS stations:

1. USGS 02160991 Broad River near Jenkinsville, SC
2. USGS 02156500 Broad River near Carlisle, SC
3. USGS 02160700 Enoree River at Whitmire, SC
4. USGS 02160105 Tyger River near Delta, SC

Our analysis of the data focused on the period from July through September of each year from 2004 through 2013. For this analysis, we plotted hourly readings of flow, temperature, and DO levels at each of the gage stations. Those plots and the raw data will be available to the TWC upon request. Included below are data from the Jenkinsville gage, located immediately downstream of the Parr Shoals Dam along the east bank of the tailrace (FIGURE 1 through FIGURE 10). Since flow data is not collected at the Jenkinsville gage, flow data from the Alston gage, USGS 02161000, was used.

FIGURE 1 2004 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000

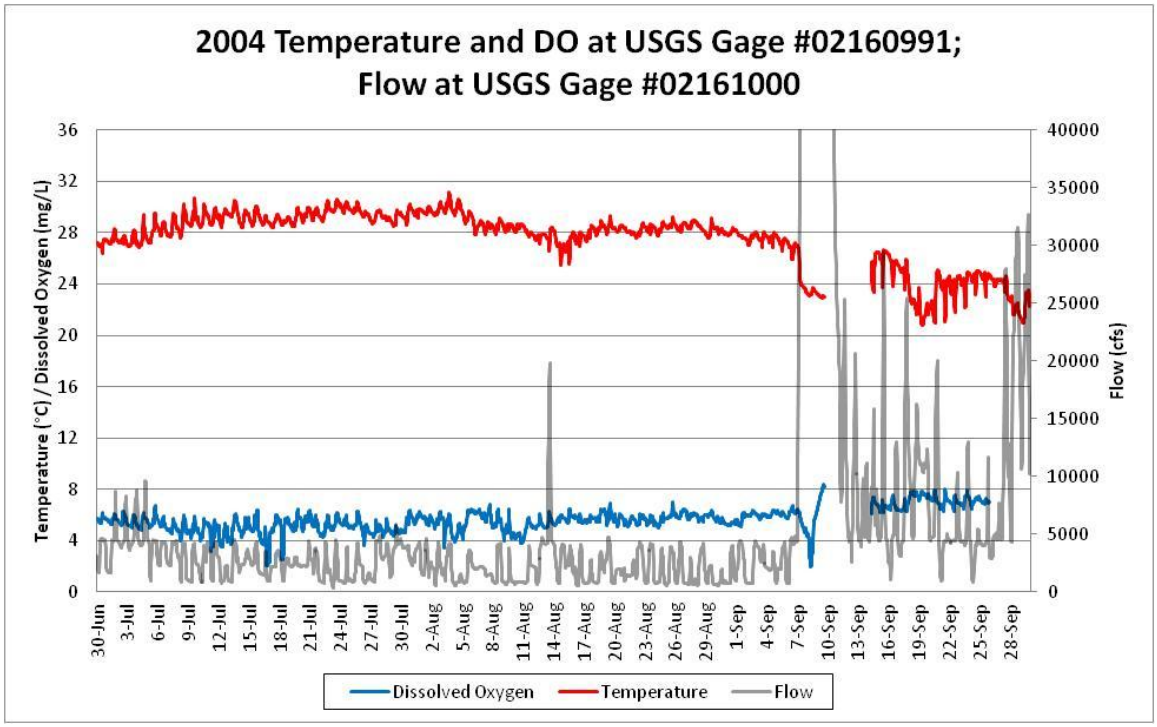


FIGURE 2 **2005 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

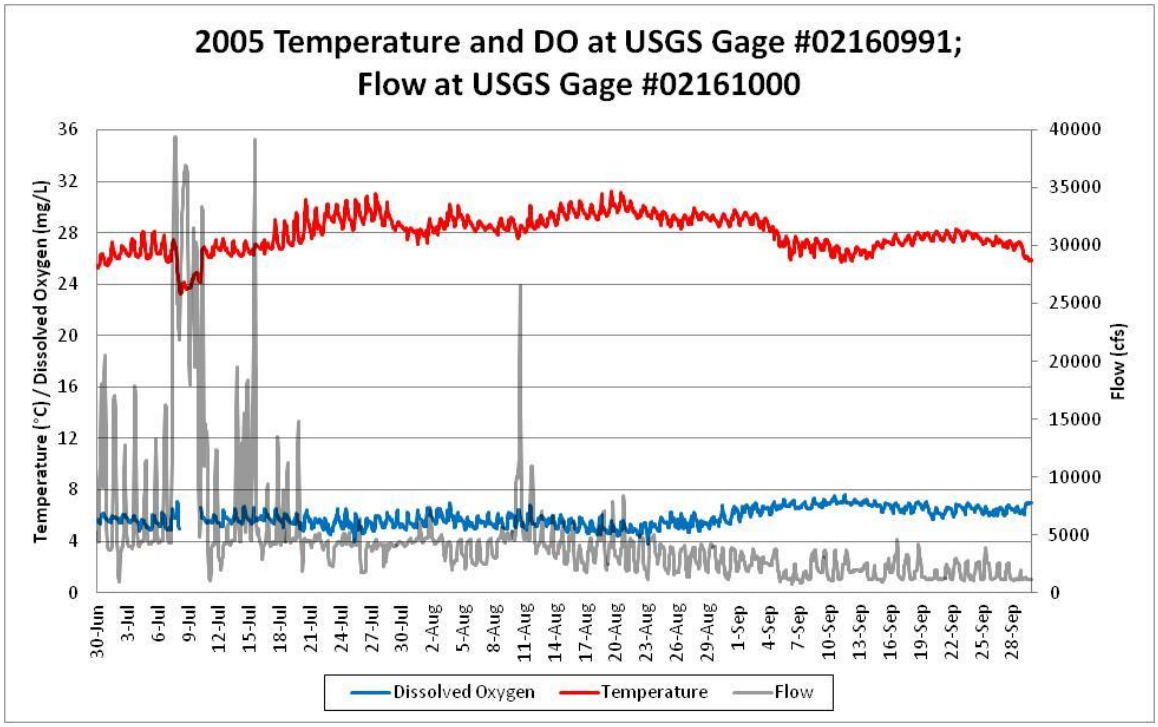


FIGURE 3 **2006 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

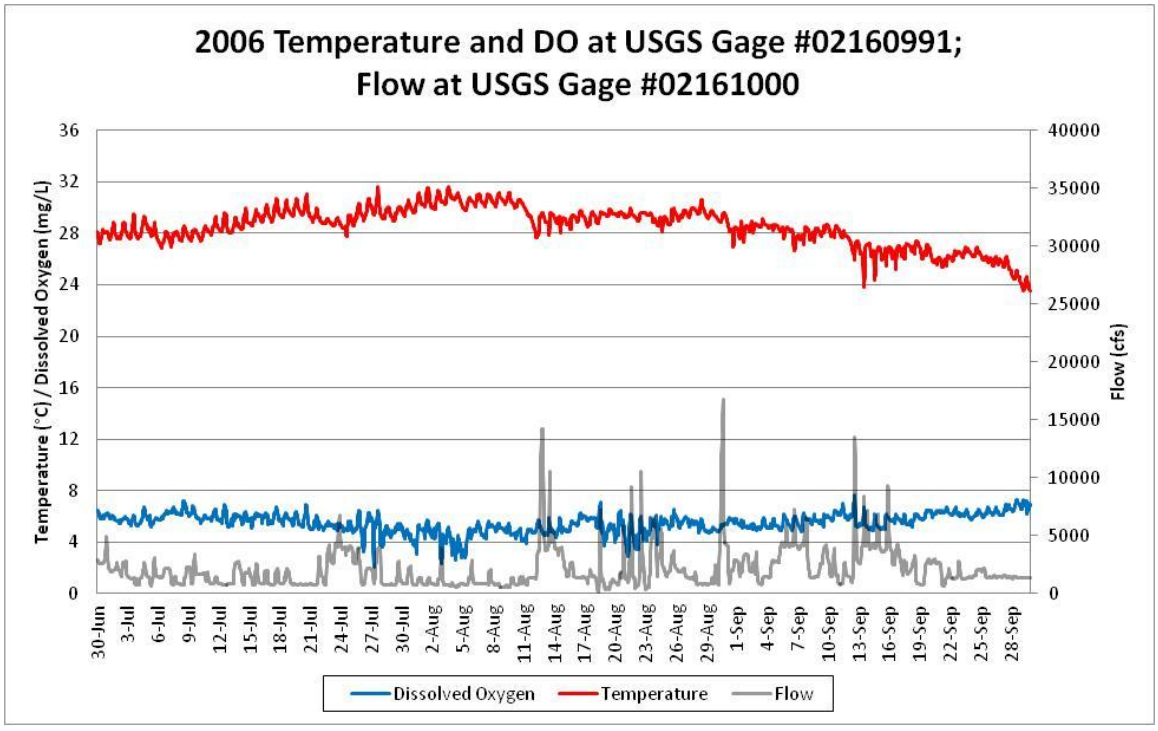


FIGURE 4 **2007 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

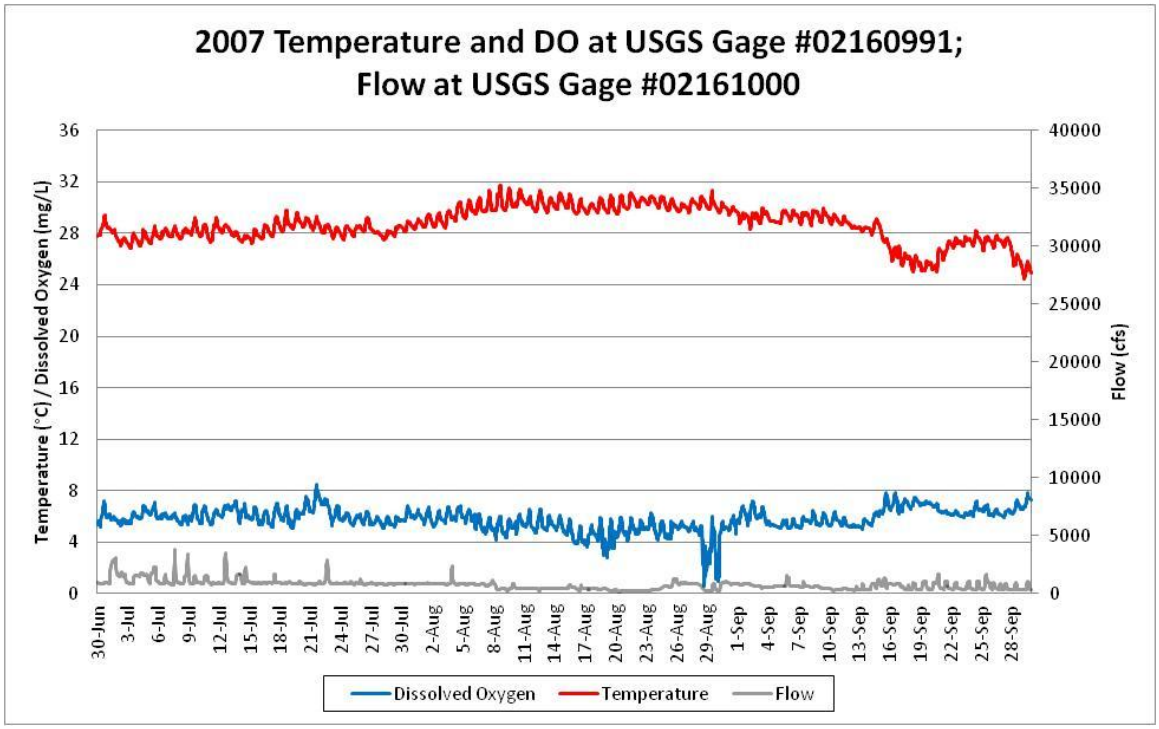


FIGURE 5 **2008 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

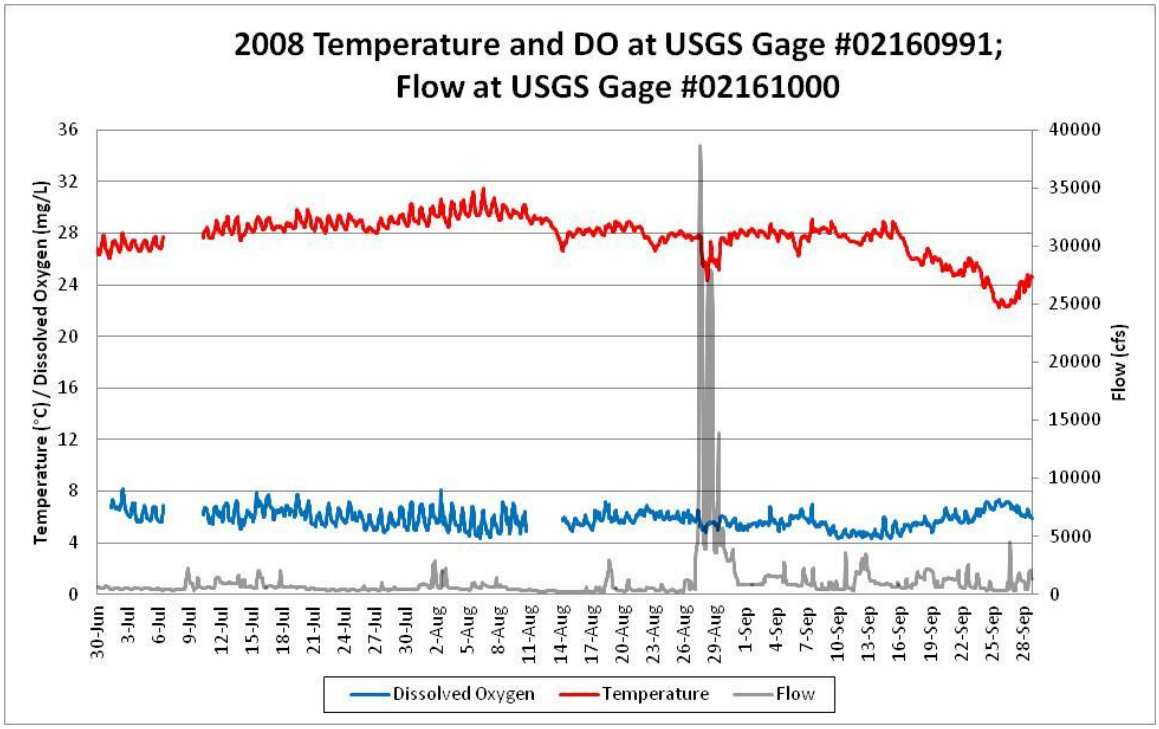


FIGURE 6 2009 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000

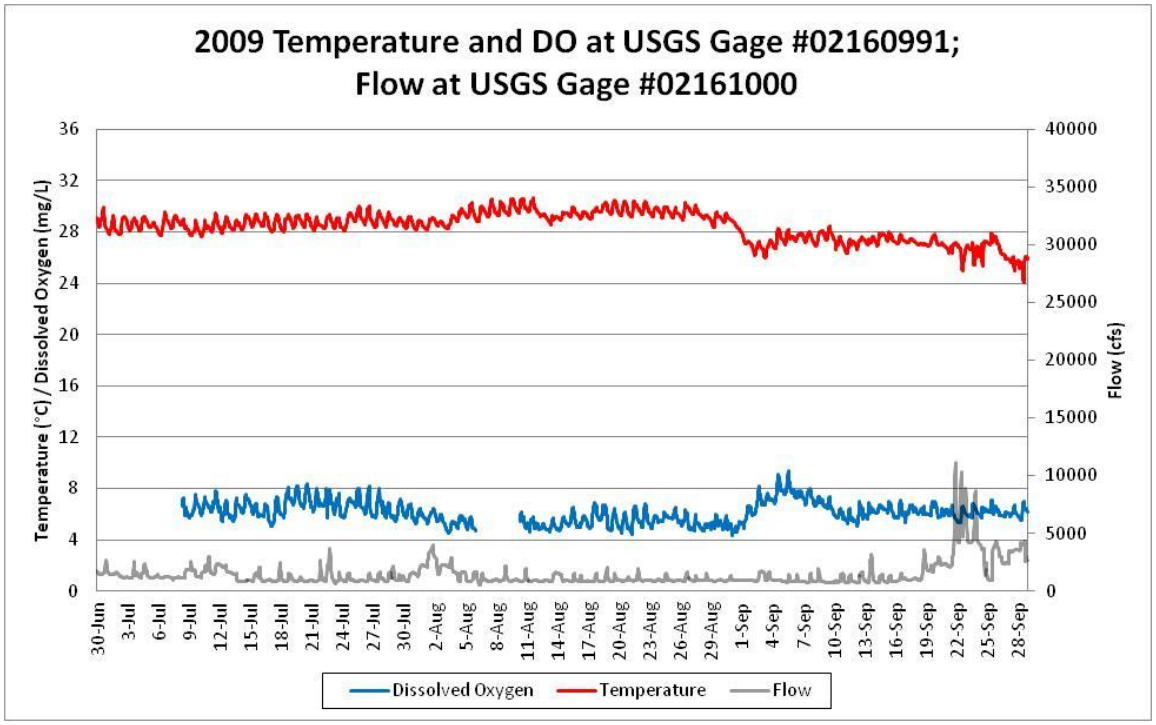


FIGURE 7 2010 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000

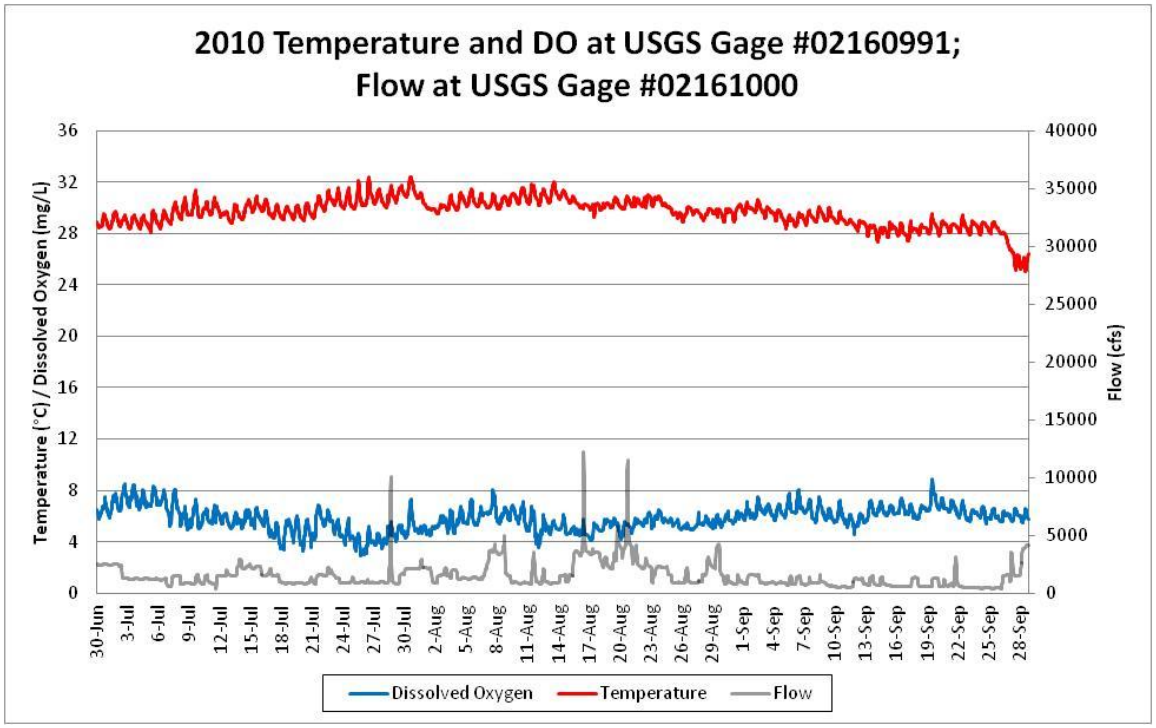


FIGURE 8 **2011 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

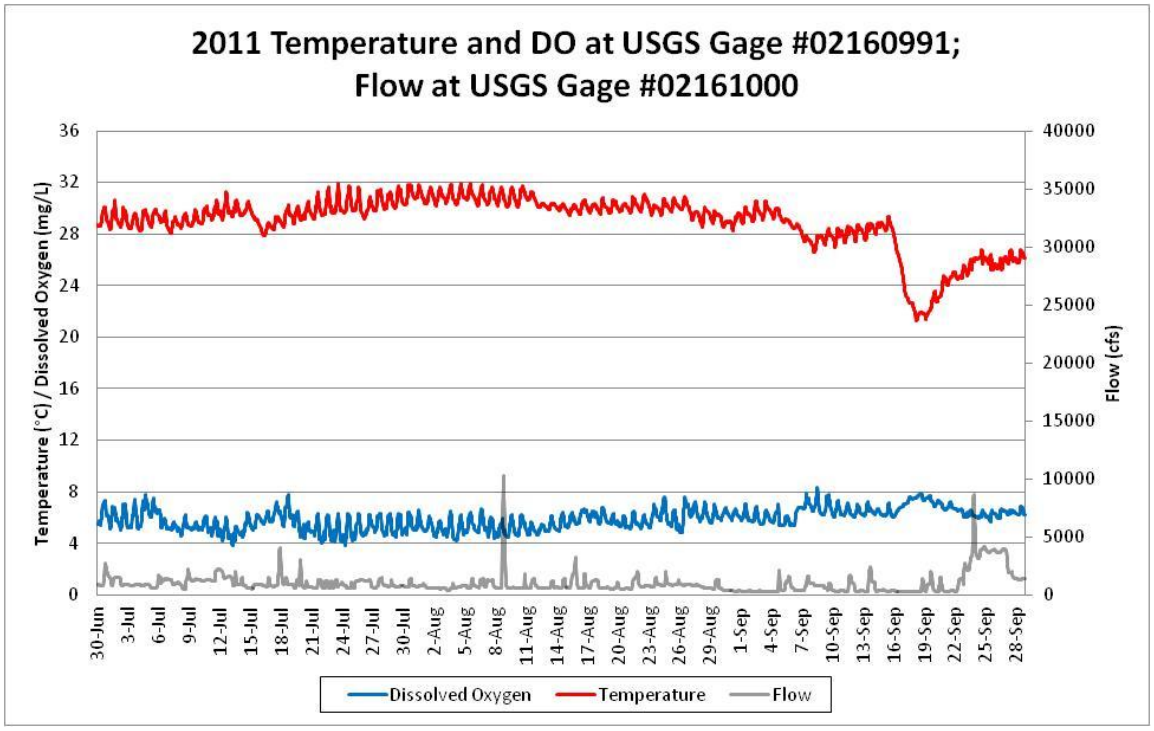


FIGURE 9 **2012 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000**

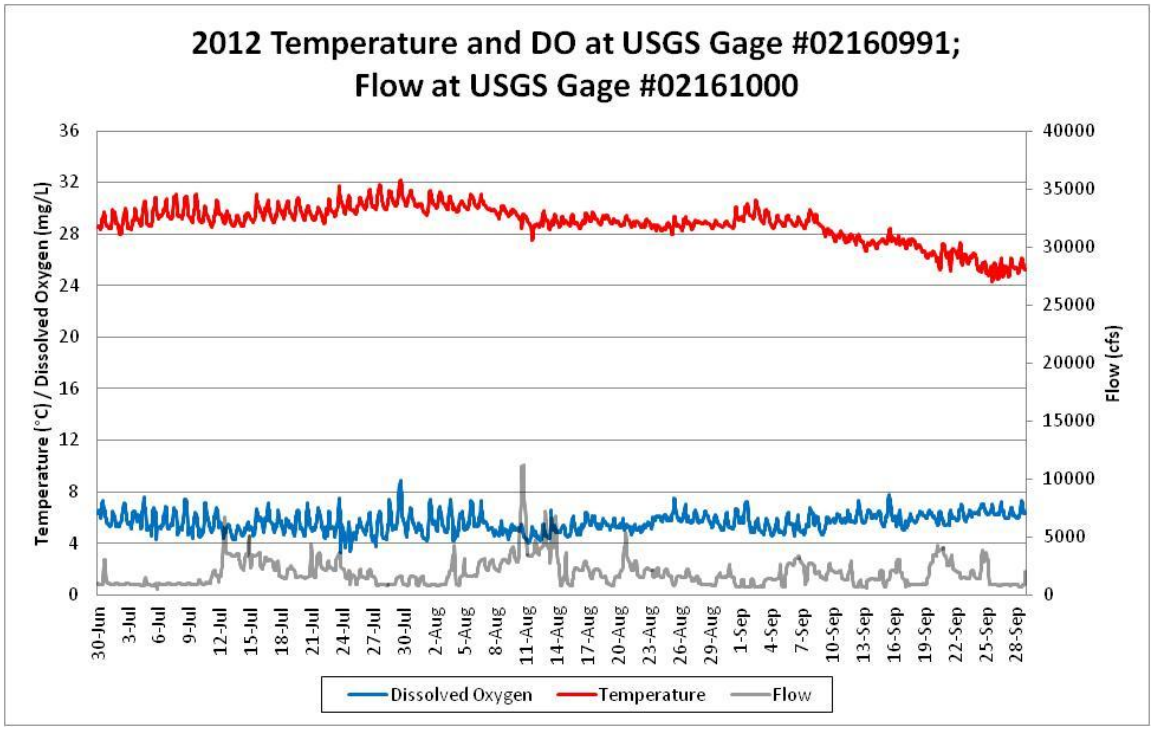
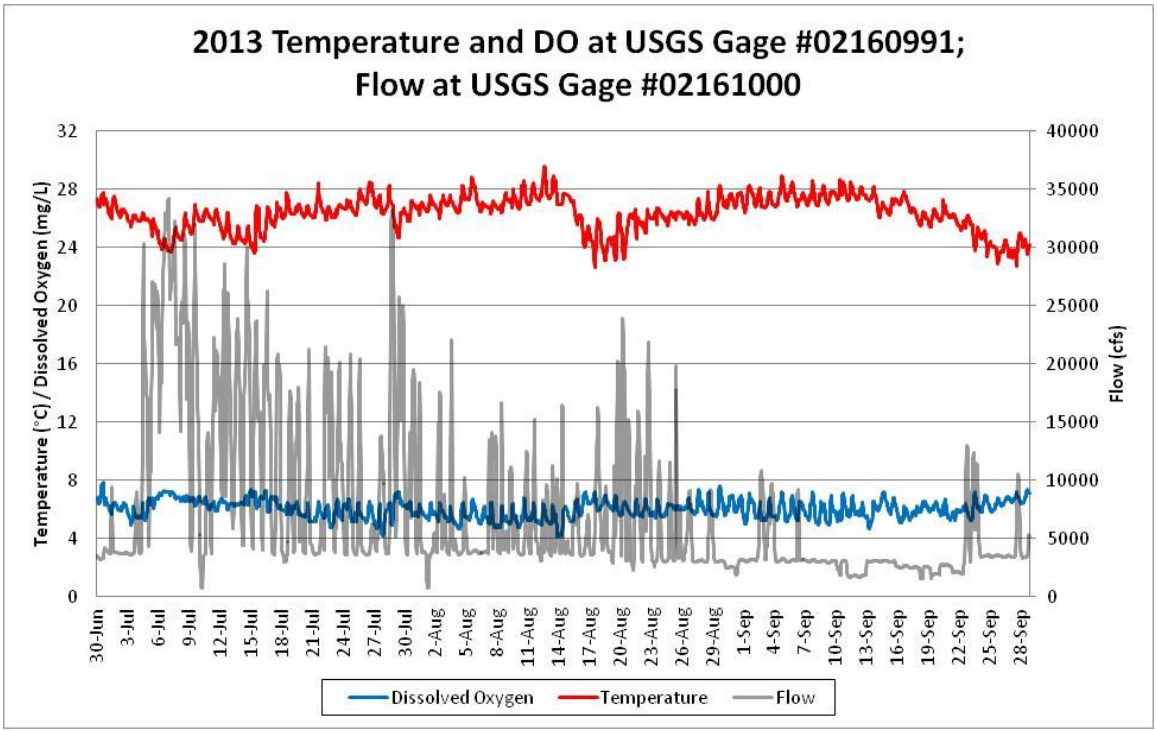


FIGURE 10 2013 TEMPERATURE AND DISSOLVED OXYGEN AT USGS 02160991; AND FLOW AT USGS 02161000



Review of the data verified that there are periodic excursions of DO levels less than 4.0 mg/l. These events are not consistent from year to year and do not typically have a long duration. We have presented representative excerpts of the raw data in TABLE 1 through TABLE 4 to demonstrate the month, flow, temperature, time of day, and DO level experienced.

TABLE 1 JULY 19-20, 2010: DO EXCURSION

Date	Time	DO (mg/L)	Temperature (°C)	Flow (cfs)
7/19/2010	9:00 pm	4.3	29.5	900.7
7/19/2010	10:00 pm	4.0	29.4	900.7
7/19/2010	11:00 pm	3.7	29.4	900.7
7/20/2010	12:00 am	3.9	29.3	900.7
7/20/2010	1:00 am	3.8	29.3	900.7
7/20/2010	2:00 am	3.8	29.2	888.0
7/20/2010	3:00 am	3.7	29.2	875.3
7/20/2010	4:00 am	3.6	29.1	862.7
7/20/2010	5:00 am	3.3	29.1	862.7
7/20/2010	6:00 am	3.7	29.0	837.7
7/20/2010	7:00 am	4.0	29.1	837.7
7/20/2010	8:00 am	4.5	29.2	825.3

TABLE 2 JULY 13, 2011: DO EXCURSION

Date	Time	DO (mg/L)	Temperature (°C)	Flow (cfs)
7/13/2011	5:00 am	4.6	29.7	1474.9
7/13/2011	6:00 am	3.9	29.3	1369.9
7/13/2011	7:00 am	3.8	29.3	939.3
7/13/2011	8:00 am	4.1	29.5	812.9

TABLE 3 JULY 24, 2012: DO EXCURSION

Date	Time	DO (mg/L)	Temperature (°C)	Flow (cfs)
7/24/2012	6:00 am	4.2	29.6	2107.6
7/24/2012	7:00 am	3.9	29.6	1789.4
7/24/2012	8:00 am	3.6	29.5	1536.0
7/24/2012	9:00 am	3.9	29.7	1459.7
7/24/2012	10:00 am	4.3	30.1	1429.5
7/24/2012	11:00 am	4.3	30.1	1429.5
7/24/2012	12:00 pm	4.4	30.2	1444.6
7/24/2012	1:00 pm	4.4	30.3	1444.6
7/24/2012	2:00 pm	4.7	30.6	1399.6
7/24/2012	3:00 pm	5.6	30.9	1444.6
7/24/2012	4:00 pm	5.7	31.0	1954.6
7/24/2012	5:00 pm	5.5	30.9	2124.8
7/24/2012	6:00 pm	4.8	30.8	1971.4
7/24/2012	7:00 pm	3.5	30.1	1154.4
7/24/2012	8:00 pm	3.4	29.9	875.3
7/24/2012	9:00 pm	3.6	29.9	1520.7
7/24/2012	10:00 pm	3.6	29.9	1676.9
7/24/2012	11:00 pm	4.1	29.9	1724.8

TABLE 4 JULY 27, 2012: DO EXCURSION

Date	Time	DO (mg/L)	Temperature (°C)	Flow (cfs)
7/27/2012	6:00 am	4.2	30.0	1490.1
7/27/2012	7:00 am	3.7	29.9	1196.5
7/27/2012	8:00 am	3.8	30.0	900.7
7/27/2012	9:00 am	4.3	30.0	837.7

Our review of this data lead us to the conclusion that the low DO levels frequently occur during the early morning hours when DO levels often begin to decline (diel fluctuation) and flows begin to decline. Based on this observation we reviewed the location of the USGS monitor which is located along the bank in a back eddy just downstream of the Parr Shoals Dam. We also asked the USGS to provide any information they had on the type of monitoring equipment used and how it had changed over time. The following is a consolidation of email excerpts that we received from Michael Hall of the USGS:

> The current DO probe that the USGS uses at the Parr Dam monitoring site is a YSI 6150 ROX, which is an optical DO probe with a self cleaning wiper system. Looking back over the last year and a half, there have been no corrections needed to the sensor data for fouling or calibration drift. The sensors and sonde are cleaned at least monthly, but sometimes more often in the summer months if needed. The DO membrane itself rarely has any visible fouling because of the wiper system. Calibration is checked monthly and readings are also verified at each visit with a separate calibrated field meter. YSI states that the accuracy of the ROX DO is +/- 0.1 mg/L or 1% of reading, whichever is greater. The USGS applies corrections to the data if the combined fouling and drift differences exceed +/- 0.3 mg/L.
>
> [USGS hasn't] noticed any issues with the quality of the readings and can't ever recall the water being stagnant where the sonde housing is placed. The flow at the sonde is mostly negative due to a swirling motion, but any debris or other trash that is floating in the pool gets "flushed" fairly quickly, so I would assume the water is constantly being refreshed. If you would like, we can arrange to be on site during different unit releases to better determine if there is a stagnant issue.
>
> Prior to the ROX sensor [installation – June 2011], [USGS] used a YSI 5739 and YSI Rapid Pulse DO Probes. All three sensors have the same accuracy according to YSI. [USGS doesn't] have the exact dates that the ROX was installed, but [they] believe it was in the 2011 water year. The frequency of cleaning for the older probes was 2 to 4 weeks depending on season and flow events. Those probes didn't self clean, so during the summer months they usually needed more attention"

It is our suspicion that some, if not all, of these low DO events are related to low flows in the tailrace and backflow or stagnant flows at the USGS monitor. To test this theory, we have planned to collect additional data in the tailrace during July and August of 2014 and compare it with USGS data collected at the same time. We will focus on these warmer summer months when flows are lower and more likely for us to observe any deviations.

DO readings will be collected along a transect starting at the furthest turbine discharge on the west end of the Parr Shoals powerhouse and proceed to the east towards the USGS monitor using a Hydrolab Surveyor 4a with a Hydrolab MS 5 sonde or similar equipment. DO readings will be collected at the mid-depth of the water column from a maximum of 10 sample locations along the transect. Collections will be performed at one hour before sunrise, at sunrise, and one hour after sunrise. Collections will also be coordinated with lower flow events – possibly scheduled for each sampling. We will perform up to eight collections during July and August of 2014 to detect any differences in the transect DO measurements and the USGS data measurements.

The transect data will be compared to the USGS data. We will use figures and tables to display the collected data and patterns in the DO level will be described based on time, flow, and distance from the USGS monitor. We will consolidate this information into a letter report to share with the TWC for review and discussion.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Operations RCG Meeting

June 26, 2014

Final KDM 08-26-14

ATTENDEES:

Vivianne Vejdani (SCDNR)
Dick Christie (SCDNR)
Scott Harder (SCDNR)
Steve Summer (SCANA)
Gerrit Jobsis (American Rivers)
Bill Marshall (SCDNR)
Bret Hoffman (Kleinschmidt)
Randy Mahan (SCANA)
Malcolm Leaphart (Congaree Riverkeeper)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Kelly Miller (Kleinschmidt)
Henry Mealing (Kleinschmidt)
Byron Hamstead (USFWS)
Bruce Halverson (Kleinschmidt) via Conf. Call

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting by reviewing the agenda and then he turned the meeting over to Bret. Bret stated that the meeting goal was to explain the methodology included in the study plan used to develop the inflow dataset and explain the methodology for determining the correlation coefficient. Bret noted that many of the comments submitted by the RCG on the Inflow Dataset Methodology Memo were related to the use of monthly data. Bret explained that the dataset will actually be daily or hourly data. Monthly data was used only to determine the correlation coefficient.

Bret then led the group through the comments and questions submitted by the RCG, beginning with those submitted by Scott Harder. (The questions submitted by the RCG on the Inflow Dataset Methodology Memo and corresponding answers are attached to the end of these notes.) Scott asked for clarification on how the dataset would be used. Bret agreed that language can be added to the memo to clarify this. Bret explained that daily data could be used to develop the coefficients, but because it is a mass balance evaluation, it makes more sense to use a monthly dataset due to daily mass variance which can result from the pumped storage operation. Gerrit asked how using a monthly dataset can capture daily variances. Bret explained that the monthly data was used only to determine the coefficients for pro-rating upstream gages, which will then be applied to the daily dataset. Bret reiterated that daily data could be used to determine the coefficients, but the coefficients would generally be the same as using monthly data, and it would increase inaccuracy into the regression analysis.

Scott stated that he compared the method explained in the dataset methodology memo to the straight area proration method, and he is comfortable with the method chosen. Bret said that the method was chosen because it more accurately predicted low flows than other methods considered.

Bret asked the group if there was a real need to use hourly data, since it has a more limited period of record than daily data, which could be substituted as hourly for corresponding hourly model runs. Ray said the model can be routed for high flow events, using hourly data during these events only, instead of for the whole period of record. Gerrit said that his interests are in the amount of water coming in to the Project, how the Project manipulates it, and how the water leaves the Project. He is interested in low flows, not particularly high flow events. He doesn't want the model to be smoothed over during the low flow events because monthly data was used. Ray said that monthly data was only used to create the coefficients, and those coefficients can be applied to anything, including daily or hourly flows. The model and its output are not governed by the input of the inflow dataset. Hourly inflow data will only have significant impacts on the project during high inflows from storm events, which can be routed. Ray said these specific events can be modeled at any time using hourly data, thus in effect "zooming in" to a particular event in time.

Byron asked if the model accounts for geologic factors. Bruce said that this is done mathematically, based on the slope of the channel. The speed of the flood wave moving downstream is dictated by the width and slope of the channel. Ray explained there is a series of coefficients for each reach of the river and these coefficients are entered into the model, which relates each coefficient to a different set of coefficients. You then examine the resulting hydrograph to determine if it looks reasonable. Ray explained that it is typical to estimate inflows. All applications of these models are approximations. Ray noted that a reservoir curve can be created, which is then compared to the reservoir stage data as water flows in to determine if the hydrograph is reasonable. Hydrographs can also be compared to observations for calibration. Real operations data and real reservoir stage data is used to calibrate the hydrographs. If the model compares closely to the actual data, you can conclude that the model is accurate and can be used to predict future operations. However, modeling is always an approximation and assumptions must be understood. Models are a tool, to which judgment must be applied.

Bret reminded the group that the method explained in the memo is only used for developing the inflow datasets, not the actual dataset used in the model. The actual dataset used in the model will be circulated to the RCG for their information. Bret told the group to consider whether they want to use routed hourly inflows with the shorter period of record versus daily inflow data in the model.

Scott's second comment submitted on the methodology memo was regarding the normalized flows graph. Bruce explained that only two consecutive years were included in the memo, which showed two years of extremes. However, he did graph all years and showed this to the group. The normalized flows show that all gages provide similar contributions, validating the use of a single alpha and a single lambda coefficient for the entire dataset. Byron asked if it would be more statistically accurate to create an individual alpha and lambda for each basin. Bret said that it would be more accurate but on such a minute level that it wouldn't make a difference in the final product. Byron said that if we could account for the subtle differences in the hydrology of contributed drainage areas, we could determine how different Carlisle is from the other basins, thus accounting for subtle geologic differences between the areas. Bret stated that the differences would not reduce the variability to a noticeable degree. Each basin has different characteristics, including some isolated storm events, regulated projects, geologic differences, and land use differences. Carlisle contributes more on a mass basis, however on a per square mile basis, it is very similar geologically to the other basins. Scott said that it doesn't matter if there are slight differences in the basins. We are trying to represent the ungaged areas by using proration, which are relatively similar. Scott said

he believes the regional coefficient is sufficient to accurately represent the ungaged areas. Scott said he doesn't believe we have the data to accurately make a coefficient for each basin.

Byron asked how the lambda for the two Enoree gages was determined. He asked if Riverdale should be considered. Bret said that the Riverdale Project is not in operation, hasn't been in operation for 10 or more years, and is so small (8 to 10 acre ft of storage) that it wouldn't have a real effect, especially since monthly data was used.

Henry asked the group if there were any further comments. The memo will be edited based on the comments submitted. The edits will be included in track changes (attached to the end of these notes) and sent to the RCG for final approval. The questions and comments received, along with answers, will be included as an appendix to the Final Inflow Dataset Methodology Memo. The proposed daily dataset will be calculated using the coefficients, and sent out to the RCG following the meeting.

The next steps include creating the reservoir routing model (HEC-Res Sim model) and the hydraulic model of the downstream reach (HEC RAS model). Data used will include the two active gages on the river, the old Richtex gage data, and data being collected for the IFIM study. Steve asked if the evaporation from the two new nuclear units will be included in the model. Bret said that evaporation losses will be deducted from the hydrology dataset by the model.

Henry reminded the RCG that at the last meeting there was discussion about future water use and future water consumption, with Duke Energy's *Broad River Water Supply Study* from 2007 specifically being referenced. Are there future water allocations that need to be considered in the model? Dick said that the numbers tend to be greatly exaggerated in these studies. We have an opportunity to test the first ten years of the Duke study now. He doesn't know if we should be worried about these numbers because he thinks they are way too high, but we can look into it. Vivianne added that these numbers may have been exaggerated so that higher water withdrawal permits can be requested in the future. Dick said that everyone pads their numbers to make sure they have enough approval to meet their needs. Scott said maybe we should consider some of the bigger water needs in the area, such as Spartanburg withdrawals or any new nuclear plants such as Lee Nuclear Station. The agencies agreed to look at the estimated numbers in the Duke study and see if they are accurate for the present.

Bret said that the reservoir model is separate from the river model and should be considered as independent. The reservoir model is designed around the following parameters: the two reservoirs transferring water back and forth, the turbines' hydraulic capacities at Parr and Fairfield, and the operation of the spillway gates. Parameters like how SCE&G operates their system will also be included. Seasonal variation in pumping and outages will also be considered.

Scenarios won't be run for another year. The models will be developed and calibrated to historical operations, but no scenarios will be run until information is gathered from other studies. Scenarios will begin to be developed in late 2015. The model demonstration is planned for early September 2014.

The meeting was adjourned. Action items stemming from this meeting are listed below.

ACTION ITEMS:

- Kleinschmidt will edit the Inflow Dataset Methodology Memo based on comments and distribute to the RCG for final approval. The memo will then be finalized with the submitted comments and questions/answers included as an appendix.
- Kleinschmidt will distribute the proposed daily dataset to the RCG.
- Kleinschmidt will complete the HEC-Res Sim model and the HEC RAS model and schedule a meeting for the model demonstration in September 2014.
- The Agencies (SCDNR and USFWS) will evaluate the estimated numbers in the Duke Broad River study and see if they are accurate for the present.

INFLOW DATASET DEVELOPMENT: STATISTICAL METHODOLOGY

PARR HYDROELECTRIC PROJECT

FERC NO. 1894

Prepared for:

South Carolina Electric & Gas Co.
Columbia, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

~~May~~ July 2014

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INFLOW DATASET DEVELOPMENT:
STATISTICAL METHODOLOGY

PARR HYDROELECTRIC PROJECT

FERC NO. 1894

1.0 PARR RESERVOIR INFLOW DATA DEVELOPMENT

1.1 INTRODUCTION

An inflow hydrology dataset is being developed in support of developing operations models and to satisfy the Final Parr Fairfield Operations Model Study Plan (Study Plan). As discussed in the Study Plan, the ~~existence~~ operation of the pumped storage development and lack of long-term operational records prevents the back-calculation of a sufficient inflow dataset. For this reason, the inflow to Parr Reservoir was calculated using upstream flow data adjusted by statistically-derived parameters. The inflow time series datasets for Parr Reservoir were developed using statistical algorithms based on flow data records from the USGS gages upstream and downstream of the Parr Dam.

The inflow dataset developed by this process will be used for two distinctly different simulation processes. The utilization of Parr Reservoir inflows for power generation by the Fairfield Pumped Storage development and the Parr Hydro development, and corresponding upper and lower reservoir fluctuations will be simulated using the USACE modeling package HEC-ResSim; this software's primary requirement is daily inflow values. The flows released from the Parr development will be used as upstream boundary conditions in the USACE model HEC-RAS, which will simulate the downstream flow and stage regimes. The HEC-RAS model requires flow values in increments of one-hour or less.

1.2 HYDROLOGIC DATA

Data used in the statistical analyses were obtained via the USGS web portal (http://waterdata.usgs.gov/nwis). The data were processed using spreadsheets and the USACE database program HEC-DSSVue. The USGS gage sites used in the analysis are listed in Table 1. Additional flow and stage data were obtained from the USGS server for use in other phases of this study, and will be fully cited and described in the applicable summary reports.

TABLE 1 USGS GAGE SITES

DATA SOURCE	USGS #	DRAINAGE AREA (SQ. MI.)	PERIOD OF RECORD	DATA TYPE
Enoree River at Whitmire	02160700	444	10-1-1973 to Current	Stage & Discharge
Enoree River near Woodruff	02160390	249	2-9-1993 to Current	Stage & Discharge
Tyger River near Delta	02160105	759	10-1-1973 to Current	Stage & Discharge
Broad River near Carlisle	02156500	2790	10-1-1938 to Current	Stage & Discharge
Broad River at Alston	02161000	4790	10-1-1896 to 12-1-1907, 10-1-1980 to Current	Stage & Discharge

1.3 PARR RESERVOIR INFLOW DATA SYNTHESIS

Prior to the statistical analyses, Kleinschmidt Associates performed a review of relevant hydrologic studies published by the USGS. These included:

- Low-Flow Frequency and Flow Duration of Selected South Carolina Streams in the Broad River Basin through 2008 (USGS Open-File Report 2010-1305);
- Magnitude and Frequency of Rural Floods in the Southeastern United States, 2006: Volume 3, South Carolina (USGS Scientific Investigations Report 2009-5156); and
- Techniques for Estimating the Magnitude and Frequency of Floods in Rural Basins of South Carolina, 1999 (Water-Resources Investigations Report 02-4140)

Although these studies included hydrologic analyses of the Parr watershed, their focus was primarily on the development of statistically-based estimates of extreme events as opposed to typical hydrology. These studies were reviewed as background information regarding the physiographic nature of the watershed, which could provide insight on the hydrologic behavior of the Broad River and its tributaries upstream and downstream of Parr Reservoir.

The synthesis of streamflow data using a proration of upstream gages typically uses a statistical regression technique based on drainage area ratios. Gages were selected for summing prorated inflows with the intention of maximizing the relevant, overlapping periods of record, as well as drainage area coverage. Periods of record that are relevant represent the current development of the waterway, which would be subsequent to the commissioning of the pumped storage project (December 1978) to current day. Three gages were selected that measure contributing flows for 84% of the project's total drainage area and compared with the corresponding period of record with the Alston gage downstream of the Parr dam[1].

In order to develop the inflow data set for Parr Reservoir, various statistical methods were assessed to determine the optimal estimate. These methods included statistical regressions to determine the weighting factors for scaling the measured upstream flows (see Figure 1) to estimate the inflow to Parr Reservoir. These methods are described in the following sections.

The statistical analyses will use monthly and annual flow data rather than daily average flows. The daily data are affected by reservoir operations, which introduce a significant degree of variability due to the cyclic transfer of up to 29,000 acre-feet between the upper and lower reservoirs. Flow releases from the project may be vastly different at any given hour from the inflows to the Parr reservoir. The monthly and annual flow data statistics are much less affected by day-to-day operations.

[1] It is worth noting that the Parr dam drainage area is 4,750 square miles compared to the slightly larger Alston gage drainage area of 4,790 square miles (about 0.8% less). However, the USGS cites the Alston gage as synonymous with reservoir outflow. No adjustment was made, as the difference is statistically insignificant.

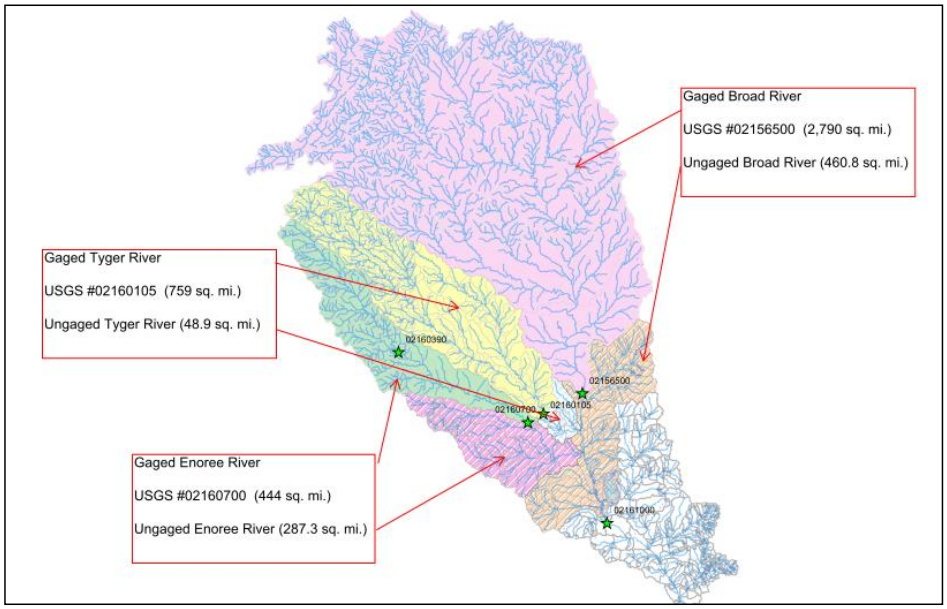
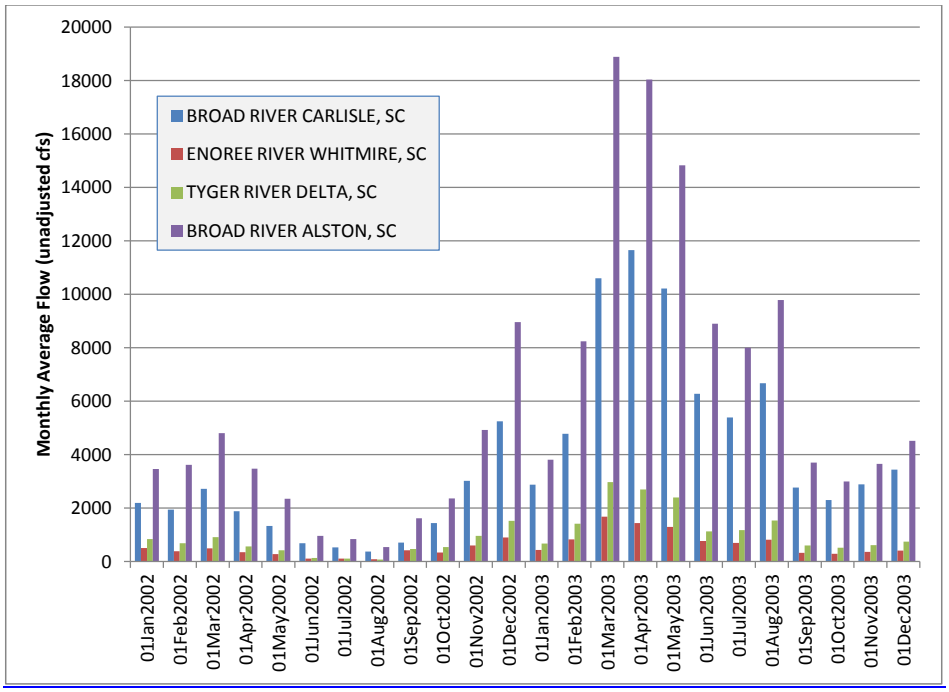


FIGURE 1 GAGED AND UNGAGED BROAD RIVER SUBWATERSHEDS

1.3.1 PRELIMINARY HYDROLOGIC REVIEW

Prior to the statistical regression analyses, a cursory review was performed to assess the hydrologic response of the subwatersheds that contribute to the Parr Reservoir inflows. The review consisted of a comparison of a sampling of monthly average flows from the upstream gages on the Broad, Tyger, and Enoree rivers to the flows at the Alston gage (see Figure 2). The purpose of the review was to determine the degree of hydrologic similarity between the three contributing subwatersheds. A high degree of hydrologic similarity indicates that the soils, topography, and land use over the entire watershed are homogeneous. The subsequent analyses, which are predicated on this assumed homogeneity, provide a basis for developing a statistical relationship between the gaged and ungaged portions of the subwatersheds.

The first comparison was the unadjusted monthly average flows from the upstream gages with the Alston gage. This comparison illustrates the relative contribution of the upstream gaged areas. For the given period, the monthly average flow at Carlisle was approximately 2/3 of the flow average at Alston.


Monthly Average Flow (unadjusted cfs)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
BROAD RIVER CARLISLE, SC
ENOREE RIVER WHITMIRE, SC
TYGER RIVER DELTA, SC
BROAD RIVER ALSTON, SC
01Jan2002
01Feb2002
01Mar2002
01Apr2002
01May2002
01Jun2002
01Jul2002
01Aug2002
01Sep2002
01Oct2002
01Nov2002
01Dec2002
01Jan2003
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01Dec2003

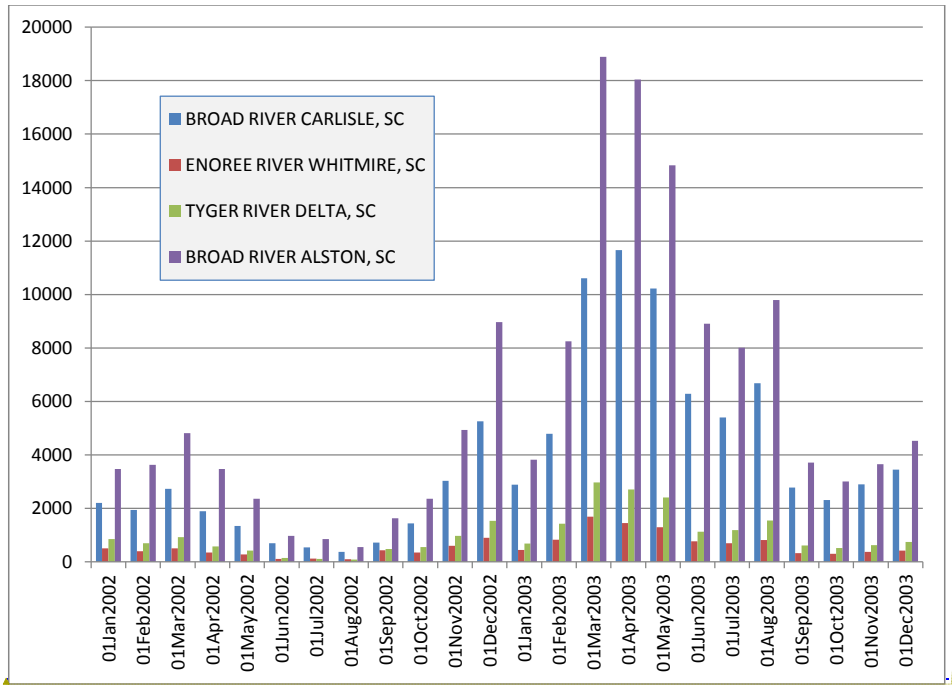

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FIGURE 2 MONTHLY AVERAGE FLOWS, UNADJUSTED

The second portion of the review was a comparison of the runoff from the gaged upstream subwatersheds. The monthly average flows from the previous step were normalized by drainage area, resulting in the average flow per 100 square miles of drainage area. This comparison was performed to determine the similarity in runoff characteristics between the three gaged areas. The comparison (see Figure 3) illustrates that the range of the monthly averages (per 100 sq. mi.) was visually close to the aggregate average through a variety of flow ranges; this indicates the hydrologic similarity of the three subbasins.

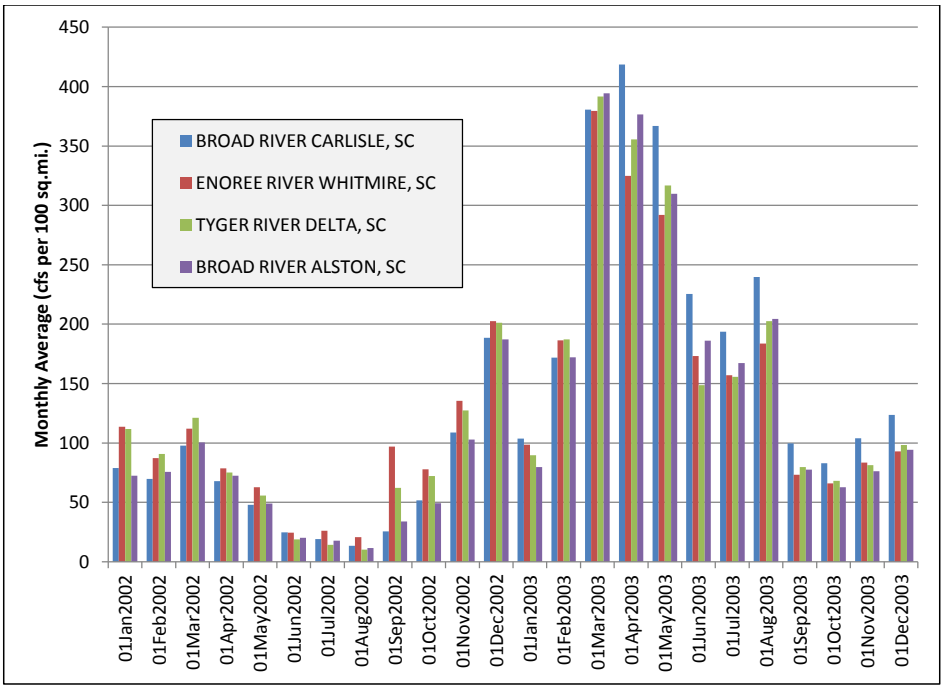


FIGURE 3 NORMALIZED MONTHLY AVERAGE FLOWS

1.3.2 MULTIVARIATE REGRESSION ANALYSIS

A multivariate regression was performed to determine the parameters of a generalized equation for estimating the inflow to Parr Reservoir. The flow estimate is based on the flows measured at three gage sites upstream of the impoundment. The two parameters include a fitted regional exponent (γ), and a fitted regional coefficient (α). The equation, shown below, is a summation of the three upstream flow values multiplied by scaling factors, which include the ratio of the total drainage area represented by each to that gage's actual drainage area.

Equation 1: $ParrInflow = \langle \alpha * BRC \left(\frac{3250.8}{2790}\right)^{\gamma} \rangle + \langle \alpha * TRD \left(\frac{807.9}{759}\right)^{\gamma} \rangle + \langle \alpha * ERW \left(\frac{731.3}{444}\right)^{\gamma} \rangle$

where,

BRC – Broad River at Carlisle
TRD – Tyger River near Delta
ERW – Enoree River at Whitmire
α – Fitted Regional Coefficient
γ – Fitted Regional Exponent

The regional exponent was developed by quantifying the relationship between monthly streamflow averages and drainage area using two unregulated stream gages on the same river with overlapping records. The only gages that meet this in the immediate Parr Dam watershed are on the Enoree River. The regional exponent was developed by performing a regression on monthly flow averages from the Woodruff gage (drainage area = 249 sq. mi.) and the Whitmire gage (drainage area = 444 sq. mi.). These two gages were selected because they have the longest overlapping (current) periods of record. The result of this regression produced the drainage area regional exponent (γ) of 0.599.

This proration exponent was used to normalize the monthly flow averages, prior to performing the second regression to develop the drainage area coefficient (α). The regression used monthly flow averages for the period 1/1/1981 through 12/31/2013, a total of 396 months. The target data used in the regression is the monthly average flow at the Alston gage, which was adjusted by adding the estimated evaporation from both the Monticello and Parr reservoirs. Evaporation

estimates were based upon monthly losses in inches[2] applied to the average surface area of both reservoirs, plus estimated increased evaporation caused by the V.C. Summer Nuclear Station thermal plume in Monticello Reservoir. This adjustment ranged in value from 37.5 cfs in January to 103.5 cfs for July.

The results of this regression, using all 396 months, produced a value of $\alpha = 1.041$, an R^2 of 0.9828, and a standard error of 495.4. The scatter plot of Alston monthly flow vs. predicted flow, including a 1:1 reference line, is shown in Figure 4. The modeling residuals were also calculated and are shown graphically in Figure 5. The modeling residual values are the difference between the target value and the predicted value. In this case, a negative modeling residual indicates that the predicted value is greater than the target value. The plot of the modeling residuals indicates that the statistical model tends to overpredict flows during months for which the average flow was less than 7,700 cfs (the y-intercept shown on Figure 5) and tends to underpredict during months with flow averages greater than 7,700 cfs.

[2] Evaporative rates from "Pan Evaporation Records for the South Carolina Area," John C. Purvis, SC State Climatology Office, with FWS evaporation taken as 75% based on Discussions in "NOAA Technical Report NWS 33: Evaporation Atlas for the 48 Contiguous States," June 1982.

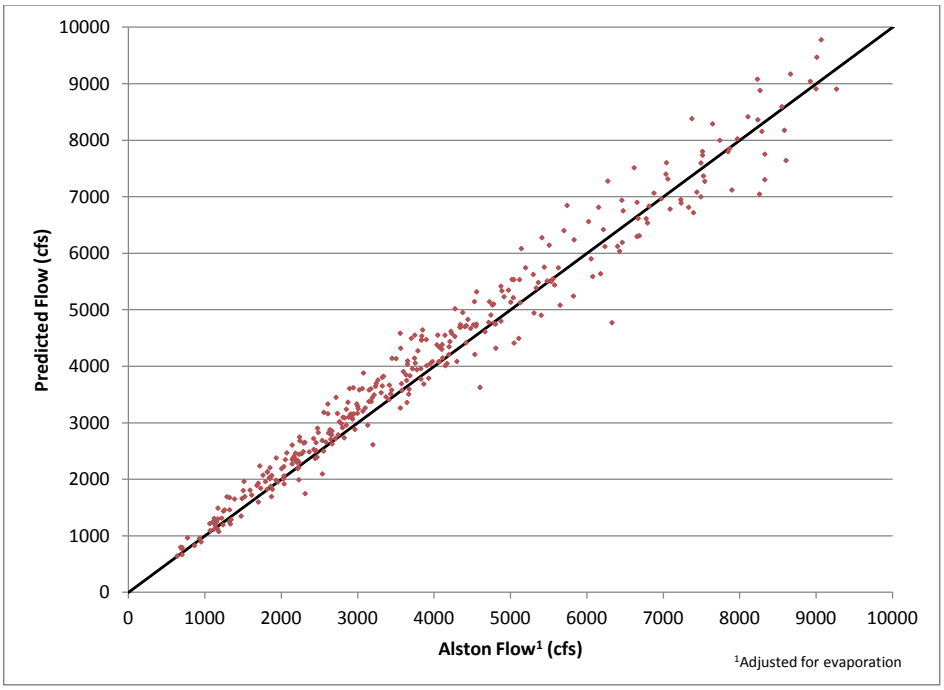


FIGURE 4 ALSTON FLOW VS. PREDICTED MONTHLY AVERAGES (33 YEARS) – REGRESSION BASED ON ALL MONTHS

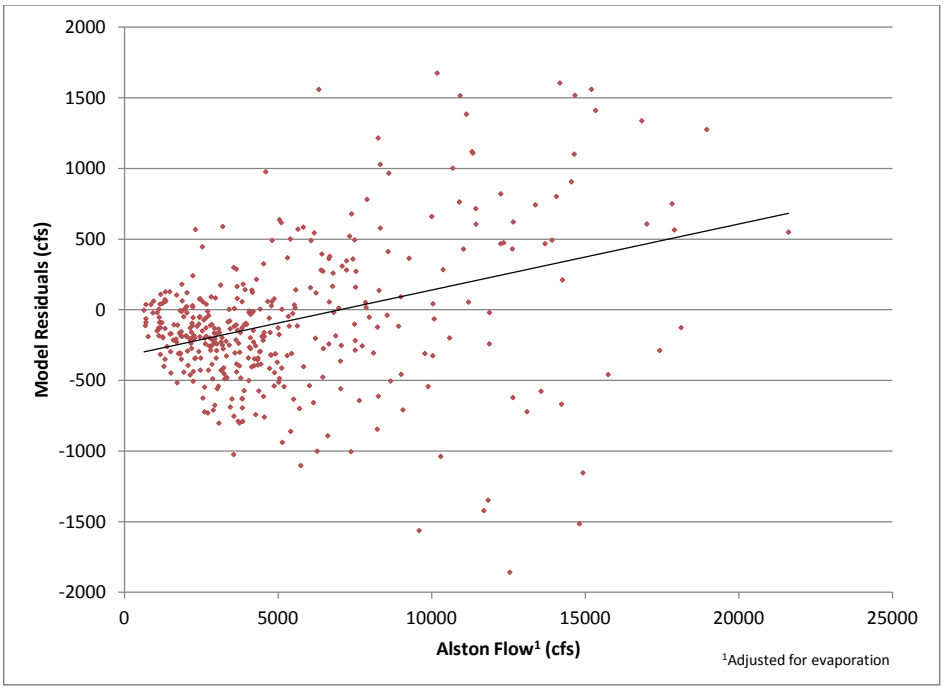


FIGURE 5 MODEL RESIDUALS – REGRESSION BASED ON CONCURRENT PERIOD OF RECORD

1.3.3 MODIFIED REGRESSION (ADJUSTED FLOW RANGE)

Due to the results of the first regression attempt, which indicated a tendency to overpredict during months with less than 7,700 cfs average flow, a second regression was developed. Because balancing the hydrologic resource is imperative during lower inflow conditions, this modified regression was performed to more accurately predict flows in the lower range. The second analysis used the lowest 75% of monthly average flows (289 out of 396 months) as a basis for the regression and then applied the resulting coefficients on the entire dataset to quantify the statistical performance.

The results of the second regression, using 289 of the 396 months, produced a value of α = 0.988, an R^2 of 0.9828, and a standard error of 469.6. Compared to the first regression, the reduced α-value did not change the R^2 value, but reduced the standard error. The most significant change was the modeling residuals. The y-intercept for the residual plot for the second regression is approximately 3,900 cfs. This indicates that the second regression has a lower statistical bias in the range of the most typical flows than the first regression. The scatter plot of Alston monthly flow vs. predicted flow is shown in Figure 6, and the modeling residuals are shown in Figure7.

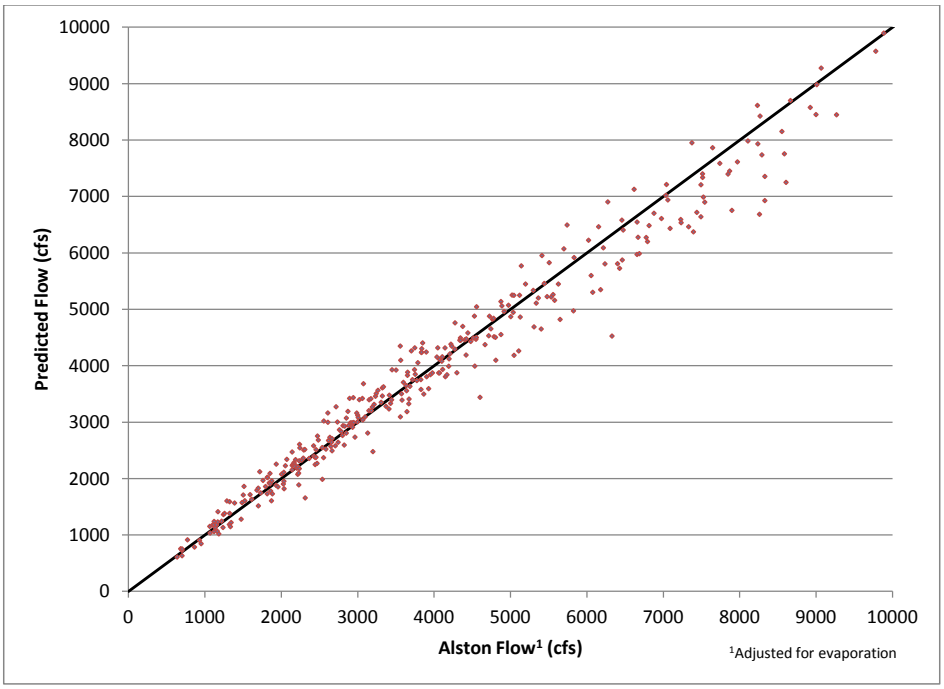


FIGURE 6 ALSTON FLOW (ADJUSTED) VS. PREDICTED MONTHLY AVERAGES (33 YEARS) - REGRESSION BASED ON DRIEST 75% MONTHS

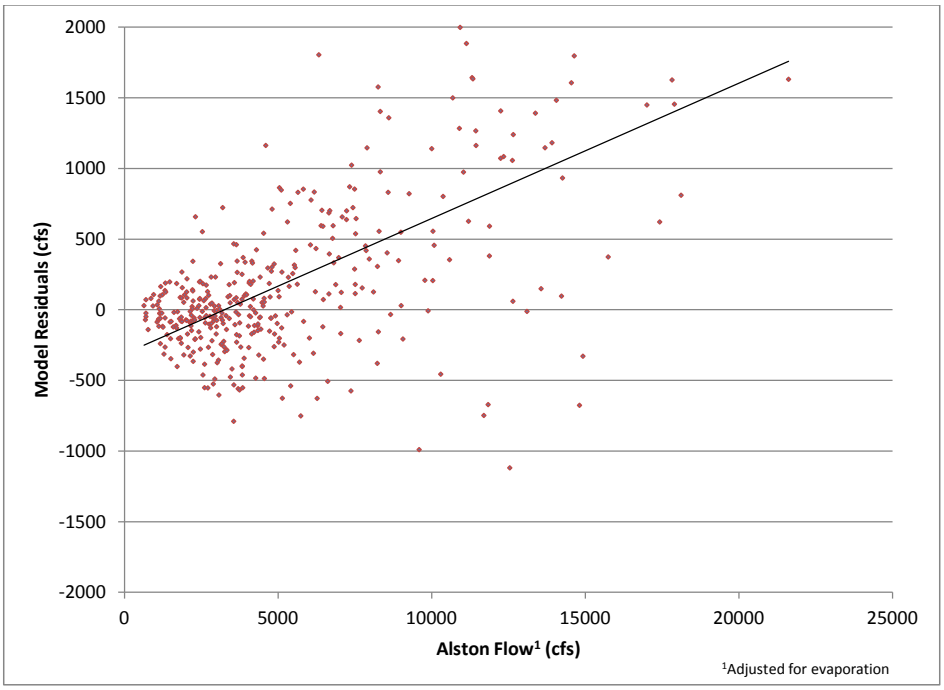


FIGURE 7 MODEL RESIDUALS - REGRESSION BASED ON 75% LOWEST FLOW AVERAGE MONTHS

1.3.4 MODEL VERIFICATION

The verification of the model results was performed by comparing the predicted flows vs. the target flows for three year periods, including statistically wet and dry periods (see Figures 8 and 9). The dry period was from January 2006 to December 2008, inclusive. The wet period was from January 1993 to December 1995, inclusive. These periods were selected on the basis of the average flow of the three years and of the 33-year period for which there was a complete flow dataset for the gages, which spanned January 1981 to December 2013.

These comparisons indicate that the estimated values have a slight overprediction bias during prolonged low-flow periods. During higher flow periods, such as 1993 - 1995, there is very little bias on the lower flows and a slight underprediction bias on the higher flows.

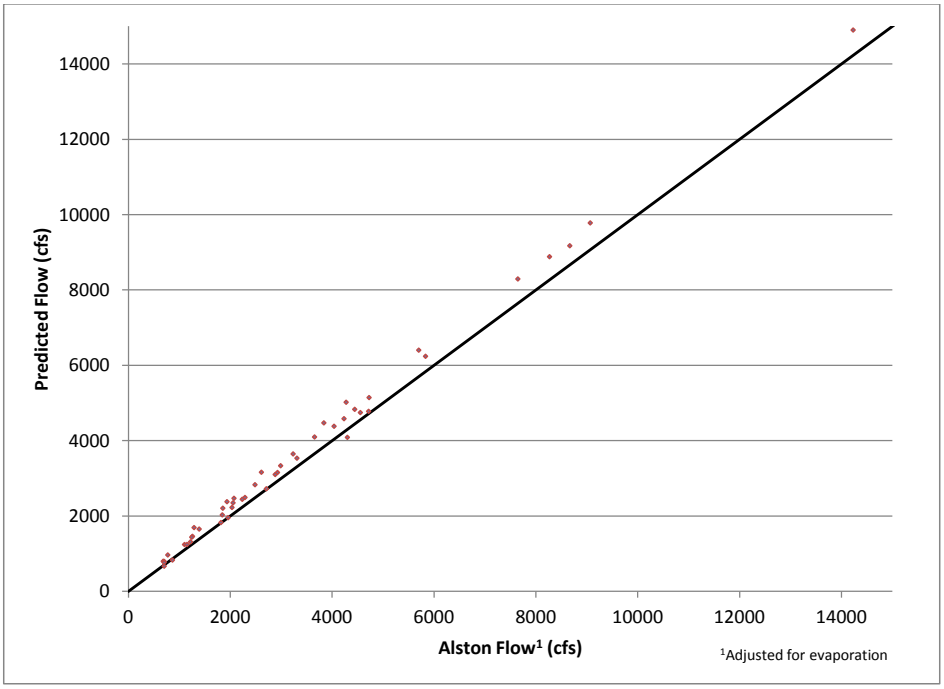


FIGURE 8 ALSTON FLOW (ADJUSTED) VS. PREDICTED MONTHLY AVERAGES (DRY 3-YEAR PERIOD) - REGRESSION BASED ON DRIEST 75% MONTHS

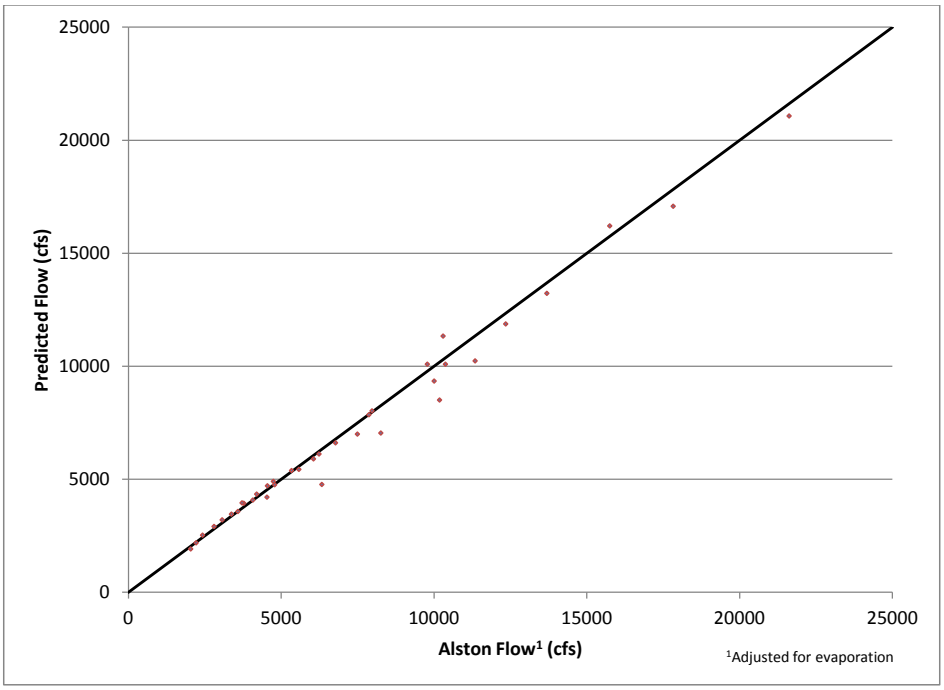


FIGURE 9 ALSTON FLOW (ADJUSTED) VS. PREDICTED MONTHLY AVERAGES (WET 3-YEAR PERIOD) - REGRESSION BASED ON DRIEST 75% MONTHS

1.4 SUMMARY

Two statistical regressions were performed to develop the coefficients used in Equation 1 (see Section 1.3.2). The first regression, using all of the monthly flow averages, resulted in a trend of negative modeling residuals (overprediction) for months with flow averages less than 7,700 cfs. A subsequent regression, using monthly flow averages less than 6,000 cfs (approximately 75% of the data values) produced a better balance between negative and positive modeling residuals. This regression performed statistically better in the range of the most frequent values of monthly average flows, with flows nearest 3,900 cfs predicted most accurately. As this lower flow range is of greater importance than the entire historic range for balancing the hydrologic resource, the coefficient and exponent determined through the second regression are preferred for the development of the inflow dataset (see Table 2).

TABLE 2 STATISTICAL MODEL RESULTS SUMMARY

MODEL NAME	REGRESSION DATASET OF ALL MONTHLY AVERAGES (396 VALUES)	REGRESSION DATASET OF LOWEST 75% MONTHLY AVERAGES (289 VALUES)
α – Coefficient	1.041	0.988
γ – Exponent	0.599	0.599
Standard Error	495.0	469.6
R^2	0.9828	0.9828

Scott Harder

Hydrologist, LWC Division, SCDNR

5/30/14

Comments regarding Kleinschmidt's "Inflow Dataset Development: Statistical Methodology" for the Parr Hydroelectric project (FERC No. 1894).

1. The methodology pertaining to how the monthly statistical analysis will used to develop daily (or hourly) Parr inflow dataset needs to be clarified in the report. Also, will time of travel be factored in when moving to a daily or hourly time step?

We propose to edit the report during the meeting so the clarifications are agreed to and understood by the RCG. Preliminary clarification follows: The statistical analyses were performed on data points that were monthly average flow values for each of the gages, for the common gaged periods of record (1981 – 2013). The regional coefficients derived from these analyses will be applied to recorded data for each of the three upstream gages. The resulting sum of these inflows will serve as the dataset input to the HEC reservoir and downstream river models. The reservoir and downstream models will use hourly (or longer) time steps for evaluating operations. The downstream river model will include travel time on an hourly basis.

Hourly inflows can use mean daily data as a substitution, or they can be calculated from hourly gage data. If done on an hourly basis, the flows will be routed from the upstream gages using one of several routing algorithms (such as Muskingum, Muskingum-Cunge and Modified Puls), the selection of which will be based on the stream hydraulics. The routing of hourly data would include travel time, whereas mean daily data would not be adjusted for travel time because the gages are only hours away from the project.

Hourly inflows are not expected to have noticeable affects on the project model runs due to the magnitude of the usable storage, except during high inflow hydrographs. The RCG should consider the benefit of developing hourly inflow data versus capturing a longer period of record with daily data. If the daily data is used, hourly model runs will assume the mean daily inflow is occurring for that 24-hour period. If the hourly data is used, the gages are limited to October 1, 1987; daily data is available back to October 1, 1980 (although monthly values used to determine the regional coefficients were truncated for complete calendar years, 1981-2013).

2. Regarding the technique to compare the hydrologic similarity between the three gages area (Tyger, Enoree and Broad in section 1.3.1:

a. Only two years were used for comparison (2002 and 2003) in Figure 3. Was there an attempt to include more years? These two years represent extremes, or close to it, for dry and wet years back to back and the comparison would be more robust if it included more normal periods as well or if a comparison was made for a longer period of time (see below also).

The comparison of normalized flows for evaluating hydrologic similarity was performed using the monthly average flows for the period 1/1/1981 to 12/31/2013, a thirty-two year period. Only two years were charted for the document for visibility, selected to illustrate consistent gaged contributions across a

range of hydrologic conditions: extreme drought conditions during the summer of 2002, and high inflows the following spring. We can present additional years for comparison, and propose to include them in appendices. Our conclusions apply to the entire period of record and range of flows.

The statistical regressions were performed using several variations of inflow subsets including the entire 32-year period, as well as using an abridged dataset that included only the lowest 75% of the flow values. The abridged version used an equivalent of 24 years of monthly average flows.

b. Please rewrite or elaborate on the following statement at the end of page 6: "The comparison (see Figure 3) illustrates that the range of the monthly averages (per 100 sq. mi.) was visually close to the aggregate average through a variety of flow ranges; this indicates the hydrologic similarity of the three subbasins." Please consider summarizing the point you are trying to make here quantitatively in a table and not just visually from a plot. In Figure 3, normalized monthly average runoff is consistently higher for the Broad basin in 2003 than for the Tyger and Enoree, which maybe isn't surprising given that the Broad is a much larger basin that extends up into the North Carolina mountains. It would be instructive to see if this was observed for other years besides 2003 (my own preliminary analysis shows that it does). The higher runoff suggests that the assumption of homogeneity for the gaged portion of Broad basin (as a whole) at Carlisle as compared to the Enoree and Tyger basins may not be valid. As a result, it may be problematic to use the Broad River gage at Carlisle to develop a regional coefficient. However, I think that the assumption that the *ungaged* parts of the three basins (Tyger, Enoree, and Broad) are very nearly homogeneous is likely valid, but the question remains on how to best account for the additional flow from these ungaged areas (but see 4 below).

Visual examination of the normalized flows was done to check for consistent, significant discrepancies between gaged areas under a range of hydrologic conditions. The comparison of any single normalized gage with the aggregate average was visibly within the same order of magnitude for all months across a large range of inflow conditions, and was the basis for concluding the similarity. The Carlisle gage does appear to contribute more flow more often, but to a nominal degree compared to the aggregate. In the interest of simplicity, consistent regional coefficients were used for the analysis.

The desired end product is a dataset that consists of six time series of flow data, three of which are USGS flow records measured at the gage sites for the three rivers, and the other three time series are estimates of ungaged flows from the three rivers. Several statistical models were evaluated in an attempt to determine the most effective regression, using statistical metrics such as r-square and standard error values. The selected statistical model produced r-squared values above 95%, suggesting a strong correlation using consistent fitted regional coefficients.

Although not documented in the report, the initial screening of statistical models included many variations of regressions that were attempted in order to determine if the ungaged flows appeared to be more similar to one or two of the upstream gages as opposed to all three. A regression model was evaluated, using 1) all data, 2) three consecutive dry years, and 3) three consecutive wet years. This regression model included alpha values for each of the streamgages. The statistical regression results indicated that the ungaged flows were more similar to the Tyger River than the Broad or Enoree, but the relationship shifted between wet and dry periods. The statistical model used in this initial screening was dropped from consideration and not documented in the report.

3. In section 1.3.2, please make sure that the x and y axes scales are set to display all data points in Figures 4 and 5. For example, in figure 4, average flows at Alston extend well beyond 10,000 cfs for some months, but the maximum flow is cutoff somewhere between 9000-9500 cfs.

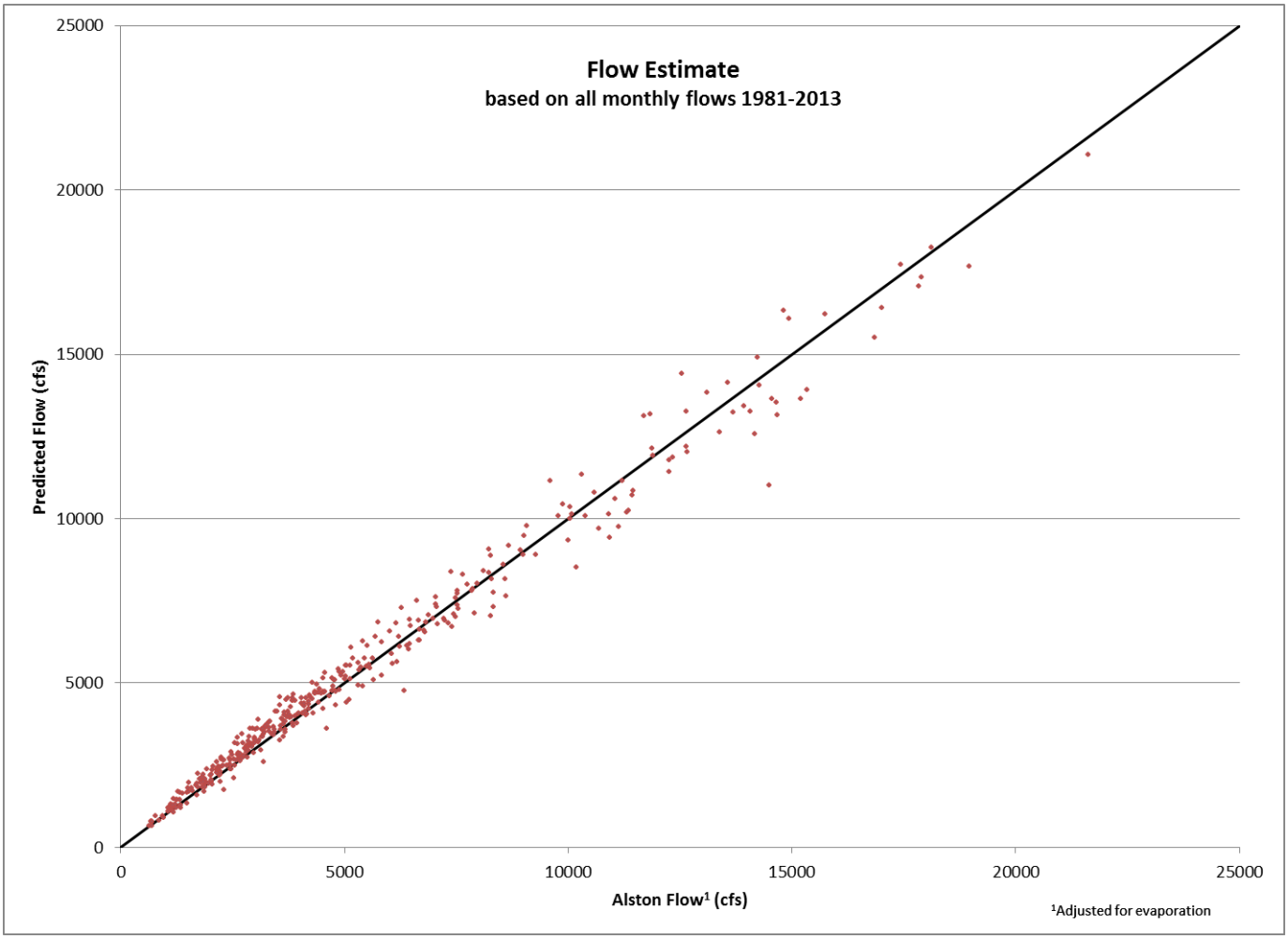


FIGURE 1 (EXPANDED) ALSTON FLOW VS. PREDICTED MONTHLY AVERAGES (33 YEARS) – REGRESSION BASED ON ALL MONTHS

4. I initially had some strong reservations with applying a regression using monthly average flows at the Alston gage as a driver for computing daily inflows to Parr. Part of the reason (maybe the whole reason) for using an alternative method for estimating daily inflow is that the straight area proration method likely overestimates daily inflow during low inflow periods. I at first was not convinced that the method presented here would provide the best estimate of low flows on daily to weekly time scales due to the reliance on statistics from monthly averages which tends to smooth out the daily variations. After comparing hydrographs for several low flow years (2002, 2007, etc.) using the method presented in this report with a hydrograph developed using the area proration method (and with a hydrograph using just the sum of the 3 gages) the resulting daily inflow dataset seems reasonable (and thus, the concern over

homogeneity above may not be an issue) for low to moderate flows. I did not look at high flows in detail since I am not too concerned at that end.

Daily data evaluation for the development of the regional coefficients is a noted concern due to the potential short-term mass balance impacts associated with the significant usable storage. Even under low flow conditions, a mass balance approach for determining the regional coefficients should have good correlation. Using the entire range of flows for developing the regional coefficients has more effect on the accuracy at the upper and lower ends, as prorating coefficients are widely acknowledged to vary with flows. Observation of the initial regression results, with coefficients derived using the entire range of flows, indicated a tendency for the model to over-predict lower flows. This inflection was noted in section 1.3.2 to be around 7,700 cfs, above which the model tended to under-predict flows. Concern for low-end accuracy led to the regression based upon flows at or below the Parr Hydro capacity, which was approximately 75% of the inflow months. This reduced the tendency of the model to over-predict lower flows, at the expense of higher flow predicted accuracy.

5. As has been suggested by others, a meeting is probably necessary to further discuss and clarify the inflow methodology.

Responses to Byron Hamstead, USFWS Fish and Wildlife Biologist

Email:

Hi Kelly,

Please see attached for the USFWS's comments/questions in track changes regarding the Parr inflow dataset statistical methodology.

Thank you,

Byron

Requested edit: "As discussed in the Study Plan, the ~~existence~~ operation of the pumped storage development and lack of long-term operational records prevents the back-calculation of a sufficient inflow dataset." [Replace existence with operation].

Answer: Agreed, edit incorporated.

Comment: *Y axis label = unadjusted Q* (regarding the Figure 2 Monthly Average Flows column chart)

Answer: Agreed, Label Added to Chart in final version.

Comment:

"The comparison (see Figure 3) illustrates that the range of the monthly averages (per 100 sq. mi.) was visually close to the aggregate average through a variety of flow ranges; this indicates the hydrologic similarity of the three subbasins."

BH: Is there a benefit of normalizing discharge by 100 sq. mi. versus normalizing by 1 sq. mi.?

Answer: The scale for normalizing was selected to match the order of magnitude of the contributing (smallest) drainage area. Examining the three gages on a cfs per unit square mile would not change the results or the relative contribution of any gage area, but only the scale. The lower flows would change from around 10 cfs/100 square miles to 0.1 cfs/square mile, while the higher 420 cfs/100 square miles would reduce to 4.2 cfs/square mile.

BH: I think it is necessary to quantify statistical differences between gages in terms of Q/square mile since subbasin hydrologic homogeneity is an important assumption included in the model. Accounting for these differences might further reduce the variance in the model, making it more accurate at lower flows.

Answer: Visual examination of the normalized flows was done to check for consistent, significant discrepancies between gaged areas under a range of hydrologic conditions. The comparison of any single normalized gage with the aggregate average was visibly within the same order of magnitude for all months across a large range of inflow conditions, and was the basis for concluding the similarity. While any given month may show one gaged area has a

noticeably higher contribution, no general trend indicates a consistent bias across the range of hydrologic conditions. Significant differences in runoff characteristics would be indicated by one or more normalized areas consistently contributing more or less than the aggregate average. In the absence of significant consistent contribution by any single gage, consistent fitted regional coefficients (alpha and lambda) were selected for all three gaged areas. Variances observed for individual months, where one gaged area contributes more or less than others, is attributable to precipitation that was inconsistent for the entire drainage area, rather than differences in runoff characteristics.

BH: Was this the sole period of record [referring to Figure 3, Normalized Monthly Average Flows, which shows 2002 – 2003 calendar years] used to infer similarity of runoff characteristics among subwatersheds? According to table 1 there are overlapping discharge data for all of these gages since 1973.

There appear to be potentially significant differences in mean monthly discharge between gages even when the data is normalized by drainage area.

Answer: The period of record used to infer similarity was 1981 – 2013, the longest concurrent period for the four gages available (in complete calendar years); the Alston Gage period of record has a gap in the dataset from 1907 through 1980. We will correct the current period or record in Table 1 in the final version. Only two years were charted for the document for visibility, selected to illustrate consistent gaged contributions across a range of hydrologic conditions: extreme drought conditions during the summer of 2002, and high inflows the following spring.

Comment:

"These two gages [Woodruff and Whitmire gages on the Enoree River] were selected because they have the longest overlapping (current) periods of record."

BH: What is the period of record for discharge here?

The proposed Riverdale Project (formerly Inman Mills) was licensed in 1982, but became inoperable 12-years ago. Since this calculation assumes that the hydrologic characteristics of the Enoree River apply throughout the Broad River subwatershed, I want to make sure that the regional exponent/model is not confounded by a period of record that includes river regulation activity.

Answer: The overlapping period of record for the Whitmire and Woodruff gages is indicated in Table 1 as 2-9-1993 to present, limited by the Woodruff gage. The use of monthly flow averages to establish the pro-rating coefficient would eliminate any effects of short-term regulation upstream of the Parr dam. FERC documentation (correspondence from project licensee) indicates the Riverdale project has not operated since August 2001.

With respect to daily average flows that will be prorated to create the dataset, the project has insignificant storage and re-regulating capacity with respect to the Parr Reservoir (9 acre pond with a gross storage of 22 gross acre-feet, compared to 4,400 acres and 32,000 acre-feet).

Comment:

TABLE 1 STATISTICAL MODEL RESULTS SUMMARY

MODEL NAME	REGRESSION DATASET OF ALL MONTHLY AVERAGES (396 VALUES)	REGRESSION DATASET OF LOWEST 75% MONTHLY AVERAGES (289 VALUES)
α – Coefficient	1.041	0.988
γ – Exponent	0.599	0.599
Standard Error	495.0	469.6
R^2	0.9828	0.9828

BH: The standard error [469.6] for this model may be too high considering that annual daily flows are often below 3,000, and approach 2,000 cfs in late Summer/ early Fall.

Figure 6 shows a few stray data points that may be driving up SE. Were any statistical outliers omitted from analysis?

Answer:

The Standard Error represents the standard deviation across the entire range of flows. The Standard Error on the left and right columns are based on the associated regional coefficient and exponent, which were established according to the conditions of the headings (all flows vs. lower 75% flows, approximately 6,000 cfs limit). The Standard Error for only low-flow scenarios would have lower values. The Standard Error calculated for flows up to 6,000 cfs is 321 for the left column, and 304 for the right column. The Relative Standard Error of the entire dataset more accurately explains the error versus the total range of flows. For both regressions, the RSE is calculated at 9.3%.

No statistical outliers were omitted from the analysis, as the good correlation between the predicted and measured flows across the range of data did not suggest that data points needed eliminated.

Responses to Gerrit Jobsis, American Rivers Sr. Director:

Email:

Kelly,

Please find attached American Rivers comments on the inflow data plan. It is intended to support the Final Parr Fairfield Operations Model Study Plan. That study plan says "The goal of this task is to create the best available historic inflow series, which will form the input to the operations models, energy models, and habit and recreational studies." As my comments in the document state, I do not agree that this inflow data set will be usable to evaluate the effects of project operations on habitat and recreation. Project operations via inflow alterations and reservoir fluctuations affect habitat and recreation values

on a real time basis (hourly or less) that cannot be estimated using monthly average inflow estimates. Smoothing the data with regression equations removes the hourly and sub-hourly variation that is essential to understanding project effects.

I received USFWS comments which also raise some important questions. It would useful to convene a call among those interested to answer some of the questions raised in our respective comments.

Gerrit

Answer:

The inflow dataset is a model input that is independent of the project operations. This effort is to determine accurate coefficients for prorating the gaged inflows for summing the total dataset. They are being determined on a monthly basis because mass balance between the upstream gages and the Alston gage can be significantly affected by project operations. Daily analysis could be performed, but would introduce a significant level of inaccuracy in determining the coefficients. The inflow dataset will be developed as mean daily flows, using the coefficients determined through the mass balance effort. Hourly inflows are proposed to be the same as daily average, as the travel time between gages under varying flows would introduce high potential for inaccuracy. The model outputs will evaluate the hourly and daily impacts on the areas within the PBL and the reach downstream of the Parr Shoals dam.

Comment:

"The statistical analyses will use monthly and annual flow data rather than daily average flows."

GJ: I don't agree with this for evaluating a project effects on stream flow (inflow versus outflow) and reservoir fluctuations. Project effects occur on an hourly or shorter time frame. Analysis of project effects should be done similarly. The issue for habitat and recreation is not how Parr/Fairfield affects monthly or annually, but within the day and hour.

Answer:

Project effects will be evaluated via modeling efforts on time steps of an hourly basis, in addition to any longer periods requested.

Comment:

"Flow releases from the project may be vastly different at any given hour from the inflows to the Parr reservoir."

GJ: This is exactly what we need to understand

Answer:

This statement is alluding to the inherent error associated with calibrating the inflows with the Alston gage on a daily basis, due to the storage of the project. The model will facilitate the

understanding of these releases. The inflow dataset will not be affected by project operations, but is an independent input.

Comment:

" A multivariate regression was performed to determine the parameters of a generalized equation for estimating the inflow to Parr Reservoir."

GJ: Again, this may be good for the operations models and energy models but I don't understand how this will help answer the question of how the project affects streamflow and reservoir fluctuations. Smoothing things out with a regression takes away the variability of inflow that is essential to understanding project effects on habitat and recreation.

Answer:

This regression is performed only to determine the regional prorating coefficients. Project effects on streamflow and fluctuations are addressed in the Res and RAS models. The regression is not intended to smooth out the extreme high and low flows, but rather best establish the prorating coefficients to most accurately represent the inflow. Inflows will still be highly variable, based on mean daily records.

Comment on graph:

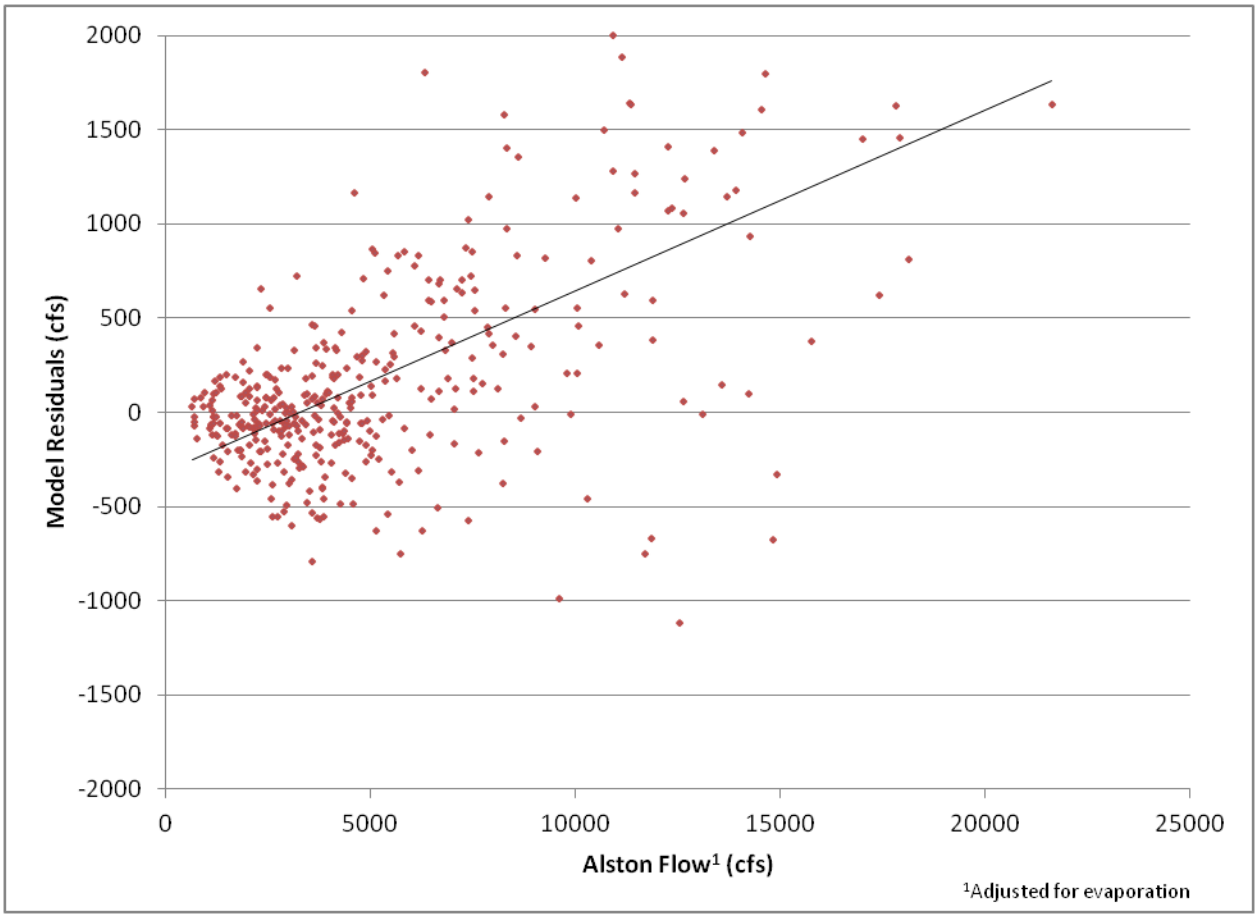
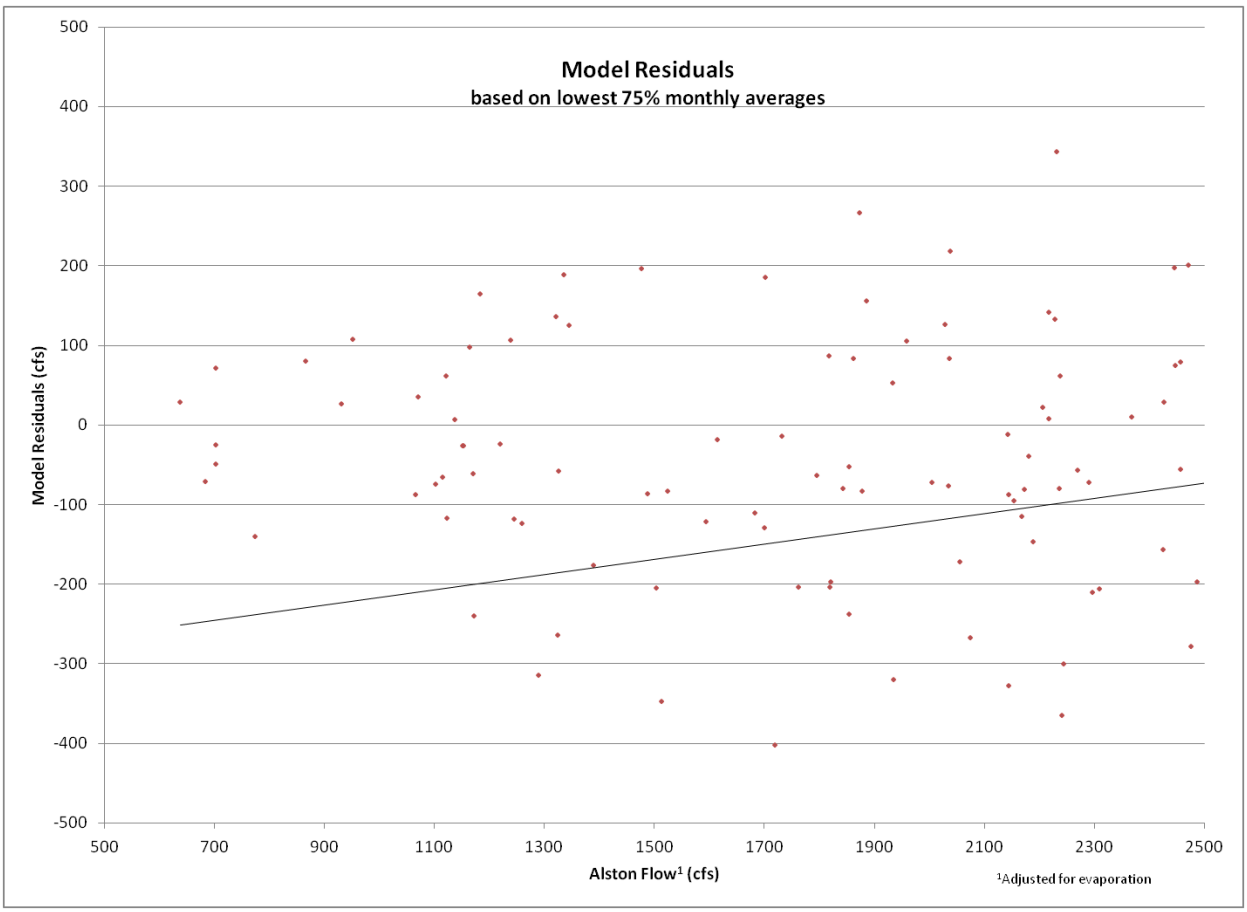


FIGURE 1 MODEL RESIDUALS - REGRESSION BASED ON 75% LOWEST FLOW AVERAGE MONTHS

GJ: Poor fit at lower end of flow range affects the reliability of the model

Answer:

The residuals diminish in magnitude as flows decrease, are appear evenly distributed about the zero value. While the inflow dataset will have calculated values both higher and lower than the Alston readings, no significant bias is evident under low flow conditions. A closer examination of the low-end flows can be made with the graph below, scaled to flows below 2500 cfs. (The trendline is a linear average across all flows for the 75% lower inflow months, and does not represent the trend of the lower flow residuals alone.)



Comment:

TABLE 2 STATISTICAL MODEL RESULTS SUMMARY

MODEL NAME	REGRESSION DATASET OF ALL MONTHLY AVERAGES (396 VALUES)	REGRESSION DATASET OF LOWEST 75% MONTHLY AVERAGES (289 VALUES)
α – Coefficient	1.041	0.988
γ – Exponent	0.599	0.599
Standard Error	495.0	469.6
R^2	0.9828	0.9828

GJ: This [referring to the 469.6 standard error value] seems significantly high when evaluating low flow periods and could represent 20% to 25% of the average flow

Answer:

The Standard Error represents the standard deviation across the entire range of monthly average flows (up to 20,000 cfs). The Standard Error on the left and right columns are based on the associated regional coefficient and exponent, which were established according to the conditions of the headings (all flows vs. lower 75% flows, approximately 6,000 cfs limit). The Standard Error calculated for low-flow conditions has lower values. For example, the calculated Standard Error for the two columns limited to flows up to 6,000 cfs are 320 and 304 (left and right respectively). For flows up to 2,000 cfs, they are 155 and 147. If considered from a percentage perspective, as the Relative Standard Error, it would more accurately explain the error versus the total range of flows. For both regressions, the RSE is calculated at 9.3%.

Response to Pace Wilber, NOAA National Marine Fisheries Service Atlantic Branch Supervisor

Hi Kelly. I agree with the comments from FWS and American Rivers that short-term variation important for assessing project effects on fishes and riverine habitat may be masked by using monthly average flows as model inputs. I also agree there are much better ways to judge the similarity of flows between subwatersheds than "eyeballing" the histograms in figures 2 and 3. A correlation matrix may be a more rigorous way to make the comparisons. Pace

Answer: Short-term variation will still be performed using daily mean inflows. Monthly average flows are only being used to determine regional pro-rating coefficients for daily inflow calculations, due to the mass balance errors associated with daily operations.

Visual examination of the normalized flows was done to check for consistent, significant discrepancies between gaged areas under a range of hydrologic conditions. The comparison of any single normalized gage with the aggregate average was visibly within the same order of magnitude for all months across a large range of inflow conditions, and was the basis for concluding the similarity. Due to the good overall correlation, it is unlikely that altering one set of regional coefficients to more accurately represent the contributing ungaged area will offer significant improvement to the model. Lower homogeneity in runoff characteristics may be inferred from metrics when the contributing factor is actual weather event(s) specific to a single subbasin within a given month.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Operations RCG Meeting

September 17, 2014

Final KDM 10-30-14

ATTENDEES:

Dick Christie (SCDNR)
Scott Harder (SCDNR)
Steve Summer (SCANA)
Henry Mealing (Kleinschmidt)
Bret Hoffman (Kleinschmidt)
Randy Mahan (SCANA)
Bill Argentieri (SCE&G)
Ray Ammarell (SCE&G)
Kelly Miller (Kleinschmidt)
Byron Hamstead (USFWS)
Bruce Halverson (Kleinschmidt)
Amy Bresnahan (SCE&G)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry gave a brief overview on the purpose of the meeting and then turned the floor over to Bret. Bret gave a PowerPoint presentation on the Operations Model, including the three different components; the river routing model (HEC-RAS); the reservoir routing model (HEC-ResSim); and the model database (HEC-DSS). The presentation is attached to the end of these notes.

Byron asked if the HEC-DSS was used to manipulate variables of the HEC-RAS and HEC-ResSim. Bret said that changes are made in the rules of these two programs, but the HEC-DSS allows the user to see how those changes affected the model output. Datasets, such as the input and results datasets, are easily stored in HEC-DSS versus Excel spreadsheets.

Bret then discussed the HEC-RAS model and the SCDNR terrain data that was used. Bret explained that the LiDAR data doesn't show what is going on beneath the water, so Bruce developed an approximate equivalent trapezoid underneath the water level that is large enough to pass the flows for that particular day. The IFIM study will give better definition of the bathymetry at specific transects along the Broad River.

Scott asked how the HEC-RAS applies to the IFIM study. Bret said that the IFIM is targeting habitat qualities and the amount of water and flow needed to support a particular species. Henry explained that low flows are examined in the IFIM study to determine how minimum flows affect the quality and amount of fish habitat available at adjustment range of flows.

Scott asked if there was a point identified downstream that could cause a problem during high flows. Ray said that there is an area of private property downstream that could be inundated during high flows. Ray also mentioned that the current license does not allow the Project to add to a flood event.

Scott asked if the HEC-RAS model was a tool that SCE&G wanted to use, or was it requested by the agencies. Ray explained that it is important for studying wave attenuation, navigation, etc downstream of Parr Shoals Dam. Also, stakeholders expressed interest in determining how fluctuations might be affecting the downstream reach, including striped bass spawning in the river.

Bruce then began the demonstration of the HEC-ResSim model. Scott asked if the model was set up to use the maximum amount of fluctuation. Ray said that the model currently represents the full capability of the Project, even if it isn't used to the maximum every day. Ray said that in the future the Project will be used to its full capacity more often. The group disagreed as to whether the "baseline" model should be set up to demonstrate how the Project is currently being utilized or to demonstrate the full capabilities of the Project. Ray said that every day the Project is operated differently based on conditions, so the "baseline" model should demonstrate full operational abilities. Dick said that baseline seems to him to be current or daily operating conditions, which typically does not include full fluctuation potential. A scenario can then be created to demonstrate the full capabilities of the Project.

Bruce said that a scenario can be created to show what has happened in the past, but the model must be developed first to include the full operating range of the Project. Once the full range has been accounted for, the model operator can hone in on specific daily variations.

Scott said that while it is impossible to recreate the past in the model, there needs to be a check completed to demonstrate that the model is accurate. Ray said that there is a lot more that goes into operating the Project on a daily basis than just the if/then constraints that Bruce used to create the model. If the generation (MWH) for a particular day is entered into the model, it should yield reservoir levels and flows that were recorded for that day by the USGS. The group then discussed running a load curve. Ray said that if the group decides on a representative load curve for the Project, the MWH demands can be entered into the model. Flows that the model produces can be compared to the inflow and downstream flow recorded by USGS for that time period. This is one way to check the accuracy of the model.

Ray noted that it is important to ensure the Project works in the future with the addition of the new nuclear units. This is why it is important to make sure the model will mimic a load curve. Bruce and Ray will identify a two week period when all data needed to perform a load curve check is available. This information will be included in an appendix to the Operations Model Report.

Scott asked how the nuclear units will affect the operation of the Project and downstream flows, and if this is accounted for in the model. Scott said it was the DNR's understanding that when there is less water in the system, due to low inflow, withdrawals from the new nuclear units would be removed from the 29,000 acre-feet of usable storage and Monticello would reach the low pool limit quicker.

Currently the existing nuclear unit evaporation is deducted from inflows for minimum flow release requirements. Bruce created a flow diversion in the model that accounts for this. However, the two new nuclear units are permitted withdrawals and not deducted from inflows for minimum flow requirements. The current model does not include future diversions. Bruce will update the model with a placeholder for future diversions.

The group agreed that the model needs to include license constraints. The group also agreed that it would be helpful if the RCG members would create a list of issues that will be examined during relicensing, such as spring spawning flows, reservoir constrictions, recreation flows, and continuous minimum flows. These would be provided to Bruce so that he can develop an Output Format that will interpret model outputs into to more easily understandable results.

During the discussion of the HEC-ResSim model, Scott asked that a glossary be added to the Operations Model Report for datasets of primary interest. Bruce then demonstrated the HEC-RAS model to the group.

Following the meeting, Scott submitted a list of comments regarding the Operations Modeling System and the Operations Model Report. These comments are appended to the end of these notes.

ACTION ITEMS:

- Bruce will refine the HEC-ResSim model to remove diversions for withdrawals associated with the new nuclear units.
- Bruce will add a glossary to Operations Model Report for datasets of primary interest.
- RCG members will provide a list of possible scenarios to be run in the future. These scenarios should cover a range of issues that the RCG anticipate could arise.
    - Examples:
        - continuous min-flow of XXX,
        - spawning flow of XXX cfs during (Feb – April),
        - recreation flow on the weekends of XXX for 6 hours (10am-4pm) during June – Oct

Scott Harder

Hydrologist, SCDNR

9/18/14

Re: Comments on the Parr-Fairfield Operations Modeling System report and the 9/17/14 Model demonstration meeting.

1. A "baseline scenario" should be developed that uses a monthly or seasonal load shape curve that approximates historic or current generation patterns. The baseline scenario would also not include the two new nuclear units at VC Summer.

2. A methodology for model verification needs to be developed to show that the model is approximating reality or current operations (for baseline scenario). One approach is to look for time periods (weeks to months) where there were few to no complicating operational considerations and compare model outflows with data from the Alston gage. Another approach is to perform some tests on mass conservation over longer periods of times (years) to ensure that the model is not losing or gaining (unlikely) water over time and serve as a check on evaporation estimates. I would recommend attempting both approaches but certainly welcome other suggestions as well. A section should be added to the "Parr-Fairfield Operations Modeling System" report on model verification.

3. From previous discussions associated with the nuclear licensing of the two new units at VC Summer, my understanding was that the evaporative losses from these units would not be subtracted from the inflow to determine outflow during low flow conditions. Instead, the volume of water pumped between Monticello and Parr would be reduced during these low flow periods. In other words, the operation of the new units would have little to no impact on downstream flows during low flow periods. The version of the model introduced at the meeting on 9/17/14 should be modified to reflect this rule. Future scenarios should generally reflect this rule unless a scenario(s) is proposed that specifically addresses the rule.

PARR-FAIRFIELD
OPERATIONS MODELING SYSTEM

BRET HOFFMAN, PE

BRUCE HALVERSON, PE

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Kleinschmidt

Introduction

- FERC Licensing of Parr Hydroelectric Project
- Operations Resource Conservation Group
- Study Plan – Methodology and Objectives

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Study Objectives

- Historic Inflow Hydrograph Development
- Hydraulic Modeling
- Operations Model
- Next steps: Scenario Modeling

Project Scope

- Develop an Operations Model
  - Identify pre-defined constraints
  - Simulate baseline conditions
  - Capable of evaluating stake-holder requested changes to existing operating parameters
- Develop Draft Operations Model Report
- Provide Model Demonstration
- Finalize Baseline Operations Model Report

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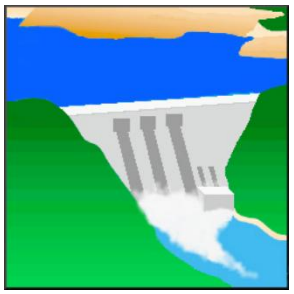
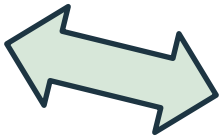
Modeling System Components

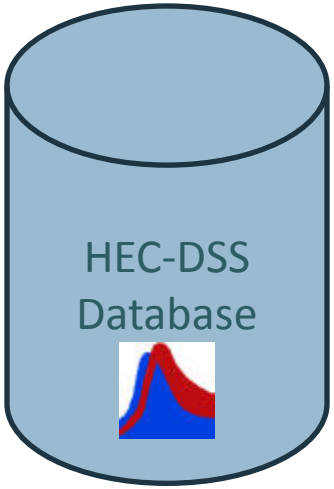
- River Routing Model (HEC-RAS)
- Reservoir Routing Model (HEC-ResSim)
- Model Database (HEC-DSS)

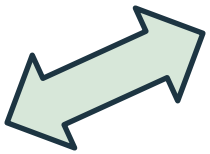
Modeling System Schematic

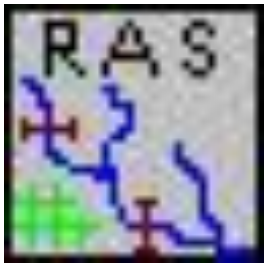


HEC-ResSim
Reservoir Model









HEC-RAS
River Model

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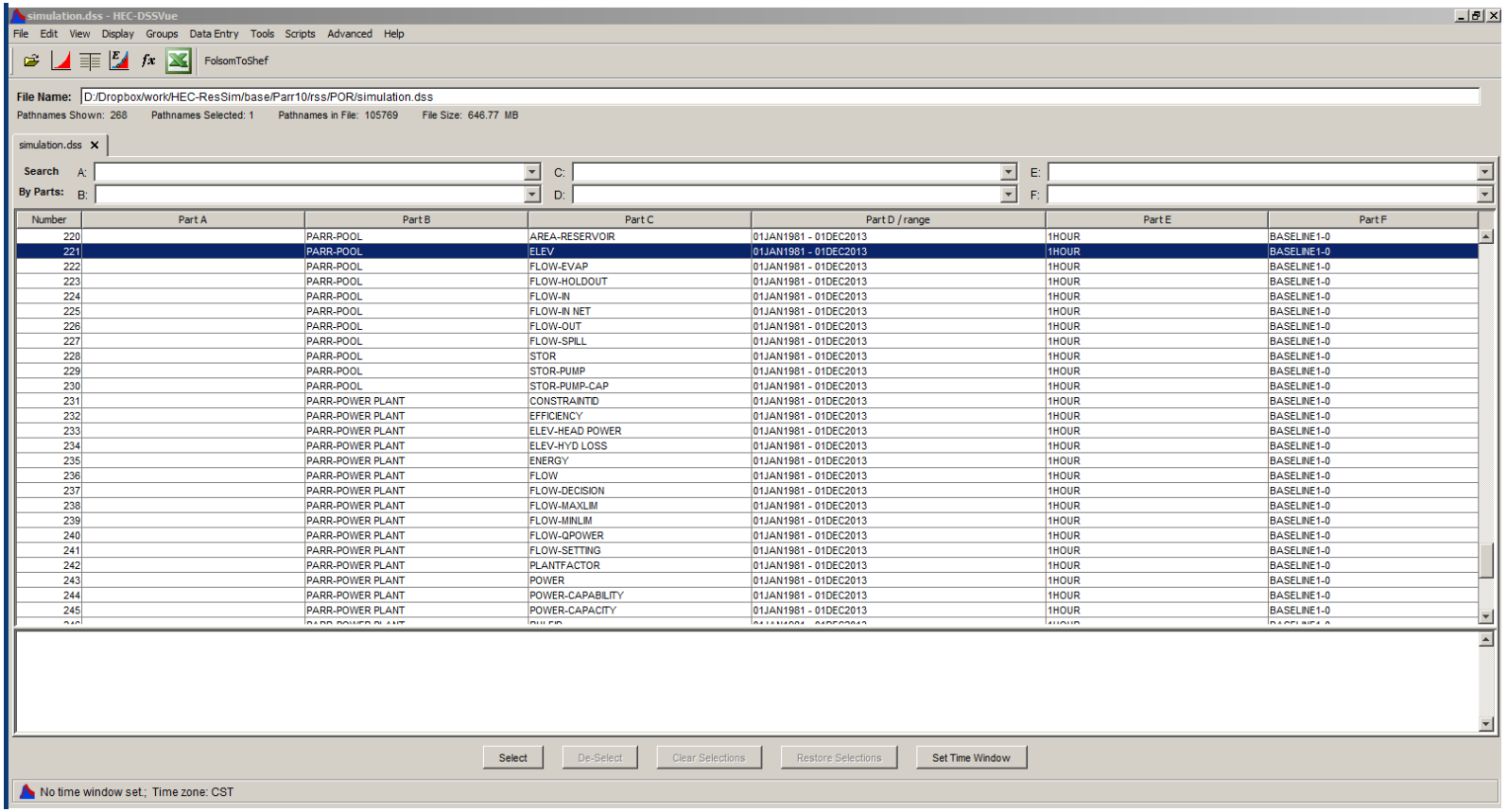
Modeling Database Files

- HEC-DSS files
- Direct access database file structure
- Primarily for time series and paired-data, such as rating tables
- No manual handling of data required

Modeling Database Files

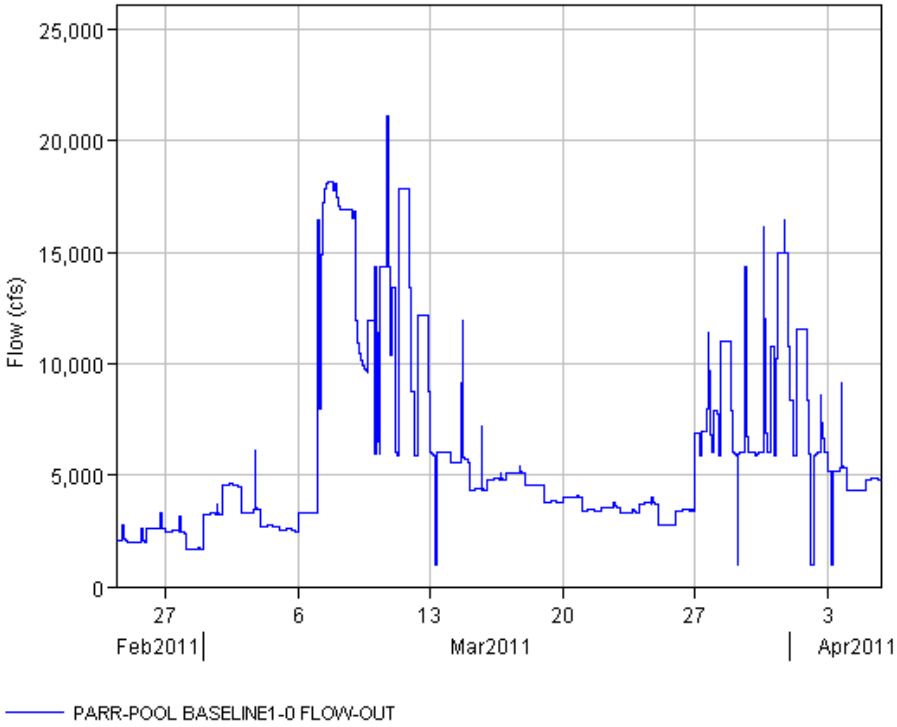
- File #1 > Input data for HEC-ResSim (inflow)
- File #2 > Output data from HEC-ResSim, used as input to HEC-RAS
- File #3 > Output data from HEC-RAS

HEC-DSSVue - Point/click GUI

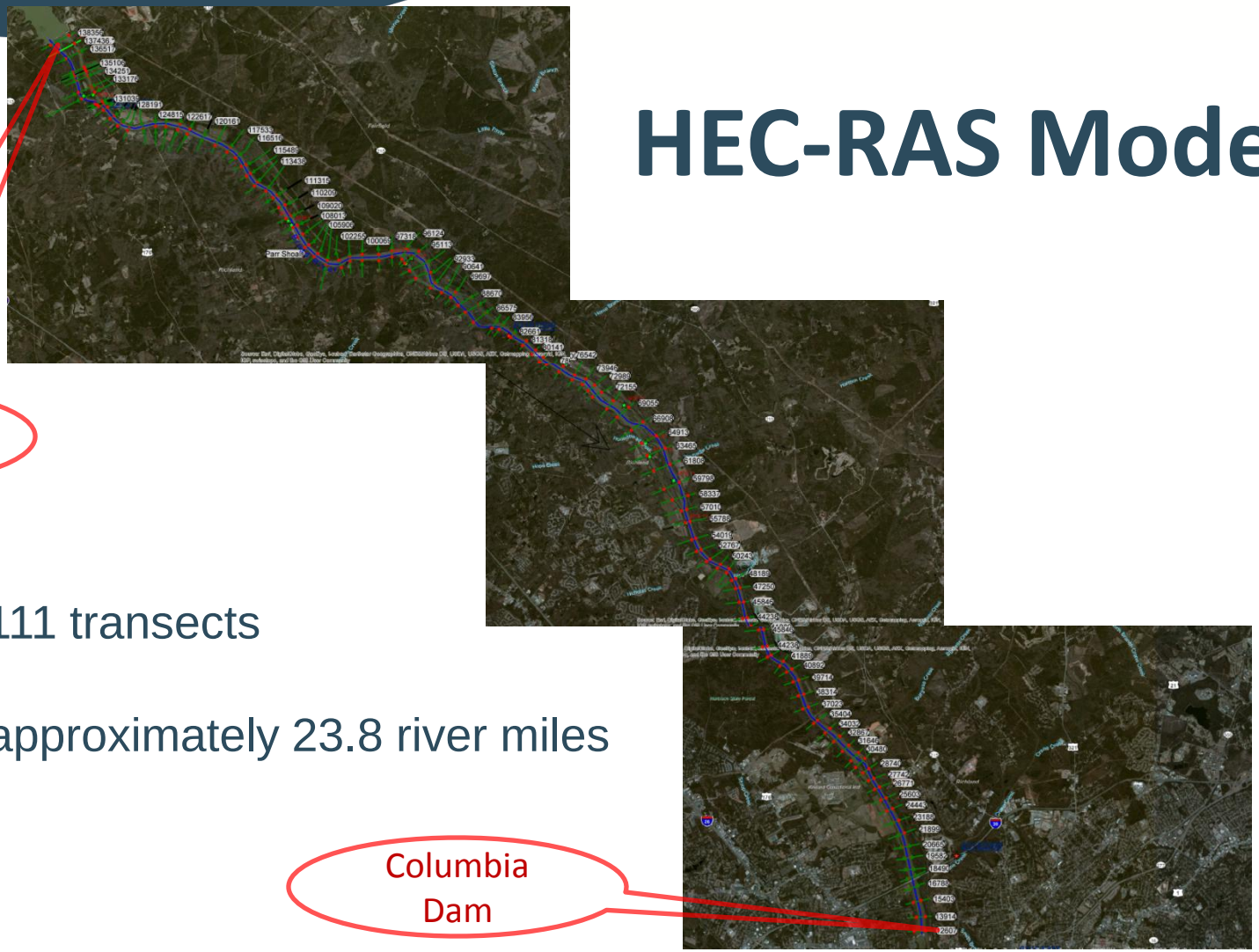


HEC-DSSVue - Point/click GUI

- View
- Print
- Export to Excel
- Several others



HEC-RAS Model



- Total of 111 transects
- Covers approximately 23.8 river miles

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Data Requirements

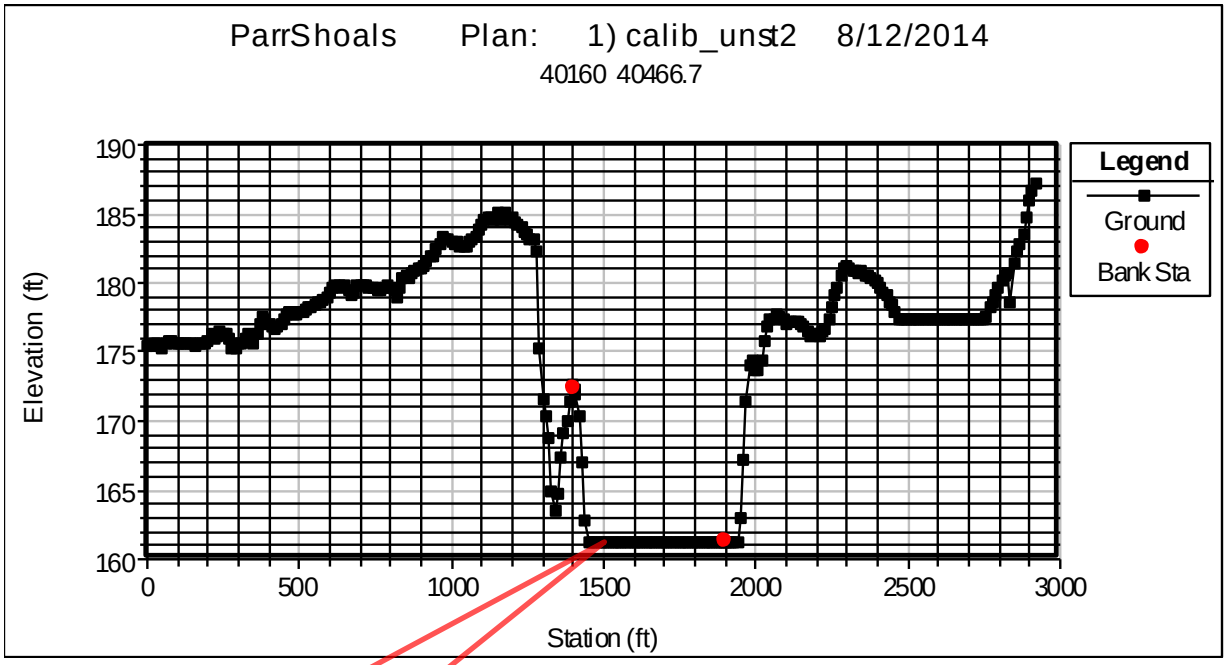
- Physical Geometric / Terrain data
- Satellite Imagery (visual aid)
- Boundary conditions & calibration data
- Inflow data

Terrain Data

- Downloaded from SCDNR web server
- LiDAR data – 10’ (approx.) grid
- Vertical datum = NAVD88
- Note > HEC-RAS is NAVD88

Cross-section – Unedited LiDAR

- Lacking bathymetric definition
- Requires manual editing



LiDAR elevation indicates water level

Imagery Data

- Primarily ESRI non-proprietary aerial images
- Georeferenced
- Not used by the model – used by the model**er**
- Used to determine landforms and channel characteristics

Imagery example

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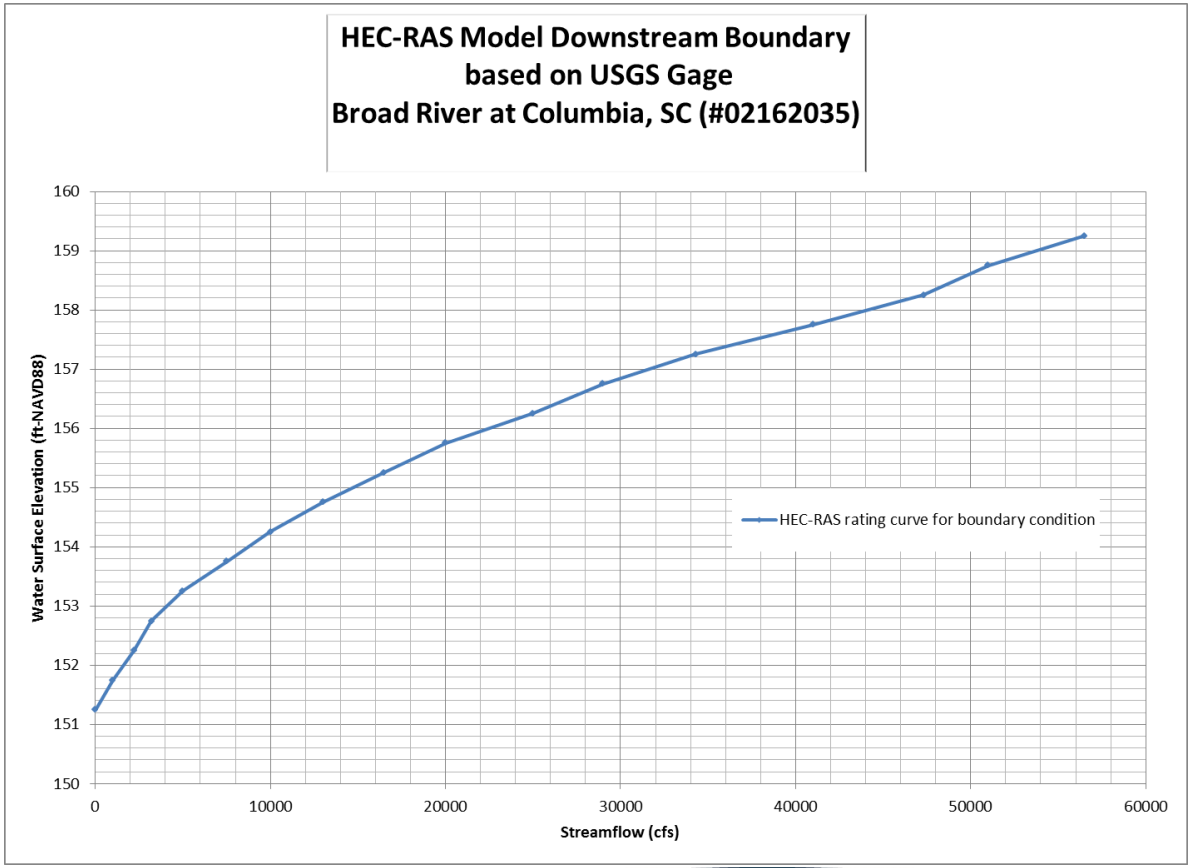
Boundary Conditions & Calibration Data

- USGS flow and stage data
- USGS gage rating tables
- Downstream boundary – Columbia Dam
- Monitoring data - 2014

Downstream Boundary Condition

- Includes observed data for normal flows
- High flows – computed
- Affects downstream-most 5 miles

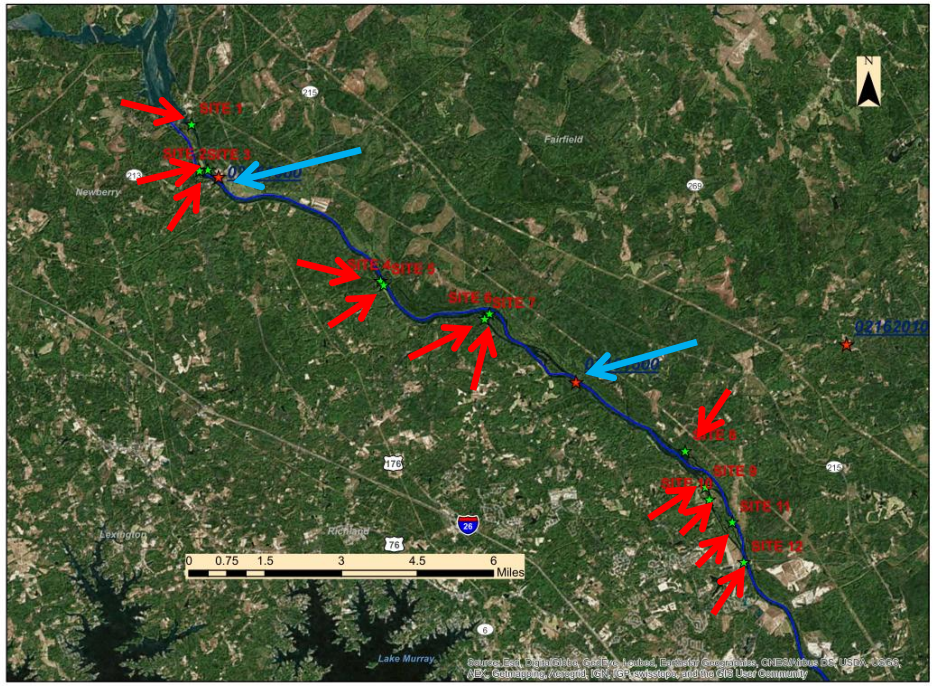


Model Calibration

- Iterative process to adjust cross-section data and channel roughness

- **USGS gage sites (2)**
- **Monitoring sites (12)**

Broad River - Datalogger Sites / USGS Gage Sites



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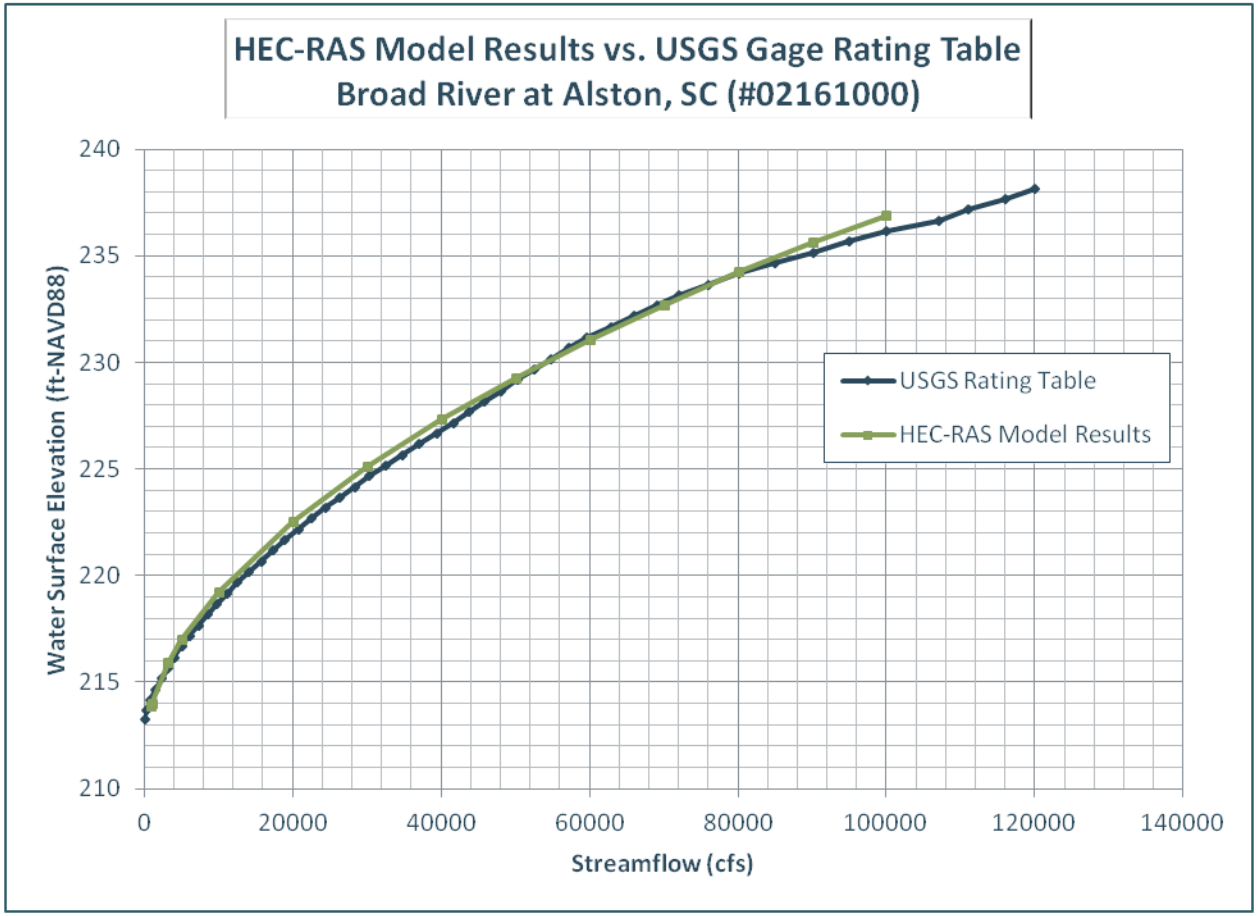
Calibration example: Alston gage



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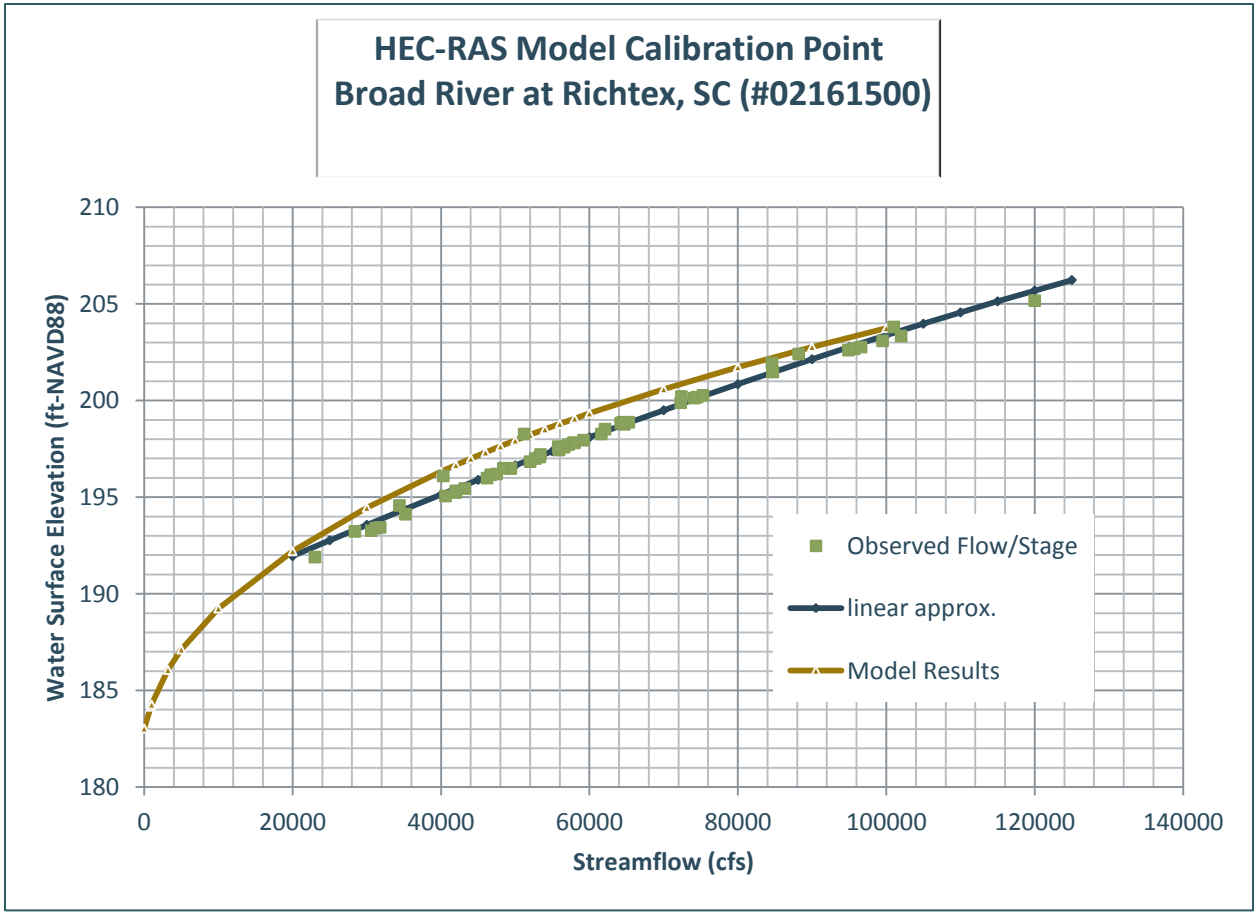
Calibration example: Richtex gage site



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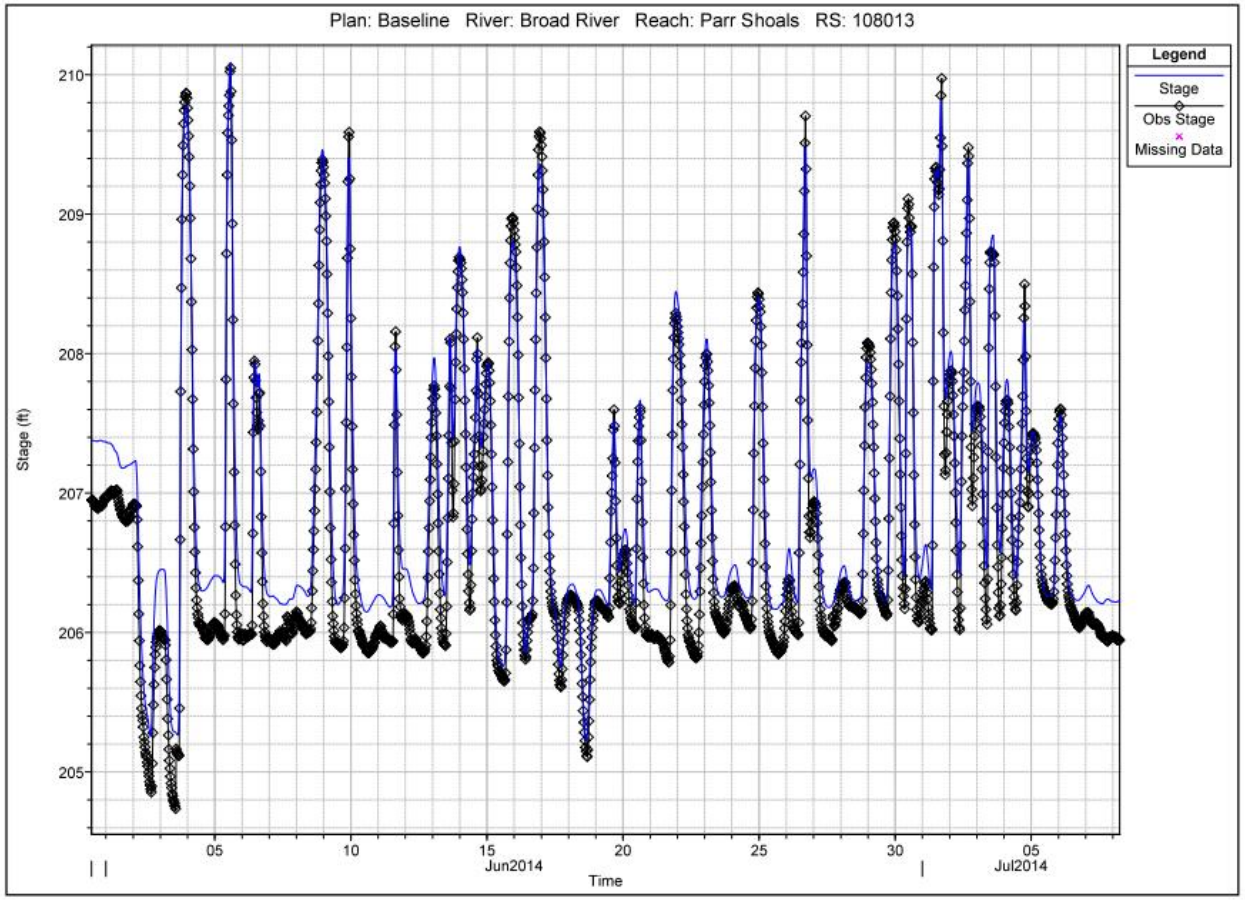
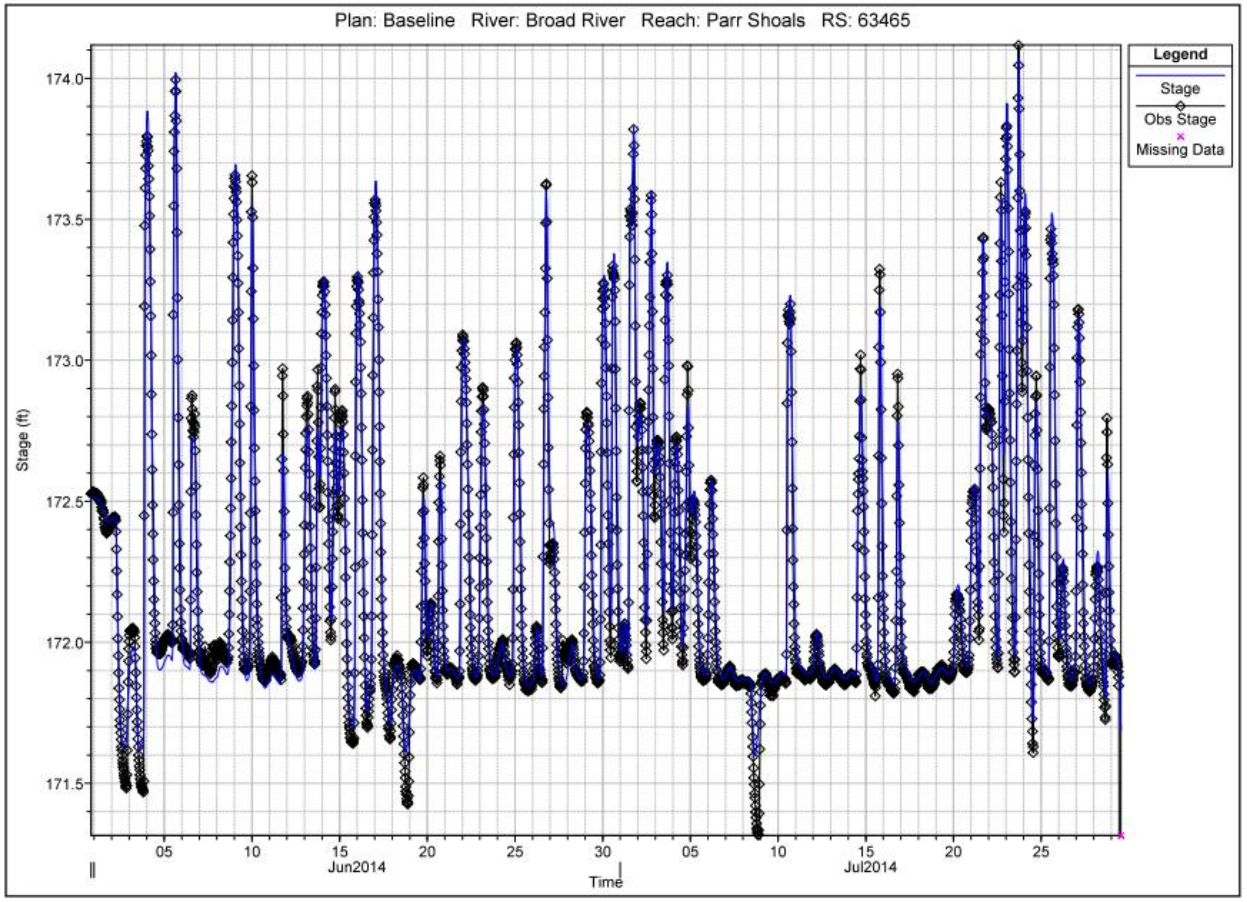
Calibration example: Site 5



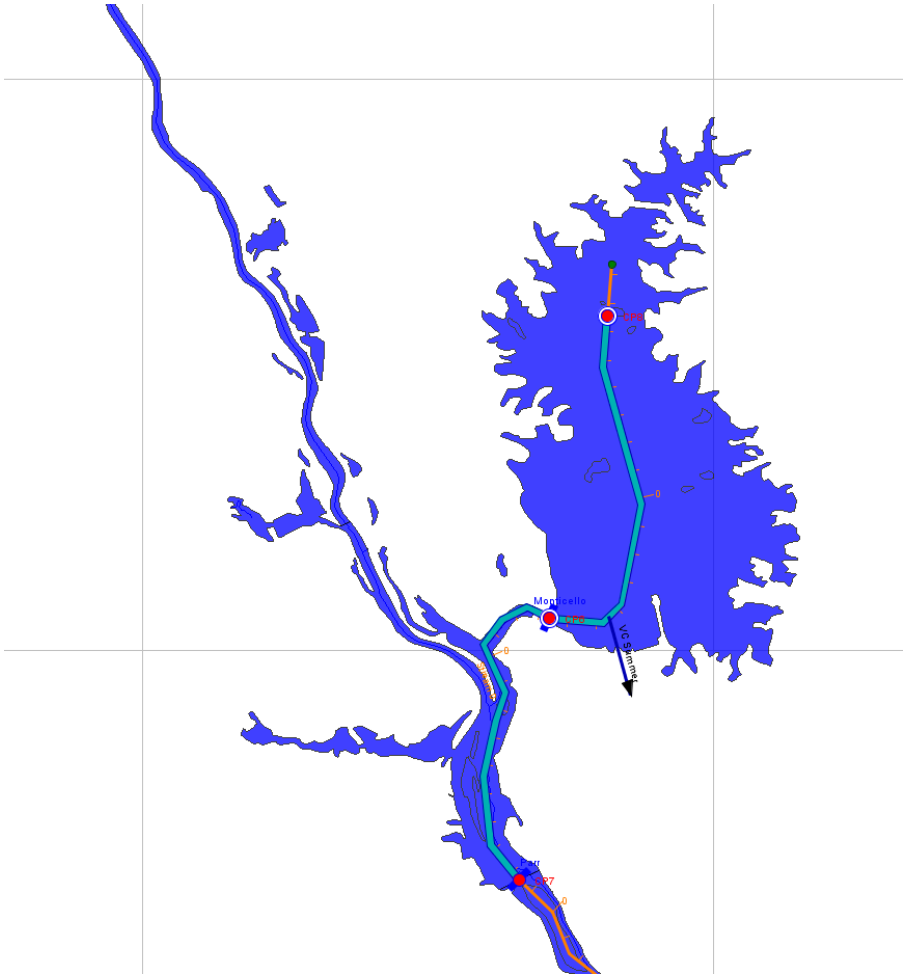
Calibration example: Site 10



HEC-ResSim Model

Data Requirements:

- Static model inputs
- Temporal / time series data
- Operational Rules



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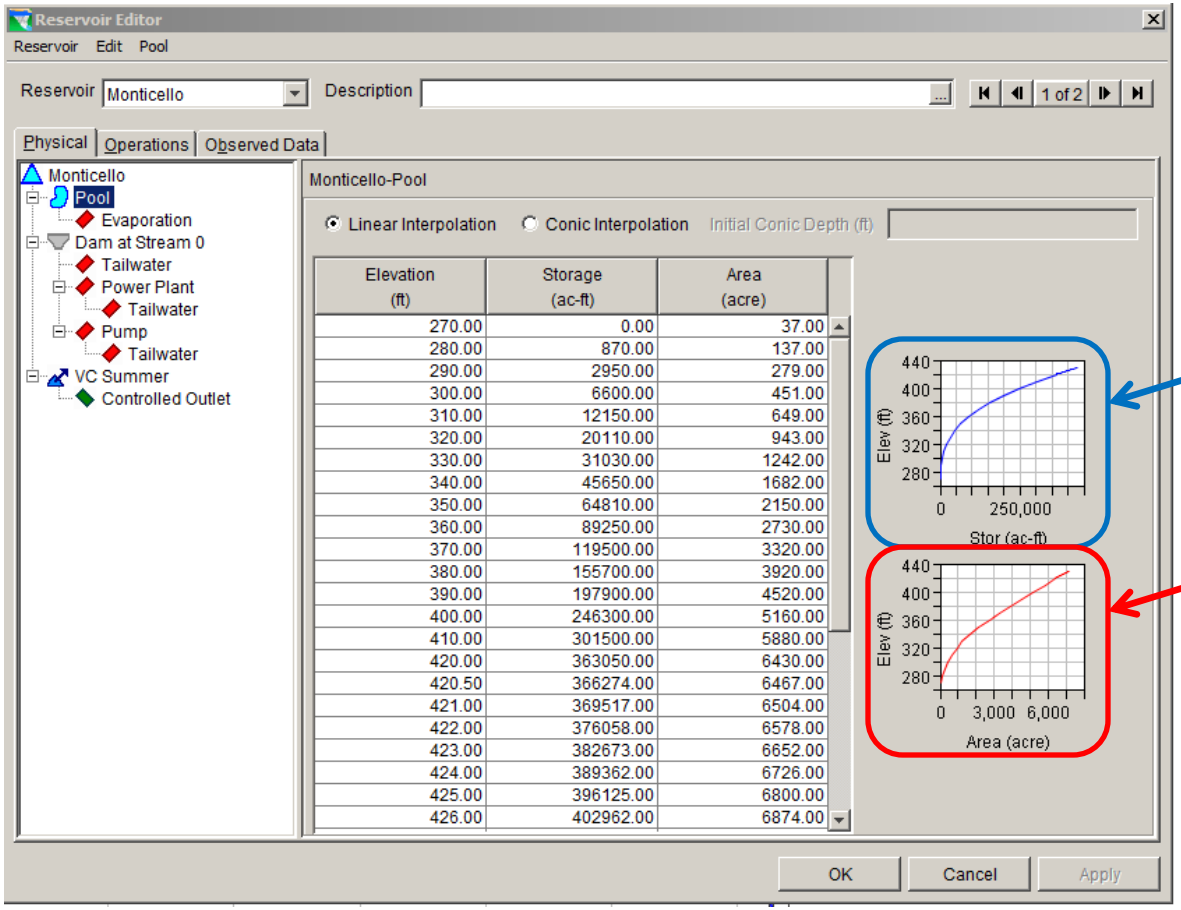
Static Model Inputs



Stage vs Volume

Stage vs Area

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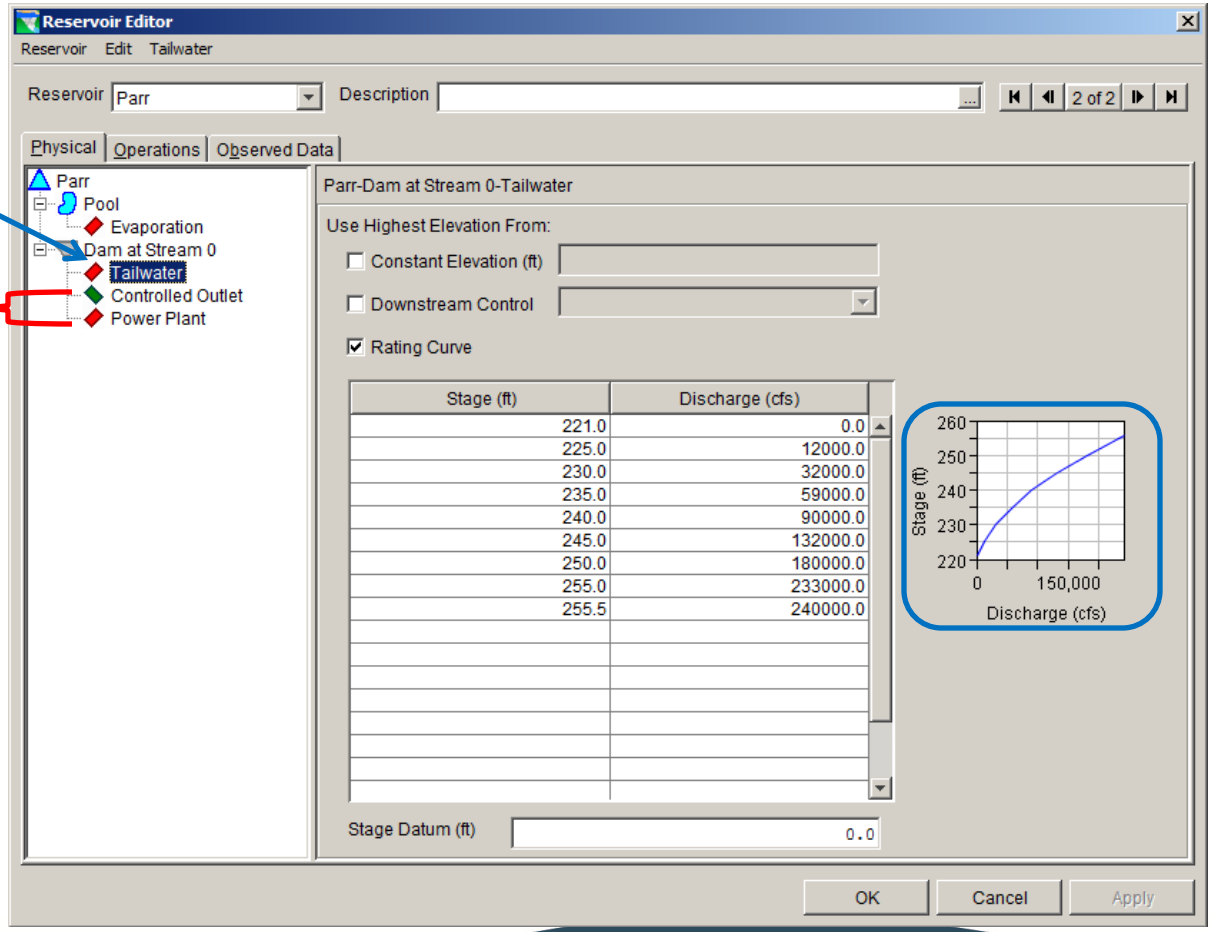
Static Model Inputs

Tailwater rating curves

Outflow rating curves



Temporal Model Inputs

- Inflow Dataset
- Evaporation rates
  - losses computed as function of pan evaporation

Operational Rules

- Minimum flow
- Drought constraints
- Min / max pool levels
- Pumping Rules
- Generation constraints

Operational Rules

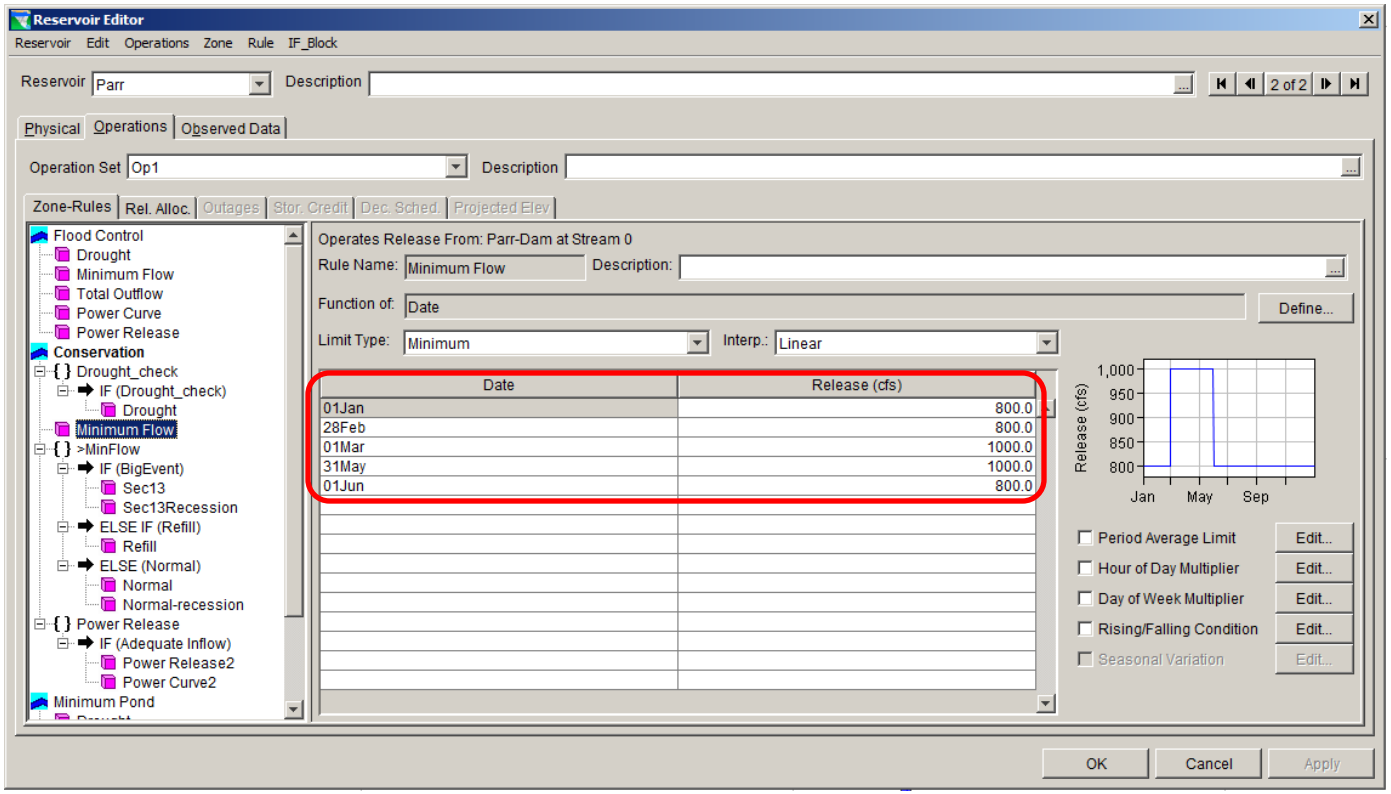
- Coded in model using if-then logic
- Constrained by variety of factors
  a. Date
  b. Inflow
  c. Reservoir level

Baseline vs. Scenario Rules

- Baseline operational rules are superseded in scenario simulations
- Prioritizations and thresholds can be adjusted

Operational Rules – Minimum Flow

Coded as function of date



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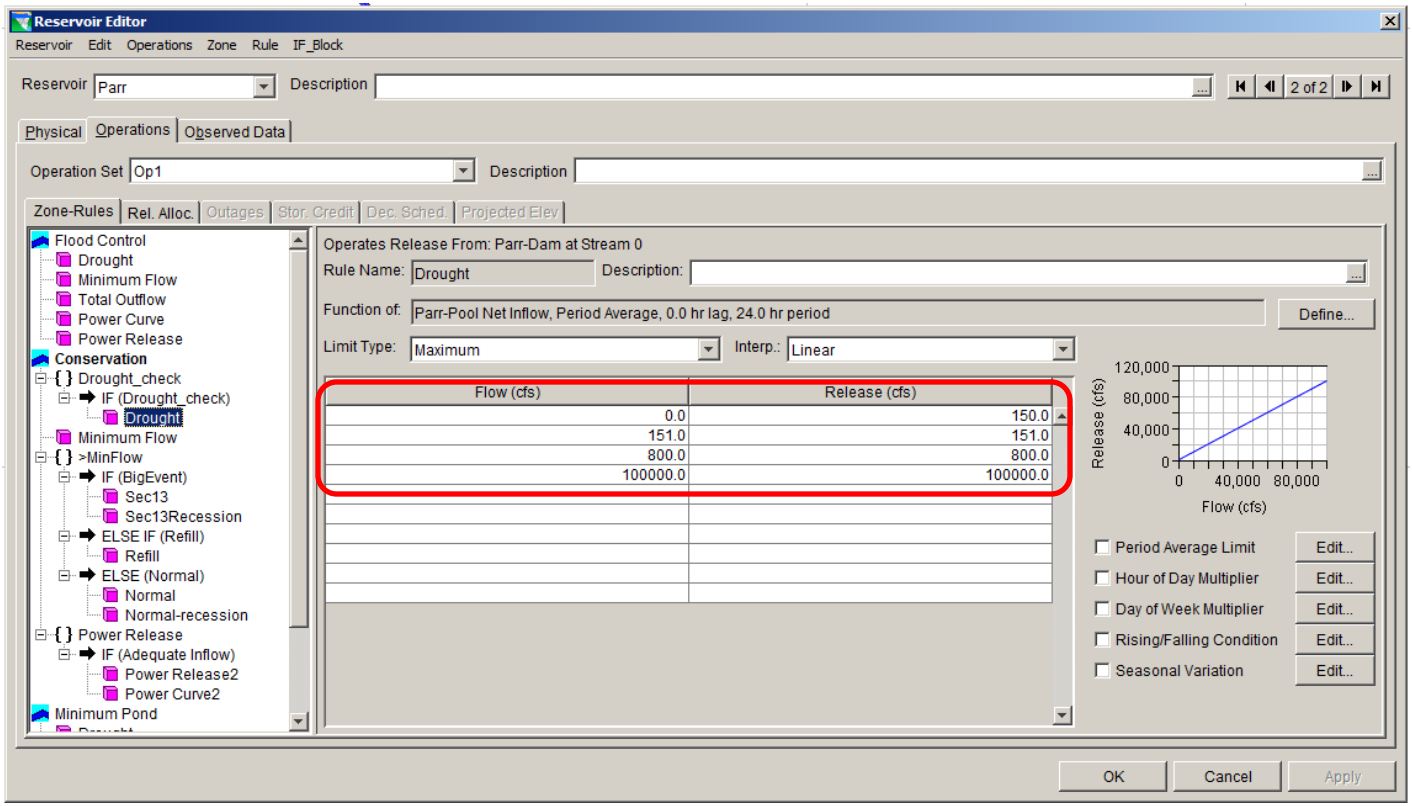
Operational Rules – Drought

Coded as function of net inflow (Upstream flow minus evaporative losses)



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Other Operational Rules

- Curtail generation at Fairfield to avoid contributing to high flow releases (> 40k cfs)
- Decrease max pond level at Parr during high inflows to prevent upstream flooding
- Pumping to Monticello during evening, Fairfield generation during day

Next Steps

- Finalize Baseline Model & Report (Current Project, 2014)
- Define Metrics to be Evaluated (2015)
- Develop Output Summary Format (2015)
- Final Report of Model Simulations (2016)

QUESTIONS?

Bruce Halverson, PE
Bruce.Halverson@KleinschmidtGroup.com

Thank you

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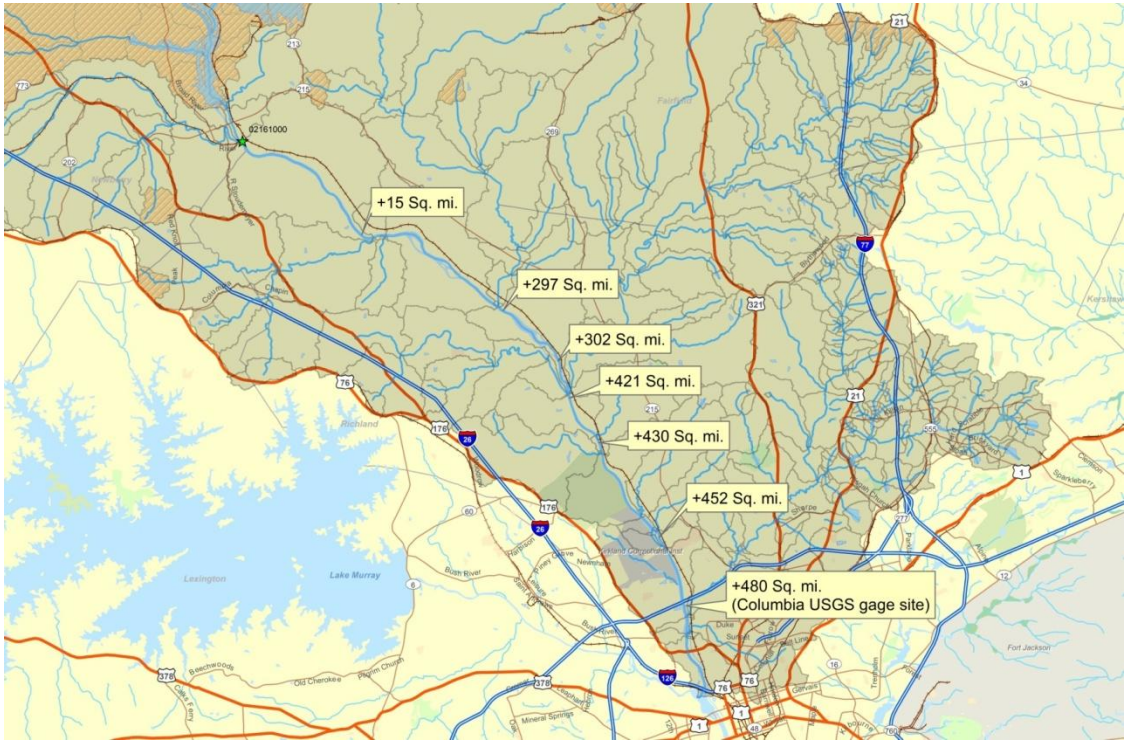
Broad River Hydrology – Parr to Columbia



Drainage Area Comparison:

- at Parr – 4,750 sq. mi.
- at Columbia gage – 5,230 sq. mi.

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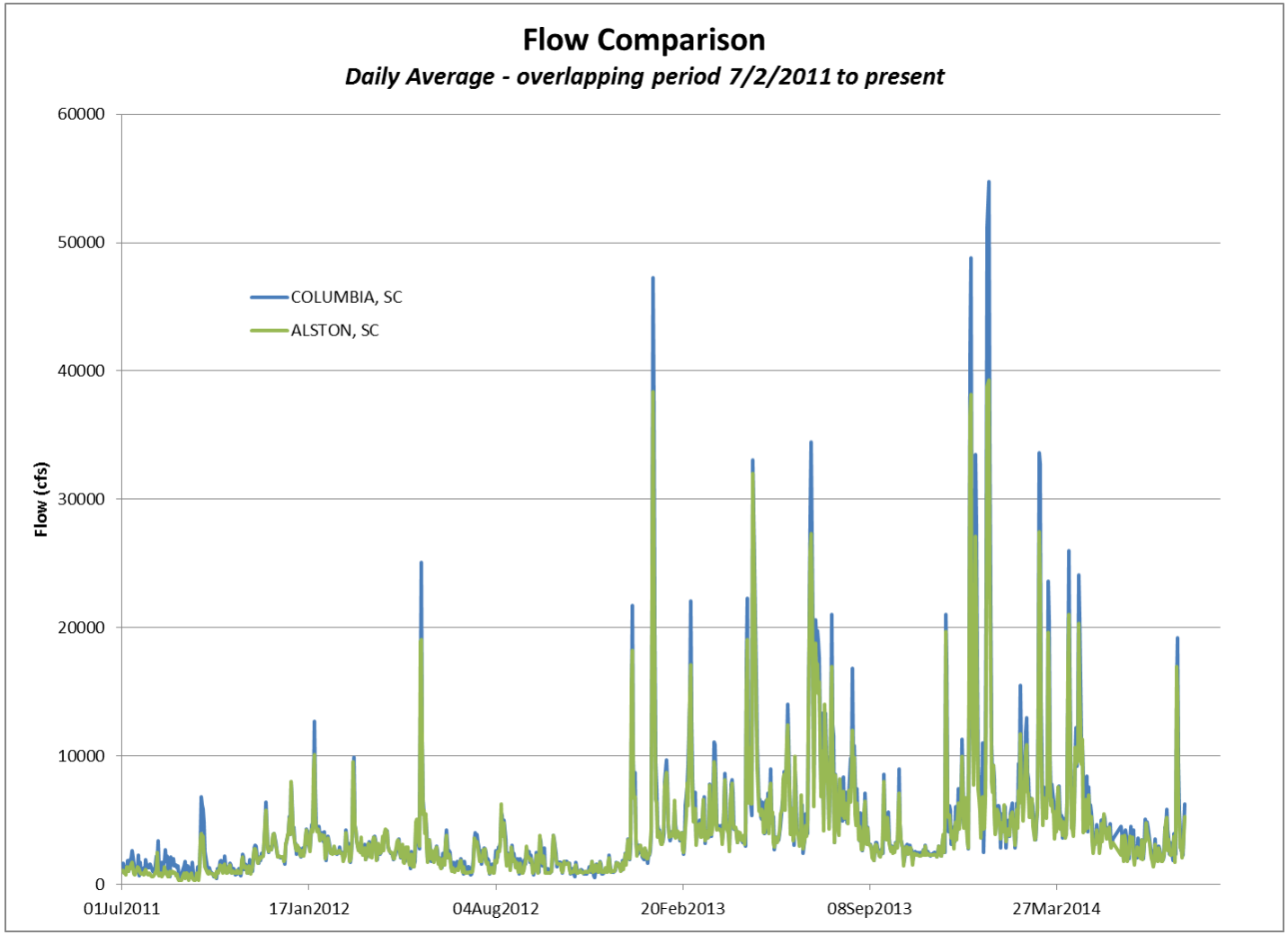

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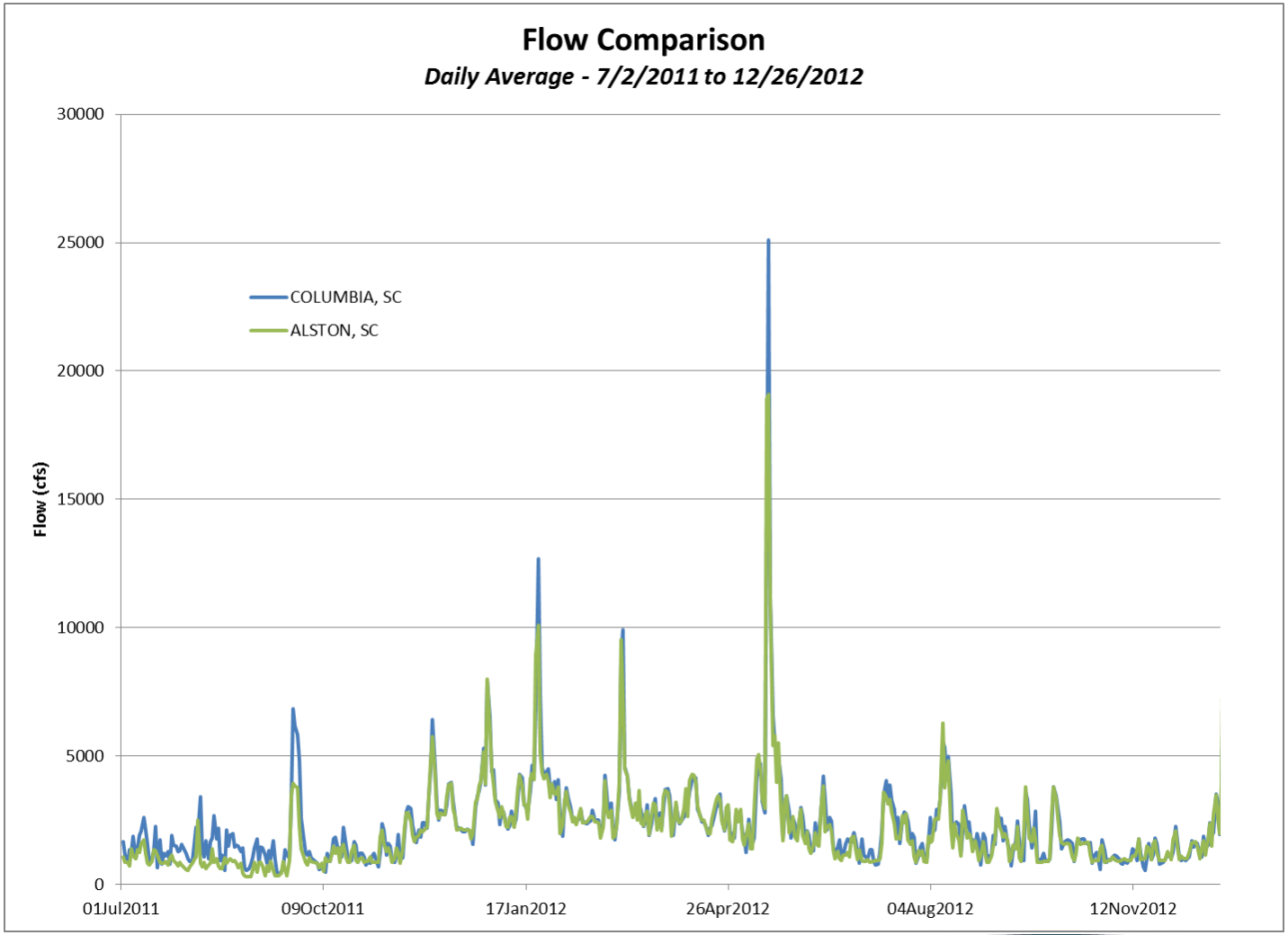

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Average Daily Flow Comparison*

Period	7/2/2011 to present	7/2/2011 to 12/26/2012
Alston	4,150	2,097
Columbia	4,633	2,282
Difference	483	185
% of Columbia	10.4%	8.1%
# of values	1,122	540

*Includes only days with data values from both gages

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MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Joint RCG Meeting

October 9, 2014

Final KDM 12-15-14

ATTENDEES:

Steve Summer (SCANA)
Milton Quattlebaum (SCANA)
Bill Marshall (SCDNR)
Randy Mahan (SCANA)
Bill Argentieri (SCE&G)
John Fantry (Town of Winnsboro)
Byron Hamstead (USFWS)
Pace Wilber (NOAA) via conference call
Amy Bresnahan (SCE&G)
Greg Mixon (SCDNR)
Bill Stangler (Congaree Riverkeeper)
David Eargle (SCDHEC)
Dick Christie (SCDNR)
Tommy Boozer (SCE&G)
Beth Trump (SCE&G)
Henry Mealing (Kleinschmidt)
Kelly Miller (Kleinschmidt)
Shane Boring (Kleinschmidt)
Alison Jakupca (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The purpose of the joint RCG meeting was to discuss the draft Parr Hydroelectric Project Preliminary Application Document (PAD). The draft PAD was developed using existing Project data to describe the Project resources and how it operates under the current FERC license. The draft PAD was distributed to stakeholders to review and comment on prior to submittal to FERC.

Henry opened the meeting by explaining that a PAD is not the Final License Application or a National Environmental Policy Act (NEPA) document. It is a starting point for relicensing based upon the results of the collection of existing Project related data. No new, relicensing-focused studies have been conducted and the actual relicensing process doesn't begin until the PAD is filed with FERC.

Bill A. told the group that he has received several letters from agencies and NGOs endorsing or expressing a neutral stance on SCE&G's request to use the Traditional Licensing Process. Bill A. explained that he will be visiting FERC in October and additional letters of concurrence would be appreciated.

Kelly then began reviewing the comments received on the PAD. Comments were submitted by SCDNR, SCDHEC, USFWS, and the Congaree Riverkeeper. Kelly told the group that many comments or edits were simply accepted, or added to the document, but several comments needed further discussion with the group. She told the group that all comments were combined into one document so the document could be reviewed from beginning to end during our meeting. During

the review, Kelly noted the comments that were accepted, and identified the comments that required additional discussion.

PAD comments that were discussed at the meeting are listed below.

- Byron asked for further explanation of the 6 deviations listed in the Parr Hydro Minimum Flow Compliance Summary (Table 3-3). The footnote was expanded to clarify information on these deviations.
- SCDNR asked for further explanation on Article 50 and 51 regarding odor monitoring. Bill A. explained the history of the two license articles and that discontinuation of odor monitoring was approved by SCDHEC and FERC in 1982 and 1983, respectively. (see PAD Section 3.8: Compliance Summary).
- Byron asked for additional information on erosion within the Project Boundary. Parr and Monticello Reservoir erosion studies were added to the PAD, including maps that indicate erosion levels along each reservoir's shoreline. (See PAD section 4.1.4: Existing Erosion, Mass Soil Movement, Slumping, or Other Forms of Instability)
    - Greg asked if SCE&G monitored the islands on Lake Monticello for erosion. Bill A. said that they currently do not, but that this may be something to consider in the future. It was noted that currently no islands were indicated as areas of concern for cultural resources in the SHPO studies.
- Several comments were submitted regarding the dissolved oxygen levels downstream of Parr Shoals Dam. Kelly added information in the PAD to address this concern. (See PAD section 4.3.2: Effects of Project Operations on Existing Water Quality)
- Byron suggested that the information included in the PAD on the Santee River Basin Accord for Diadromous Fish Protection, Restoration and Enhancement be expanded to discuss the triggers for fish passage at Parr Shoals Dam. Kelly included the trigger information, along with information on passage at the Columbia Dam. (See PAD section 4.4.1.4: Diadromous Fish)
- Byron asked for additional clarification of the macroinvertebrate studies that were included in the PAD – try to summarize and shorten this section of the PAD. Kelly said that this section (PAD section 4.4.2: Macroinvertebrate Species and Habitats) would be reviewed and revised to provide a clearer, more concise summary of the studies. Byron said he would submit comments to aid in this effort.
- David asked that the Japanese Mystery Snail be added to PAD section 4.4.4 Invasive Aquatic Species. This section will also be reviewed to ensure all invasive aquatic species in the Project Area are listed.
- Dick said he would like to review the section on striped bass and submit additional comments.
- SCDNR asked for additional information on Land Use at the Project several times throughout the document. Alison discussed the information that was included in the PAD (Table 4-30: Land Use Classifications within the Project Boundary).

Additional edits to the PAD, including information on striped bass and macroinvertebrates, will be distributed to the group for final review. A copy of the final Parr Reservoir Erosion Report will also be distributed to the group when it becomes available.

Due to the size of the PAD, the edited version is not attached to the end of the notes, however, it will be provided upon request via email. If you would like a copy of the edited PAD, which reflects

in track changes comments submitted before and during the meeting, please call or email Kelly. The final Parr Hydro Project PAD is scheduled to be submitted to FERC the first week of January 2015. A copy of the final PAD will also be emailed to the stakeholders and will be posted to the Project website at www.parrhydrorelicense.com.

ACTION ITEMS:

- Dick will submit additional comments on striped bass.
- Byron will submit additional comments on the macroinvertebrate section of the PAD.
- Kelly will review and clarify the section on macroinvertebrates.
- Additional major edits will be circulated to the group for review and approval.
- The final PAD will be distributed to the group when it is filed with FERC in 2015.

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Lake and Land Management TWC Meeting

November 5-6, 2014

Final KDM 12-11-14

ATTENDEES:

Bill Marshall (SCDNR)
Byron Hamstead (USFWS)
Dick Christie (SCDNR)
Randy Mahan (SCE&G)
Beth Trump (SCE&G)
Steve Summer (SCANA)
Bill Argentieri (SCE&G)
Amy Bresnahan (SCE&G)
Tommy Boozer (SCE&G)
Henry Mealing (Kleinschmidt)
Alison Jakupca (Kleinschmidt)
Kelly Miller (Kleinschmidt)

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The Lake and Land Management TWC met over two days to discuss the Shoreline Management Plans (SMPs) for Parr Reservoir and Monticello Reservoir. Alison prepared the SMPs from the outlines agreed upon at the LLM TWC meeting held on May 21, 2013.

November 5, 2014

The group discussed the Monticello Reservoir SMP. Edits made to the Monticello Reservoir SMP are included at the end of these notes in track changes.

Byron asked if the tables presenting the total miles of shoreline at Monticello Reservoir include the island shorelines. Alison said that island shoreline mileage was included in the total for Monticello Reservoir because the islands are used for recreation and are owned by SCE&G. The table presenting the total miles of shoreline at Parr Reservoir does not include island shoreline miles, as Parr Reservoir is characterized by shoals that may be present depending on water level. Although there are several islands on Parr Reservoir, they are not all owned by SCE&G.

Alison discussed the differences in the current land use classifications on Monticello versus the proposed land use classifications. Tommy said the biggest change is reclassifying the section of land next to the Fairfield Pumped Storage Channel from future recreation to project operations.

The group discussed the proposed waterfowl management area land use classification in great detail. Dick reviewed the SCDNR Wildlife Management Area Classifications with the group. Dick said that the SCDNR waterfowl management area classification are specific for waterfowl hunting, however a wildlife management area allows for hunting of deer and other small game. Although the group was unsure of the hunting specifics allowed in these areas currently at Monticello and Parr reservoirs (water versus land, species allowed, how many days of the week, etc.), the group

decided to list the hunting areas in the SMPs as Wildlife Management Areas (WMAs) and refer the public to DNR for more specific information. Dick will also research this issue.

Byron asked if there would be a specific classification for "natural areas" as he was interested to see if the SMP definition of natural areas lines up with that of the USFWS. Alison noted that although there wasn't a specific land use classification for natural areas, all of the shoreline within the PBL (except for those areas that are developed for recreation and within a permitted meandering path) has a non-disturbance classification. SCE&G does employ timber management along certain areas of the shoreline, but adheres to sound forest management practices, as discussed further below. Alison said that the group will have a meeting to discuss each parcel around the reservoirs and its classification and will review the management of each area at that time. Henry said that Monticello and Parr have different natural environments. The cove areas have some vegetation, but mostly the shoreline is a pine forest that extends to the lake's edge.

Byron asked if any commercial activities will be allowed on Monticello. Alison said that no commercial activities will be permitted, only governmental and residential water withdrawals will be considered for permits. The group also discussed boat lifts, and decided that they would not be permitted until public interest warrants a change.

Byron asked about the maintenance restrictions for meandering paths on Monticello, and if SCE&G has any issues with straight paths. Tommy said paths must be kept clear and if there are steps, they need to stay in place. He also said there are no issues with straight paths, because when a permit is issued, SCE&G comes to flag out the path before construction. Meandering paths are associated with docks on Monticello, so they will be tracked through the dock permit. Docks will not be permitted on Parr Reservoir at this time however meandering paths will be allowed, and will be tracked through a permit. Specifics on meandering paths will be included in the permitting handbook.

Beth told the group that forest management land is included within the Project Boundary, so the SMPs will need to be amended to include information on these areas. SCE&G adheres to the forestry best management practices put forth by South Carolina. Tommy said that the forestry management areas are mostly located around the upper end of Monticello Reservoir, near the Recreational Lake. These lands are located in areas classified for recreation. SCE&G has a forestry management plan, however since this plan is subject to change, it will be referenced in the SMPs, but the actual document will not be included. Alison will work with Beth to procure these documents and share them with the group. The group will also review which areas in particular are managed under the forestry management program when they review each parcel in the Project Area.

November 6, 2014

The group focused on discussing the Parr Reservoir SMP. Edits made to the Parr Reservoir SMP are included at the end of these notes in track changes.

The group discussed the permitting of meandering paths on Parr. Tommy noted that if someone has land along the Parr shoreline, they will naturally want to create a path to the water. Permitting this activity will allow SCE&G a say on the most appropriate positioning for this path. Randy added that because of the nature of Parr Reservoir (riverine, topography, etc.) SCE&G would prefer to consider permitting on a case by case basis for limited uses, such as meandering paths and water

withdrawals. Dick expressed concern that allowing meandering paths might promote boat ramps. Tommy said that allowing a 5 foot path is more acceptable than a 10 foot path, because a larger path is more likely to become a boat launch. The group agreed that the majority of Parr Reservoir shoreline should be classified as non-development areas. Within these non-development areas, 5-foot meandering paths and water withdrawals may be allowed with a permit.

The group then discussed water withdrawals. Henry said that a water withdrawal that is 1 MGD must be permitted by SCDHEC, and FERC also has to be involved. The group decided that within the SMPs, instead of labeling water withdrawals as residential or commercial, they should be defined by volume.

As with the Monticello Reservoir SMP, the subject of Wildlife Management Areas on Parr Reservoir was discussed. The group agreed that waterfowl hunting should be restricted to boats because of the fluctuation of the reservoir. However, Dick pointed out that SCDNR will have difficulty enforcing this. Dick said he would talk to SCDNR enforcement and provide more information on how to best deal with the hunting issues. This will be discussed in more detail at future meetings.

Byron said he is interested in seeing the specific places where watering livestock in the lake is allowed. He also wants to see where docks and water withdrawals are located and where the shoreline is managed for timber on both Monticello and Parr reservoirs. He wants to see how the overall shorelines are balanced. Tommy will plan a trip to the reservoirs in the March to April 2015 timeframe for Byron and others.

The group then discussed the Permitting Handbook outline. Edits made to the Permitting Handbook are included at the end of these notes in track changes.

The group discussed having a small pull-out section of the handbook for distribution to the public, since there is concern on the final size of the handbook. After the entire handbook is developed, the group will decide if this is needed or not.

After the meeting, Byron Hamstead with USFWS submitted a document clarifying a comment he made during the meeting. This document is attached to the end of these notes. Action items stemming from these meetings are listed below.

ACTION ITEMS:

- Alison and Beth will work together to include information on SCE&G's forestry practices in the Monticello and Parr SMPs.
- Dick will gather information from SCDNR enforcement regarding the hunting issues at Parr and Monticello reservoirs.
- Tommy and Scott will develop a new location map with the Project Boundary and updated shoreline classifications.
- Alison will update the SMPs based on the edits discussed at the meetings.
- Tommy will schedule a meeting in March/April 2015 to show agencies the project boundary areas on Parr and Monticello.

SHORELINE MANAGEMENT PLAN
MONTICELLO RESERVOIR

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

September 2014

SHORELINE MANAGEMENT PLAN
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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

EXECUTIVE SUMMARY

South Carolina Electric & Gas Company ("SCE&G") is the Licensee of the Parr Hydroelectric Project (Federal Energy Regulatory Commission [FERC] No. 1894) ("Project"). The Project consists of the Parr Shoals Development and the Fairfield Pumped Storage Development. The developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project developments form two distinct Project reservoirs. Parr Reservoir is located along the Broad River, as impounded by Parr Shoals Dam, and functions as the lower reservoir for the Fairfield Development. Monticello Reservoir is located adjacent to the Broad River and functions as the upper reservoir for the Fairfield Development. Both Project reservoirs serve as popular recreation destinations and are used and enjoyed by local residents as well as visitors to the state.

In conjunction with its relicensing activities, SCE&G has assembled a diverse and inclusive group of stakeholders to advise and assist in the development of two Shoreline Management Plans ("SMPs"), each tailored to a specific reservoir. SMPs are comprehensive plans for the management of Project land and adjoining water resources and their uses, consistent with License requirements and broad Project purposes, and appropriately accessible and beneficial to adjacent shoreline residents and the recreating public. A SMP serves to identify existing and appropriate future uses and to provide plans and programs for responsible future use and management of project lands and waters as well as the flora and fauna encompassed within them. This SMP exists specifically to address shoreline uses surrounding Monticello Reservoir. A SMP to address Parr Reservoir is included under separate cover and available from the SCE&G Lake Management Department (Lake Management).

In addition to a SMP for each Project reservoir, a Shoreline Management Handbook and Permitting Guidelines (Permitting Handbook) was developed for both developments in consultation with governmental, non-governmental, and individual stakeholders to address activities that will require consultation with and/or permits from SCE&G. These activities include construction, maintenance, and placement of docks, shoreline stabilization, lake access pathways and other shoreline activities.

The classification of Project lands surrounding Monticello Reservoir is described in Section 5.0 and includes five management classifications. These classifications are as follows: Project Operations; Nuclear Exclusion Zone; Shoreline Permitting; Public Recreation; and Undeveloped Areas/Dock Exclusion Areas. Public Recreation land includes land within public parks, SCE&G developed recreation areas, and islands.[1] Undeveloped Areas/Dock Exclusion Areas are areas protected from development to preserve environmental resources and aesthetic values. Conversely, lands included within the Shoreline Permitting classification are not automatically excluded from development related shoreline use, and hence may be available for permitted shoreline development such as access paths and docks. Lands reserved for Project operations are those lands that are specifically required for operation of the Project. They include areas such as plant facility locations, dams, electrical substations, etc. The Nuclear Exclusion Zone (NEZ) is a defined area surrounding the V.C. Summer Nuclear Station. Within the NEZ, SCE&G, as the licensed nuclear plant operator, has responsibility and the authority to control all activities and has the absolute right to exclude or remove persons and property.

Land use prescriptions associated with these land management classifications are discussed in Section 6.0. Prescriptions are administered through the Permitting Handbook.

SCE&G maintains a strong commitment to the management of the waters and shoreline of Monticello Reservoir, focusing on the social, ecological, and economic impacts of activities on and near the shoreline and water, taking into consideration in particular, the environmental, aesthetic, and recreational character of the shoreline and lake. Section 7.07.0 details the activities and structures on and adjacent to Monticello Reservoir that require SCE&G consultation and/or approval. The permitting procedures for shoreline activities or structures are set out in more detail in Section 8.0 and in the Permitting Handbook.

[1] SCE&G owns all land within the Monticello Development, including all islands within Lake Monticello

Section 9.0 details SCE&G's fee structure for the shoreline management program. Such fees can be one-time or periodic.

Periodic surveys of the Monticello Reservoir shoreline are conducted by SCE&G and include, among other things, inventories and inspections of all docks, including those built and permitted throughout the current year. SCE&G also looks for unauthorized structures ~~below the 425 foot National Geodetic Vertical Datum ("NGVD") contour (high water mark) as well as~~ within ~~Buffer Zones~~Project boundary at that time. These represent violations of the SMP. SMP violations will be dealt with as deemed by SCE&G, in its sole discretion, to be appropriate. Consequences of violations may range from dock permit cancellations to fines and/or legal action, and are discussed more fully in Section 10.0.

SCE&G Shoreline Management Practices include actions taken to lessen or mitigate for potential impacts to a particular resource resulting from direct or indirect use. These include but may not be limited to shoreline stabilization and vegetation management, as well as aquatic plant management. Shoreline Management Practices are further described in Section 11.0 of this document.

Public education and outreach on the protection of valuable shoreline resources is integral to the effectiveness of the SMPs. Section 12.0 of this document details specific measures to be undertaken to help educate both adjacent shoreline residents and other Project resource users. Among included objectives will be SMP education and Best Management Practices ("BMP") education.

In its Application for New License, SCE&G is proposing 10 year review periods for the SMP. The 10 year SMP review periods provide reasonable opportunities for SCE&G, in concert with governmental, non-governmental, and individual stakeholders, periodically and deliberately to assess new issues that arise as a result of development around the Reservoir, and allow for analyses of cumulative effects. Concurrently with the FERC SMP review process, SCE&G will review the Permitting Handbook with interested stakeholders periodically to evaluate and improve its effectiveness. SCE&G reserves the right, however to make changes to the permitting process as it deems necessary and appropriate. This is discussed in Section 10.0.

1.0 INTRODUCTION

The Parr Hydroelectric Project ("Project") is located on the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1-1~~Figure 1-1~~). The Project is located approximately 31 river miles downstream of the Neal Shoals Hydroelectric Project (Federal Energy Regulatory Commission ["FERC" or "Commission"] No. 2315) and 24 river miles upstream of the Columbia Diversion Dam. The Project consists of two developments~~:~~ the Parr Shoals Development ("Parr Development") and the Fairfield Pumped Storage Development ("Fairfield Development"). Subsequently, two primary reservoirs are included as part of the Project, Monticello Reservoir[2] and Parr Reservoir. The normal maximum water level in Monticello Reservoir is El. 425.0 feet National Geodetic Vertical Datum ("NGVD"), which corresponds to a surface area of 6,800 acre~~-feets~~, and a gross storage of 400,000 acre-feet. Monticello Reservoir has approximately ~~54~~ 56 miles of shoreline within the Project boundary. Parr Reservoir's normal maximum water level is at El. 266.0 feet NGVD, with a corresponding surface area of 4,400 acres. The gross storage is estimated to be 32,000 acre-feet. Parr Reservoir has 94 miles of shoreline within the Project boundary.

Comment [b1]: Revise to FERC throughout document. Remove "Commission" from rest of document.

An active storage of up to 29,000 acre-feet is transferred between the two reservoirs by the pumped storage operations of the Fairfield Development. Fairfield Development's alternate cycles of generation and pumping results in daily fluctuations in the water levels of both Monticello and Parr Reservoirs. Monticello, when beginning at normal maximum pool elevation, drops 4.5 to 5 feet over a 10 to 12 hour period during the generating phase of operation. At the same time, the water from Monticello and from the Broad River is flowing into Parr Reservoir, causing it to rise as much as 10 feet. During the pumping cycle, the reverse occurs - the water level rises in Monticello Reservoir and drops in Parr Reservoir.

The Project boundary[3] encompasses land around each reservoir, extending between 50 and 200 horizontal feet from the high water mark. A 300-acre Recreation Sub-impoundment ("Recreation Lake") is situated adjacent to Monticello Reservoir and is included within the FERC Project

[2] The State of South Carolina considers Monticello Reservoir waters of the State and refers to it as "Lake Monticello".

[3] Standard License Article 5 requires licensees to acquire and retain sufficient property and rights to construct, maintain, and operate their projects, as identified in their specific license, including any property or rights needed to accomplish all designated project purposes. As such, Project lands are those lands within the FERC project boundary owned by SCE&G in fee title and those lands for which SCE&G has acquired or retained an easement.

boundary. This lake was constructed by South Carolina Electric & Gas Company ("SCE&G") solely for recreational use. The Recreation Lake is unaffected by operational reservoir fluctuations on Monticello Reservoir.

SCE&G manages SCE&G-owned lands within the Project boundary to comply with the FERC license for the Project (the "License"). The goal of project land management is to serve the public interest by providing recreational access and opportunities, protecting wildlife habitat and water quality, producing electricity, and protecting and preserving cultural and aesthetic resources. The Shoreline Management Plan ("SMP") provides a set of administrative policies, procedures, and practices by which SCE&G seeks to manage the Project shoreline to achieve these goals. Future proposals for specific shoreline related developments or activities will be reviewed for consistency with the SMP.

A draft of the initial Project SMP was filed with the ~~Commission~~ FERC in 1991. After several years of discussion and revisions, the initial SMP was approved by the ~~Commission~~ FERC on June 4, 2001. The history of the Project's SMP is described in more detail in Section 3.0 (History of the Shoreline Management Plan). The current relicensing[4] of the Project provides a near term impetus and opportunity for SCE&G to review the existing SMP in cooperation with relicensing stakeholders, including federal and state regulatory agencies, interested non-governmental organizations ("NGO"s), and individuals. Through discussions with these parties, it was decided that the existing FERC approved SMP, which encompasses both Monticello and Parr Reservoirs, should be divided into two distinct SMP's, one for each reservoir. Hence, this SMP has been prepared for Monticello Reservoir and is being submitted to FERC as part of SCE&G's Parr Hydroelectric Project comprehensive relicensing package. A SMP for Parr Reservoir is included under separate cover.

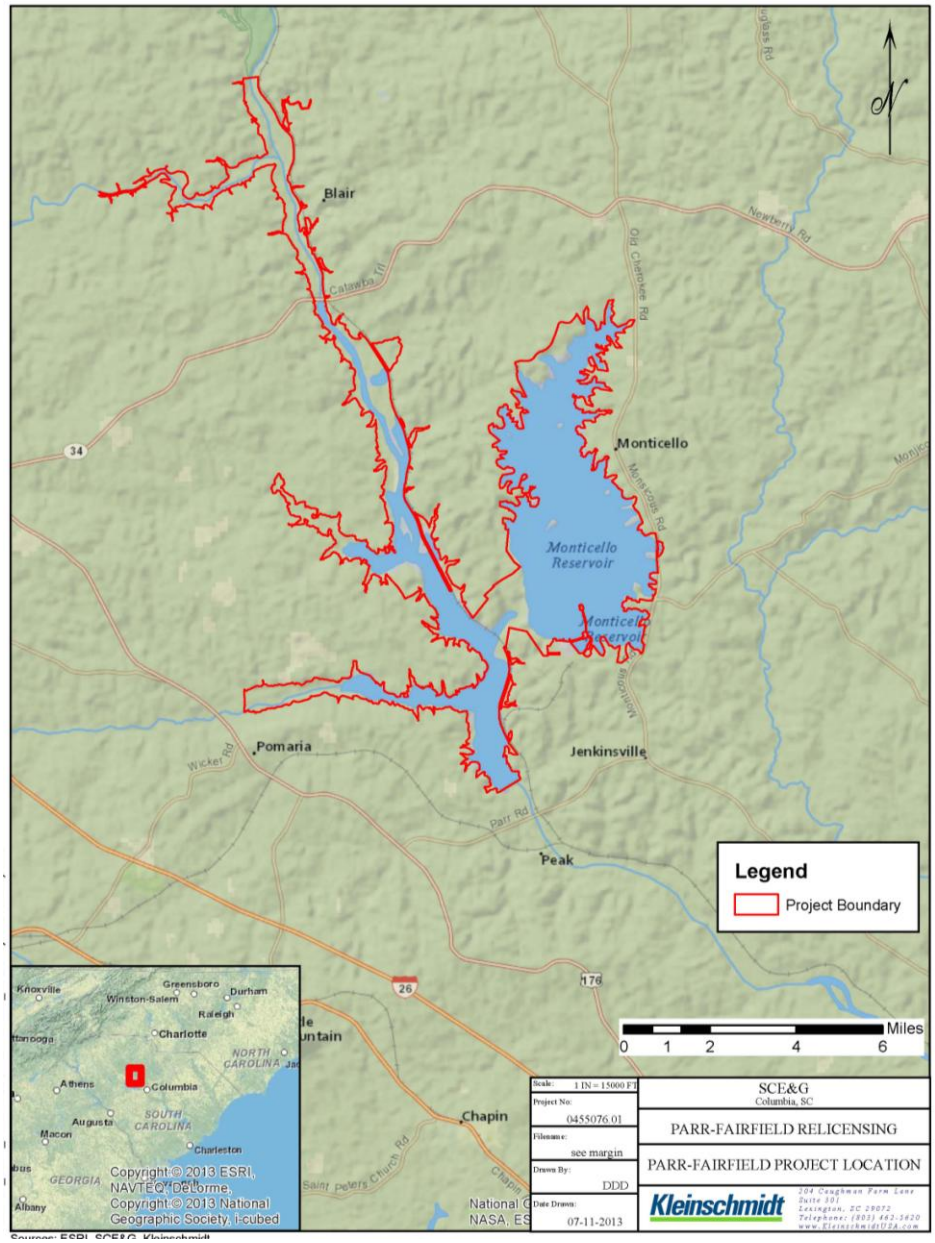
The management guidelines set forth in this SMP are applicable to all lands within the Project boundary surrounding Monticello Reservoir. Among other things, the current document includes the following components:

- Detailed descriptions, management prescriptions and mapping of land classifications;
- Summary information on the Permitting Handbook and fee policies;

[4] The current operating license for the Project is due to expire on June 30, 2020. As such, SCE&G will file for a new license with FERC on or before June 30, 2018.

- Best management practices ("BMP"s);
- Public education and outreach;
- Reservoir monitoring; and,
- A proposed review process.

FIGURE 1-1: PROJECT LOCATION AND BOUNDARY MAP



2.0 PURPOSE AND SCOPE OF THE SHORELINE MANAGEMENT PLAN

The Project has served as a major source of power generation for SCE&G's customers and recreation for local residents and visitors to South Carolina for several decades. Consistent with FERC's Standard Land Use Article, a licensee may authorize specific non-project uses and occupancies of a project's shoreline. Examples of non-project uses at Monticello Reservoir include residential boat docks, boat lifts, access paths across SCE&G property, and erosion control structures. SCE&G has a responsibility to ensure that non-Project uses remain consistent with Project purposes, including protection and enhancement of the Project's scenic, recreational, and environmental values.

As development increases in areas surrounding the Project, so too does stress placed upon Project reservoirs and the surrounding watershed. Thus, a comprehensive SMP for each reservoir that recognizes and addresses sources of potential environmental impact is essential to managing each reservoir for the benefit of all interests and to ensure that non-Project uses remain consistent with the License.

The implementation of the SMP by SCE&G will help to maintain and conserve the area's natural and man-made resources. The SMP will comply with the terms of the License, as well as the regulations and orders of FERC, and is intended to assist in providing a balance between recreational use and development, environmental protection, and energy production.

3.0 HISTORY OF THE SHORELINE MANAGEMENT PLAN

On August 28, 1974, the Federal Power Commission (FPC), predecessor to the FERC, issued SCE&G a new License for the Parr Hydroelectric Project. In addition to relicensing the existing 14.88 megawatt (MW) Parr Shoals Development, the new License authorized the construction of the 511.2 MW Fairfield Pumped Storage Development. This resulted in the creation of the Fairfield Development's upper pool, Monticello Reservoir. The new License also authorized the enlargement of the existing Parr Reservoir to serve as the lower pool to the Fairfield Development. This involved raising the height of Parr Dam approximately 9 feet, thereby nearly doubling Parr Reservoir's surface area. The construction of newly licensed facilities was completed in 1978, with the facilities beginning commercial operation that same year (F.P.C., 1974).

Article 48 of the Project License issued in 1974 required that SCE&G purchase in fee and include within the project boundary all lands necessary or appropriate for project operations, including lands for recreational use and shoreline control. The lands encompassed by the project boundary shall include, but not be limited to: the islands in the Parr and Monticello Reservoirs formed by the 266-foot and 425-foot contour intervals, respectively; shoreline lands up to the 270-foot contour, or 50 feet (measured horizontally) from the Parr Reservoir's 266-foot contour, whichever is greater; and, shoreline lands up to the 430-foot contour interval, or 50 feet (measured horizontally) from Monticello Reservoir's 425-foot contour, whichever is greater. Provided that the Project boundary, except with respect to land necessary or appropriate for recreational purposes, shall not exceed 200 feet, horizontally measured, from the 266-foot or the 425-foot contour, unless satisfactory reasons to the contrary are given. This area is referred to as the "Buffer Zone". The FPC determined that acquiring these lands would provide SCE&G with adequate shoreline control around the reservoirs, in addition to serving the purposes of Project operation and recreation (F.P.C., 1974).

Comment [b2]: Bill A to provide additional wording from Article 48.

Comment [b3]: Take out reference to Buffer Zone, just refer to Project property.

Furthermore, Article 20 of the Project License orders that SCE&G allow public access, to a reasonable extent to Project waters and adjacent Project lands (with the exception of lands necessary for the protection of life, health, and property) for navigation and outdoor recreational purposes. This Article also allows SCE&G to grant permits for public access to the reservoirs subject to FERC approval (F.P.C., 1974).

In 1991, SCE&G recognized that appropriate policies and procedures should be in place to govern shoreline activities at the Project. Utilizing experience gained at their Saluda Hydroelectric Project (FERC No. 516), SCE&G filed a proposed SMP with the Commission to regulate the use of Project shorelines. After extensive stakeholder consultation, an amended SMP was filed with the Commission. It was approved on June 4, 2001. The SMP was included as part of the Project's Exhibit R (FERC, 2001).

The SMP approved in 2001 primarily covered activities associated with Monticello Reservoir. It dealt with the following matters: water quality management; forest management; waterfowl management; nuclear exclusion zone restrictions for the operation of SCE&G's V.C. Summer Nuclear Station; fishing, boating, and hunting; public access and recreation; private boat docks and access; vegetation removal; water withdrawal; erosion control; and prohibited activities.

In 2006, SCE&G amended the SMP's policy regarding common docks. The original policy allowed for two to five adjacent property owners to share a single common dock if the shoreline frontage requirement of 200 feet was met. The policy was amended to allow no more than two individual, adjacent single family residential lots to share a common dock. The shoreline frontage requirement of 200 feet was retained.

3.1 CURRENT SMP DOCUMENT AND SHORELINE CLASSIFICATIONS

The SMP serves as a reference document for SCE&G in implementing the Standard Land Use Article, which authorizes SCE&G to permit certain non-project uses of project lands and waters. FERC did not begin including the Standard Land Use Article in new licenses until the early 1980's; thus it was not included in the Project License issued in 1974 (FERC, 2012). However, FERC granted SCE&G the specific authority to permit certain non-Project uses through the approval of the 2001 SMP, and added the Standard Land Use Article to the License (Article 62) in 2011, as revised in 2013 (Article 63). This present document, submitted in conjunction with SCE&G's License application, presents a management plan, covering only Monticello Reservoir (a SMP for Parr Reservoir is included under separate cover), while adhering to the historical management goals agreed to and developed with agencies and stakeholders.

In addition to an updated SMP for each Project reservoir, a Permitting Handbook was developed in consultation with stakeholders and agencies to address activities requiring consultation with and/or permits from SCE&G. These activities include, but are not limited to the following:

construction, maintenance, and placement of docks and boat lifts; shoreline stabilization; construction and maintenance of lake access pathways; limited brushing; and other shoreline activities. SCE&G will review the Permitting Handbook with interested stakeholders periodically to evaluate its effectiveness; however, SCE&G may make changes to the permitting process at any time as it determines in its sole judgment to be necessary and appropriate.

3.2 PROJECT BOUNDARY

Comment [b4]: Reword to address Article 48 condition. Bill A to provide

SCE&G owns all lands within the Project boundary surrounding Monticello Reservoir. As noted, this area ~~is referred to as the "Buffer Zone" and may~~ encompasses but is not limited to an area up to the 430-foot contour or measuring up to 50 feet but no greater than 200 feet horizontally from the 425-foot contour on Monticello Reservoir, whichever is greater.

3.3 ~~ACREAGE OF PROJECT LANDS~~ (SECTION TO BE MOVED TO TABLE UNDER SECTION 5.0)

4.0 SHORELINE MANAGEMENT PLAN GOALS AND OBJECTIVES

The overall goal of this SMP is to define, document, and present the processes and criteria that SCE&G will employ to manage and balance private and public access to and uses of Project lands, specifically including Monticello Reservoir's shoreline, consistent with public safety, energy production operations, environmental protection for Project land as well as Project waters, and reasonable recreational opportunities. This SMP will help to ensure the protection and enhancement of the Project's scenic, environmental, recreational, natural and cultural resources over the term of the License.

This SMP represents a consensus-based, updated management plan intended for submittal with the Project No. 1894 License Application. Specific goals relative to the SCE&G relicensing process that are discussed under this SMP include the following:

1. Provide for reasonable current and future public access;
2. ~~Preserve opportunities~~Provide for current and future ~~to meet~~ recreational needs within the Project;
3. Protect fish and wildlife habitat;
4. Protect cultural resources;
5. Protect the ability to meet operational needs;
6. Facilitate compliance with License articles;
7. Minimize adverse impacts to water quality;
8. Monitor and address erosion;
9. ~~Minimize adverse, manageable~~Protect scenic ~~impacts~~values;
10. ~~Guide the control and~~ Monitor and permit~~ting of~~ shoreline activities ~~development~~;
11. Provide a summary catalogue of the types and locations of existing recreational opportunities;
12. Establish Land Management Classifications and Land Use Prescriptions to help in the management of non-Project uses of the Monticello Reservoir shoreline lands within the Project boundary;
13. Describe the SMP amendment and monitoring process; and
14. Educate and encourage property owners who own property adjacent to or adjoining Project Property (herein referred to as "adjacent property owners") on the use of voluntary BMPs.

4.1 CONSULTATION

The Project relicensing provides an opportunity for SCE&G to seek input on Project-related shoreline management issues from interested stakeholders. SCE&G recognizes that successfully completing the relicensing process requires identifying and resolving Project issues in consultation with federal and state resource agencies, local and national NGOs, homeowner associations, and individuals who have an interest in the Parr Hydroelectric Project (Table 4-1: ~~Table 4-1~~). SCE&G began public outreach efforts in January 2013 by holding a series of public workshops in Winnsboro, Newberry, Columbia, and Jenkinsville, SC. Since that time, SCE&G has sought active public involvement in the process and fostered commitment to issue resolution among SCE&G and stakeholders.

TABLE 4-1: PARTICIPATING GROUPS IN PARR HYDROELECTRIC PROJECT RELICENSING

STAKEHOLDER GROUPS
American Rivers
American Whitewater
Catawba Indian Nation
City of Columbia
Chestnut Hill Plantation HOA
Coastal Conservation League
Congaree Riverkeeper
Environmentalists Inc.
Fairfield County
Gills Creek Watershed
National Marine Fisheries Service
National Park Service
Newberry County
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
South Carolina Department of Parks, Recreation and Tourism
South Carolina Electric & Gas Company
South Carolina Historic Preservation Office
Town of Winnsboro, SC
Tyger-Enoree River Alliance
United States Fish and Wildlife Service
United States Forest Service
University of South Carolina

4.1.1 RECREATION/LAKE AND LAND MANAGEMENT RESOURCE CONSERVATION GROUP

In support of the relicensing effort, SCE&G formed three Resource Conservation Groups ("RCG"s) to identify, address and resolve Project-related issues by resource area. The RCGs are as follows: the Fish, Wildlife and Water Quality RCG; the Project Operations RCG; and the Lake & Land Management and Recreation RCG. Consideration of potential issues by resource area allows for more focused topic discussion and targeted issue resolution. Some RCGs have established sub-groups, or Technical Working Committees ("TWC"s), for issues requiring special knowledge, education, or experience. Consequently, the Lake & Land Management and Recreation RCG has a Lake and Land Management TWC as well as a Recreation TWC. The Lake and Land Management TWC is discussed further below.

4.1.2 LAKE AND LAND MANAGEMENT TECHNICAL WORKING COMMITTEE

The primary mission of the Lake and Land Management TWC is to revise the existing Parr Hydroelectric Project SMP to provide a management framework within which Project resources can be effectively protected while assuring appropriate public and private access to the Project resources and the recreational opportunities they present. Another important focus of the TWC is to allow interested parties an effective opportunity to provide input on resource issues and the overall future management of shoreline resources. The resulting collaboration has resulted in the contribution of valuable information by entities and individuals familiar with the Project. The forum was instrumental in addressing important issues relevant to the operation and management of the Project over the term of the new License. In working collaboratively, the members of the TWC (Table 4-2~~Table 4-2~~) aimed to blend the objectives of the state and federal resource agencies with other stakeholder interests.

TABLE 4-2: ORGANIZATIONS PARTICIPATING ON THE LAKE AND LAND MANAGEMENT TWC

STAKEHOLDER GROUPS
American Rivers
American Whitewater
Coastal Conservation League
Congaree Riverkeeper
Fairfield County
Gills Creek Watershed
Adjacent Property Owners

STAKEHOLDER GROUPS
National Marine Fisheries Service
National Park Service
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
South Carolina Department of Parks, Recreation and Tourism
South Carolina Electric & Gas Company
Tyger-Enoree River Alliance
United States Fish and Wildlife Service
United States Forest Service

4.1.3 MEETING SCHEDULES

Between October of 2013 and January of 2018, SCE&G has held ~~over X~~numerous meetings of the Lake and Land Management and Recreation RCG and Lake and Land Management TWC to discuss the details of the Project SMPs. The efforts of the TWC are reflected herein.

5.0 LAND USE CLASSIFICATIONS

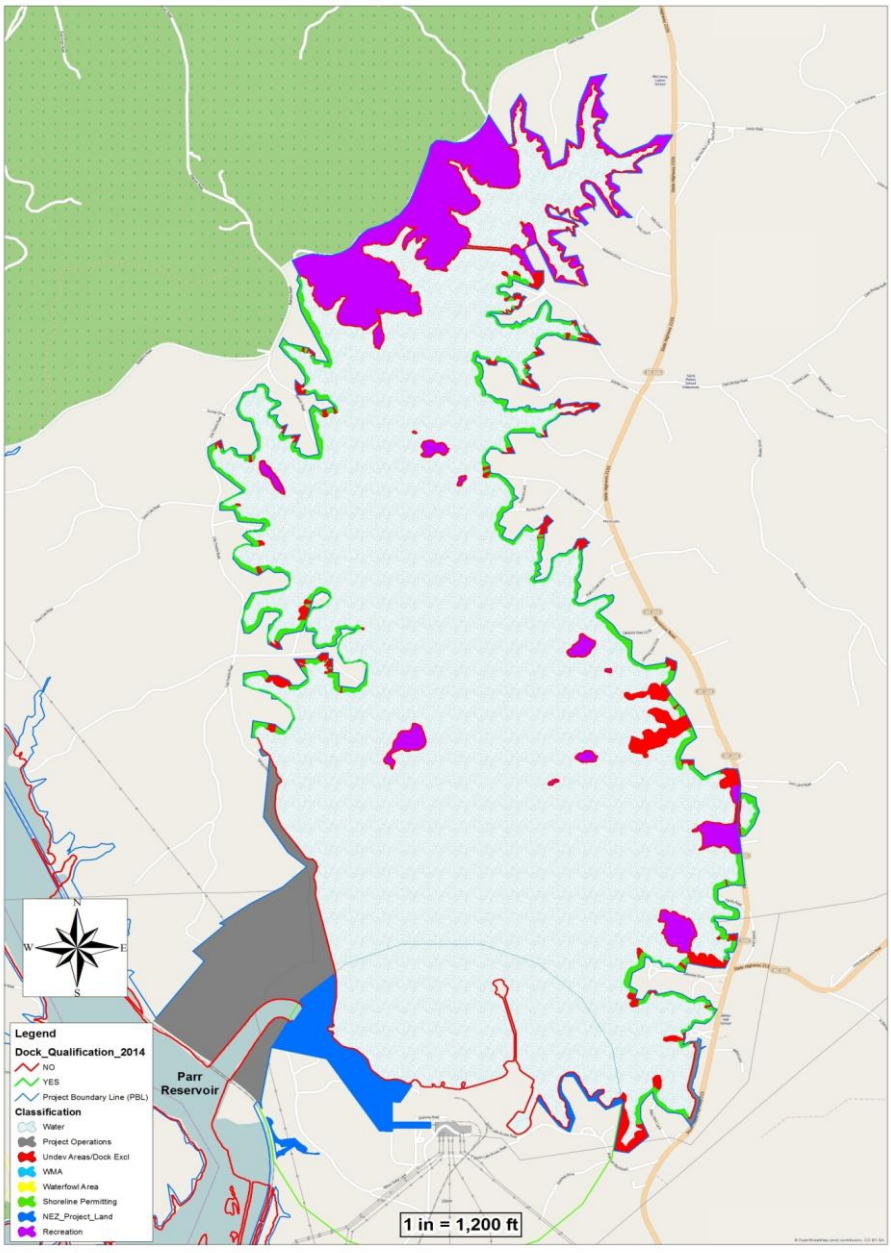
Five distinct land management classifications have been developed for the shorelines surrounding Monticello Reservoir. These land management classifications are as follows: Project Operations; Nuclear Exclusion Zone; Shoreline Permitting; Public Recreation; and, ~~Undeveloped Areas/Dock Exclusion~~Non-Development Areas. The Public Recreation Classification includes designated public recreation areas, the Recreation Lake, and all islands on Monticello Reservoir. Although SCE&G intends to manage its lands according to this classification system, the public generally will not be precluded from access to SCE&G-owned lands regardless of classification, with the exception of lands reserved and used for Project operations, lands/areas within the Nuclear Exclusion Zone, or other areas specifically protected from public access and posted as such. The sections below explain/define the land management classifications. The acreages and parcels for each of the classifications are provided in Table 5-1: ~~Table 5-1~~. Figure 5-1~~Figure 5-1~~ depicts their distribution around Monticello Reservoir.

TABLE 5-1: SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION

CLASSIFICATION	SHORELINE MILES	ACRES
Project Operation	2.47	457
Nuclear Exclusion Zone	5.43	184
Shoreline Permitting	21.46	238
Public Recreation*	18.73	895
~~Undeveloped Areas/Dock Exclusion~~Non-Development	8.14	145
Total	**56.23**	**1,919**

* - Includes the shoreline surrounding the Recreation Lake and all islands

FIGURE 5-1: SHORELINE CLASSIFICATIONS MAP FOR MONTICELLO RESERVOIR



5.1 PROJECT OPERATIONS

Areas under this classification include SCE&G-owned and managed lands required for operation of the Fairfield Development. Public access to these lands is restricted to ensure public safety or to assure the security of the infrastructure system.

5.2 NUCLEAR EXCLUSION ZONE

In addition to its use as part of the Fairfield Development, Monticello Reservoir provides cooling water for the V.C. Summer Nuclear Station located on its shore (authorized under 52 F.P.C. 537 [1974]). The Nuclear Exclusion Zone consists of the area surrounding the V.C. Summer Nuclear Station between the Project boundary line and shoreline and a specified area within Monticello Reservoir where SCE&G as the reactor licensee has the authority to determine all activities, including exclusion or removal of personnel and property. This area is designated by warning signs on the landward side and by buoys on the lakeward side. Admittance to this area is restricted in order to comply with licensing requirements administered by the Nuclear Regulatory Commission.

5.3 SHORELINE PERMITTING

It is the policy of SCE&G to authorize certain private uses of and/or acts within the ~~Buffer Zone~~Project boundary by permit when such uses or acts are consistent with the public interest and comply with the requirements of the Project License. Areas within the Shoreline Permitting Classification may be eligible for certain private residential or residential associations' uses upon approval by SCE&G. This does not include commercial activities.

5.4 PUBLIC RECREATION

Project lands under this classification serve as recreational resources for the public and include areas managed expressly for recreation as well as those with recreation as a secondary usage. Public recreation lands include the following:

- Public boat launches, and other areas currently being managed as public access;
- Islands owned by SCE&G;
- Properties owned by SCE&G that are set aside for future recreational development.
- Recreation Lake
- ~~Wildlife Management Areas ("WMA") (Water Only)~~

Comment [b5]: Add sub-sections that discuss each of these bullets.

5.4.1 ISLANDS

There are 8 islands within Monticello Reservoir, all of which are available for public recreational use in accordance with authorized activities (see Permitting Handbook for authorized activities).

5.4.2 RECREATION LAKE

The Recreation Lake is located at the north end of Monticello Reservoir and is approximately 300 acres and 10 miles of shoreline. The Recreation Lake was constructed to provide stable water fisheries and recreation opportunities.

~~**5.4.3 WILDLIFE MANAGEMENT AREA (WATER ONLY)**~~

~~The waters of Monticello Reservoir, excluding the Recreation Lake, are included in the South Carolina Department of Natural Resources ("SCDNR") statewide WMA Program. These areas are open to the public for hunting or other recreational activities. The designation for WMA allows hunting on or in the water only and not on adjacent land. For additional information on these areas please visit the SCDNR website at http://dnr.sc.gov/wma/index.html.~~

5.5 NON-DEVELOPMENT ~~UNDEVELOPED AREAS/DOCK EXCLUSION~~ AREAS

~~Project lands under this classification are protected from private developmental uses. This is done for the protection of the environmental and aesthetic integrity of the shoreline.~~ Lands under this classification warrant special protection because they may provide important habitat, aesthetic values, or other significant Project characteristics.

Comment [WU6]: I think we should discuss clarifying the acreage associated with this classification. The table lists a total of 898 acres in recreation, but we know there are 6,800 acres of water in this classification(water only).

Comment [ACJ7]: I believe that include the water with the land classifications is a bit confusing. My suggestion is to move the WMA water discussion under Section 12.3 (Public Education and Outreach).

Comment [b8]: Make sure classisifcation is consistent throughout document.

6.0 LAND USE PRESCRIPTIONS

Land use prescriptions are based upon and reflect the guiding principles regarding the management of the SCE&G-owned lands within each classification. SCE&G publishes a detailed Permitting Handbook (included under separate cover) that contains descriptions of the permitting processes and specifications for various shoreline developments. Activities that require consultation with and/or permits from SCE&G include the following: construction, maintenance and placement of docks and boat lifts, shoreline stabilization; construction and maintenance of shoreline pathways, and other shoreline activities. Persons interested in shoreline development must contact SCE&G's Lake Management Department (803) 217-9221, or at https://www.sceg.com/about-us/lake-murray (see Lake Monticello Dock Permits Application), to obtain permitting guidance and a copy of the Permitting Handbook. Section 8.0 of this document discusses the Permitting Handbook in greater depth. General information regarding permitting requirements is included where applicable within the scope of each management prescription below.

Comment [ACJ9]: SCE&G is working on getting a webpage set up just for Monticello. Therefore the link will change.

6.1 PROJECT OPERATIONS

Properties classified as Project Operation contain project works critical to the operation of the Fairfield Development. Public access to, or activities upon, these lands is restricted for reasons of safety and security.

Comment [b10]: Check grammer

6.2 NUCLEAR EXCLUSION ZONE

Properties and waters classified as Nuclear Exclusion Zone contain project works/areas critical to the operation of the V.C. Summer Nuclear Station. Public access to, or activities within~~,~~ these lands is restricted for reasons of safety and security.

Comment [b11]: Check grammer

6.3 SHORELINE PERMITTING

Residential landowners whose property adjoins lands within the Shoreline Permitting classification may be eligible for access to Monticello Reservoir by a single meandering path and a dock/boat lift upon written consent from SCE&G's Lake Management Department through its permitting program. SCE&G may allow such structures within this classification, but strictly regulates their placement and construction. Shoreline stabilization and water withdrawal for

~~non-commercial agricultural/~~residential ~~landscaping~~ irrigation purposes are also acceptable permitted activities in this classification.

To address aspects of shoreline structures, SCE&G has developed permitting application procedures and associated dock specifications guidelines. These guidelines are detailed in SCE&G's Permitting Handbook.

6.4 PUBLIC RECREATION

Project lands devoted to public recreation include developed park sites, properties set aside for future recreational development, and islands on Monticello Reservoir owned by SCE&G. With the exception of the islands, which are maintained in their natural condition, SCE&G manages the areas based on the specific, designated recreational activities for each, including swimming, fishing, picnicking, and boat launching[5]. SCE&G developed and maintained access areas on Monticello Reservoir are depicted in Figure 12-1~~Figure 12-1~~. Private permitted activities, other than those noted under the Recreation Lake Section (Section 6.4.2) are excluded.

6.4.1 ISLANDS

SCE&G owns all of the islands on Monticello Reservoir and they are available for passive public recreational use, such as fishing, walking and bird watching. Hunting is prohibited on the islands.

Comment [b12]: Add footnote for definition of passive.

6.4.2 RECREATION LAKE

The park area at the Recreation Lake offers fishing, swimming and picnic facilities. Regulations for its use are posted at the park site. The swimming/beach area is closed October through March. The boat launch area is open every day, all year long. No private docks or boat ramps will be permitted on the shoreline of the Recreation Lake. Meandering paths and water withdrawals for residential irrigation only may be considered on a case-by-case basis.

~~**6.4.3 WILDLIFE MANAGEMENT AREA (WATER ONLY)**~~

Comment [ACJ13]: Suggestion to delete this section and move this wording down to Section 12.3

~~The waters of Monticello Reservoir are designated as a category II waterfowl management area and are available for public waterfowl hunting. Permitted activities are excluded from this classification. and wildlife management as part of the SCDNR statewide WMA Program. A South Carolina WMA permit is required, and These public hunting areas are shown on WMA~~

[5] The waters of Monticello Reservoir, excluding the Recreation Lake, are available for public waterfowl hunting as discussed under Section 12.3.

~~Maps available through the SCDNR. Permitted activities are excluded from this classification. A WMA permit is required to hunt in areas with this designation. Regulations pertaining to Monticello Reservoir are available at SCDNR's website at: http://dnr.sc.gov/wma/index.html, or by contacting SCDNR at:~~

~~Waterfowl and Hunting Regulations~~
~~S.C. Department of Natural Resources~~
~~Wildlife and Fresh Water Fisheries~~
~~1000 Assembly Street~~
~~Columbia, South Carolina 29201~~
~~Telephone: 803-734-3886~~

6.5 ~~UNDEVELOPED~~ NON-DEVELOPMENT AREAS ~~/DOCK EXCLUSION AREAS~~

~~Lands under this classification warrant special protection because they may provide important habitat or aesthetic values. Water withdrawals may be considered on a case-by-case basis. Private permitted activities, other than water withdrawals on a case-by-case basis, are excluded in this classification.~~ SCE&G will not permit private shoreline development for Project lands under this classification.

7.0 SHORELINE ACTIVITIES REQUIRING SCE&G APPROVAL

SCE&G maintains a strong commitment to managing the shoreline of Monticello Reservoir for multiple resources by considering the impact of various activities on the environmental, aesthetic, and recreational character of the lands. SCE&G owns and manages the ~~Buffer Zone~~Project lands around the entire periphery of Monticello Reservoir and the Recreation Lake. Thus, any activity occurring on the "shoreline" is occurring on SCE&G property. Any activity not in compliance with the shoreline activity parameters outlined in this SMP and in the Permitting Handbook constitutes a trespass which SCE&G may elect to prosecute.

7.1 AUTHORIZED ACTIVITIES REQUIRING APPROVAL THROUGH THE PERMITTING HANDBOOK

Only the following activities and structures may be permitted on Monticello Reservoir:

- Construction or modification to private docks and boat lifts;
- Construction of a meandering access path and associated vegetation removal;
- Shoreline stabilization methods (including rip-rap and bio-engineering);
- Water withdrawal ~~for non-commercial agricultural/landscaping irrigation purposes~~.

Comment [b14]: Remove boat lifts throughout document

Comment [b15]: Make this change to reference water withdrawal only throughout document

7.2 PROHIBITED STRUCTURES AND ACTIVITIES

Activities and structures that SCE&G does not allow include, but are not limited to, the following:

- Roofs or covers over docks;
- Boat slips;
- Jet skis;
- Water skiing;
- Boathouses;
- Fueling facilities on a dock;
- Private boat ramps;
- Mooring;
- Houseboats;
- Watercraft exceeding 30 feet in length;

- Watercraft with marine sanitation devices ("MSD") ~~are permitted on Monticello Reservoir~~;
- Excavations/dredging;
- Effluent discharges;
- Commercial marinas;
- Marine rails; ~~and,~~
- Sea walls~~.~~;
- Fences;
- Electrical service;
- Permanent structures other than permitted docks;
- Land-based structures, storage buildings, shelters, patios, gazebos, fences, swimming pools, satellite dishes, signs, storage of boats, camper trailers, canoes or other watercraft, motor homes or automobiles;
- Septic tanks and/or drain fields;
- Planting of grass except as a permitted erosion control measure;
- Storage or stockpiling of construction material;
- Vegetation removal of any type except in a permitted access path to the shoreline; and,
- Limbing or trimming of ~~Buffer Zone~~ vegetation within the Project boundary to create views or visual corridors.

8.0 PERMITTING PROCESS FOR SHORELINE ACTIVITIES OR STRUCTURES

8.1 ~~LAND MANAGEMENT CLASSIFICATION OF PROPOSED PROJECT LOCATION~~ (SECTION REMOVED FROM DRAFT)

8.2 ~~ALLOWABLE AND PROHIBITED FACILITIES AND USES FOR PROPOSED PROJECT LOCATION~~ (SECTION REMOVED FROM DRAFT)

8.3 SHORELINE PERMITTING PROCEDURES

Applicants must obtain the proper permit(s), per the SCE&G's Permitting Handbook, prior to the initiation of any construction or activity on the Monticello Reservoir shoreline, which consists of the lands ~~below the 425 foot contour interval and designated Buffer Zones~~within the Project boundary. As noted above, some activities may also require local, state, and/or federal permits

Whether a non-Project use is approved under the Standard Land Use article or through ~~prior~~ Project-specific FERC approval, SCE&G is responsible for ensuring that the use is consistent with the purposes of protecting or enhancing the scenic, recreational, and other environmental values of the Project. To assist applicants in the permitting process, the staff at the SCE&G Lake Management Department is available to answer questions regarding documentation, permits, and specification requirements for their particular project. Permits from SCE&G are required for the following activities:

- Construction of a meandering access path;
- Water withdrawal for ~~non-commercial agricultural/landscaping~~residential irrigation purposes.
- Installation/application of shoreline stabilization; and,
- Installation of private docks ~~and boat lifts~~.

It is highly advisable to begin the consultation process with SCE&G Lake Management staff at the planning stage of a project. SCE&G staff will be available to discuss specific permitting requirements with the property owner. Depending on the proposed new facility or activity, local, state and federal resource agencies may impose requirements on construction start/stop dates, the placement of erosion control devices, treatment plans, remedial measures, submittal of start

construction notifications, and/or BMPs. Any permit applicant should be aware of such conditions, as violations may nullify a permit.

An overview of permitted activities is included below. Detailed information on SCE&G's permitting process, guidelines, and specifications, is provided in SCE&G's Permitting Handbook available at https://www.sceg.com/about-us/lake-murray, under Lake Monticello Dock Permits Application, or by calling (803) 217-9221), or by writing:

Comment [ACJ16]: Website will change to be more specific to Monticello

SCE&G Lake Management Department
6248 Bush River Road
Columbia, SC 29212

8.3.1 DOCKS ~~AND BOAT LIFTS~~

A permit must be obtained from SCE&G Lake Management Department for the construction, installation, replacement of, or addition to any dock ~~or boat lift~~ prior to the start of the activity. The configuration and location of a dock will be determined during a site visit by an SCE&G representative. At a minimum, dock construction and location must not create a nuisance, or otherwise be incompatible with overall Project recreation use. Impact on navigation or an adjoining property owner will be a strong determining factor. Size, length, or orientation may be restricted, or a permit may be denied if the dock would interfere with navigation or unreasonably impact an adjoining property owner. Dock length may vary depending on curvature or slope of the shoreline or lot line configuration. Any variance (i.e. increase in size or length) from guidelines included in the Permitting Handbook will be evaluated as to the effects on navigation, aesthetic value, or impact on adjacent properties and may be denied if in SCE&G's sole judgment the effects and impacts warrant denial. No dock will be permitted in narrow cove areas, which are defined to be areas where the distance across the water from one shoreline to the other at the 425-foot contour (normal high water level) is less than 200 feet. Only one dock will be permitted on a single-family lot[6]. Please see the Permitting Handbook for additional requirements.

[6] SCE&G does not guarantee usable water access to the waters of Monticello Reservoir at any time. Each lot along the shoreline will have different slopes and contours that will determine water depth in front of the lot. The Monticello Reservoir is a pumped storage project that can fluctuate vertically up to 4.5 feet over a 10 to 12 hour period during generation and pumping phases. The fluctuation of the reservoir will, at times, limit or restrict the use of most docks on the Monticello shoreline.

General boat dock design may involve either fixed or a combination of fixed and floating structures. Common docks are encouraged and may be mandated for all adjacent property owners as an alternative to individual docks and will be required on property with inadequate property line frontage (property line frontage requirements included in Permitting Handbook), or in such other circumstances that SCE&G deems appropriate. Dock layout ~~figures~~ specifications are included in the Permitting Handbook.

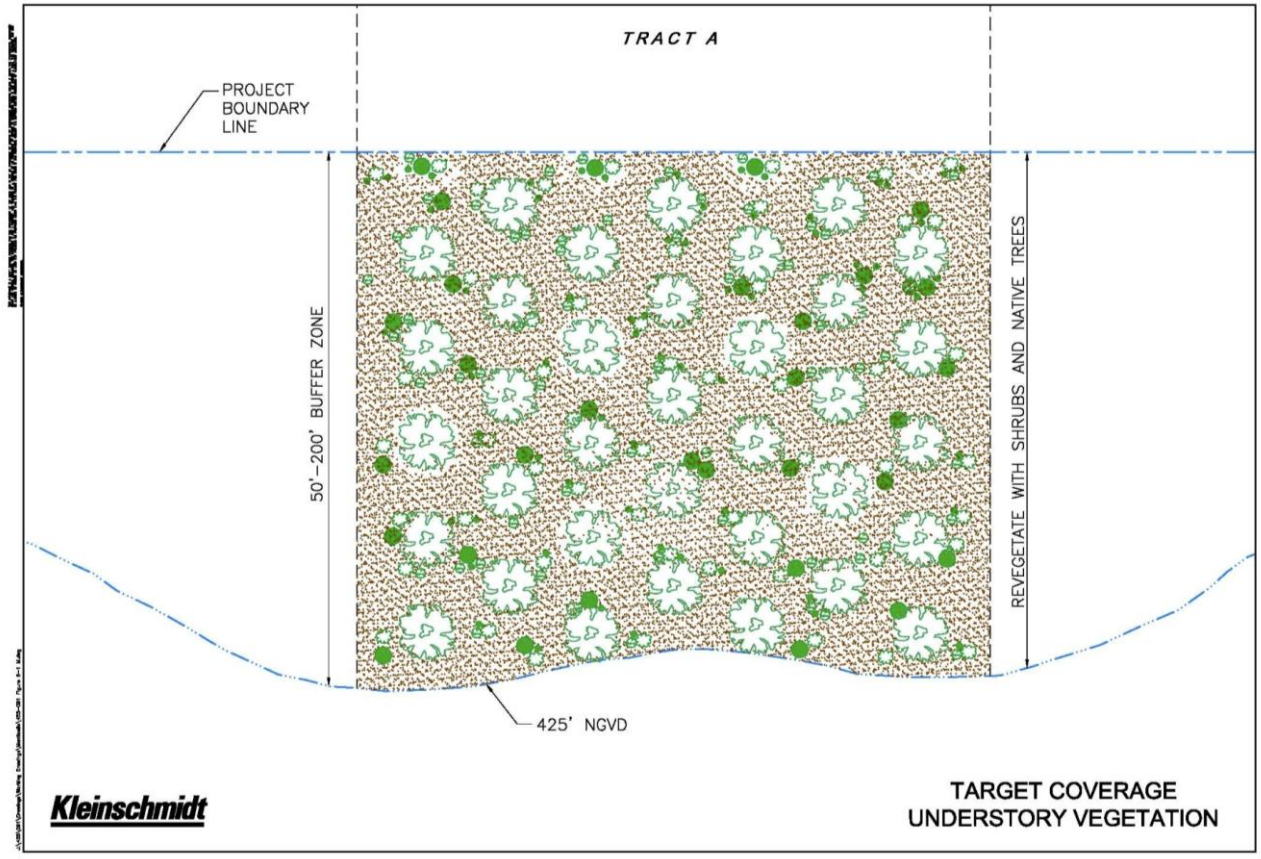
Docks generally will not be permitted on shoreline affected by significant erosion or steep slopes. Applicants may submit a request for approval accompanied by a plan to address ~~unless the applicant agrees to provide approved~~ shoreline erosion ~~control devices. This~~ that can ~~must~~ be accomplished without the clearing of vegetation or disturbance of shallow water habitat. ~~Even if these conditions are agreed to,~~However, SCE&G ~~may~~ reserves the right, in its sole discretion, to deny a permit ~~if, in its sole discretion, it determines that the installation of a dock at that location would present too much negative impact~~.

The types of docks permitted include private individual and private common docks. See Permitting Handbook for more details describing dock permitting policies.

8.3.2 SHORELINE VEGETATION MANAGEMENT

In general, SCE&G maintains a policy of non-disturbance of any vegetation ~~below the 425 foot contour or within a Buffer Zone~~within the Project boundary without approval from SCE&G. Permission to remove vegetation within a permitted access path will only be granted by SCE&G Lake Management after a site visit with the applicant. Once clearing of the access path is completed according to the permit, the applicant may maintain the site in the permitted condition. Any unauthorized removal of shoreline vegetation may result in the cancellation of the dock and other permits issued by SCE&G as well as legal action. Violators may be required to replant and restore the disturbed area with such plantings and/or shoreline manipulation as SCE&G determines is necessary to mitigate and correct the situation. SCE&G will review areas that are currently manicured, or that were previously pasture land, and will meet with the adjacent property owner to develop re-vegetation plans as appropriate. See Figure 8-1~~Figure 8-1~~ for an example of target coverage for understory vegetation.

FIGURE 8-1: EXAMPLE OF TARGET COVERAGE FOR UNDERSTORY VEGETATION IN DISTURBED AREAS



8.3.3 ACCESS PATH (NEW SECTION)

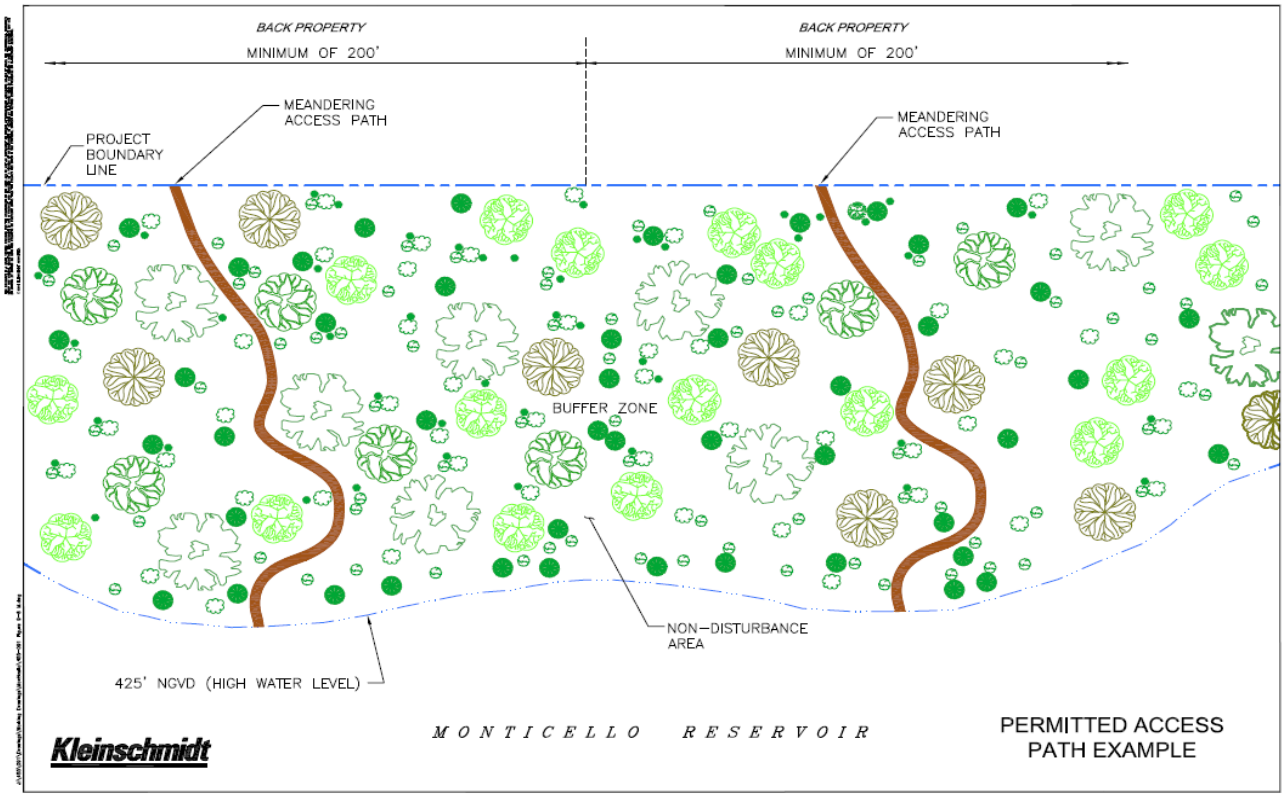
A single ~~pedestrian~~ access path may be cleared from the adjacent property owner's land upon approval of SCE&G. The access path must follow a meandering route to prevent erosion and to protect the aesthetics of the shoreline. No trees larger than 10-inches at breast height may be removed within the access path. A SCE&G Lake Management representative will identify and designate the location of all access paths. Access path restrictions are included in the Permitting Handbook. An example of a permitted access path is included as Figure 8-2~~Figure 8-2~~.

8.3.4 SHORELINE STABILIZATION

Shoreline erosion occurs in some areas where the reservoir shoreline is exposed to prolonged or recurrent wind and wave action. Such erosion, if significant enough, can lead to sedimentation in those areas of the reservoir, affecting aquatic habitats and drainage channels, stream channels, water intakes, and affecting the character of the reservoir in general. Provided it conforms to good engineering standards, as judged by it, SCE&G supports voluntary efforts to address shoreline erosion in the immediate area of docks or footpath access for adjacent property owners. To ensure that appropriate, effective techniques and materials are used, SCE&G monitors and controls erosion control projects on or directly affecting Project Property as detailed in the Permitting Handbook. Owners of property adjoining Project Property who wish to employ erosion control measures on or affecting Project Property must use SCE&G shoreline stabilization practices appropriate for the specific situation.

Because shoreline vegetation serves several important functions (i.e., soil integrity, wildlife habitat, water cleansing functions, and aesthetic value) SCE&G prefers to see employment of vegetative shoreline stabilization techniques to address soil erosion problems, whenever possible. These techniques may be referred to as bioengineering, and consist of installing living plant material as a main component in controlling problems of land instability. Plants used should consist of native species that, ideally, have been collected in the immediate vicinity of a project site to ensure that they are well-adapted to site conditions. The ultimate goal in using bioengineering techniques is to establish diverse plant communities to stabilize erosion prone areas through development of a vegetative cover and a reinforcing root matrix.

FIGURE 8-2: PERMITTED ACCESS PATH



Bioengineering techniques are least effective at sites with significant and prolonged exposure to strong currents or wind-generated waves. Stabilization of areas experiencing strong erosion pressure may also require the use of structural erosion control methods such as rip-rap. Areas with high-gradient banks or those in advanced stages of erosion may also benefit from such structural components. The optimal solution at a given location often involves combinations of techniques providing both structural and environmental benefits to the shoreline. A variety of bioengineering methodologies and devices are available to address erosion. Illustrations of erosion control designs that utilize both vegetation and structural elements are provided in Figure 8-3~~Figure 8-3~~ and Figure 8-4~~Figure 8-4~~. As depicted in the figures, rip rap can provide immediate shoreline stability, thereby enabling plantings to become established to add root-based soil integrity. Optimal erosion control designs must account for site specific slope and erosion pressure as well as homeowner/landowner preferences. Figure 8-5~~Figure 8-5~~ illustrates a site at which SCE&G's general guidance on using rip rap is followed. Bricks, blocks, tires, or materials other than rip-rap are prohibited as alternative shoreline stabilization material. SCE&G's Lake Management Department is available to provide the benefit of its knowledge and experience to help homeowners attempting to select the design right for them and the Reservoir environment.

FIGURE 8-3: EXAMPLES OF SHORELINE EROSION CONTROL DESIGNS UTILIZING BIOENGINEERING AND STRUCTURAL TECHNOLOGIES (A)

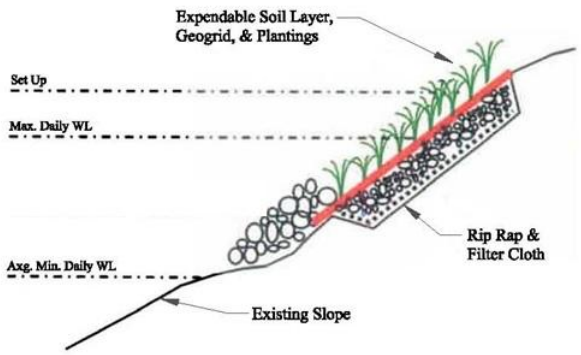


FIGURE 8-4: EXAMPLES OF SHORELINE EROSION CONTROL DESIGNS UTILIZING BIOENGINEERING AND STRUCTURAL TECHNOLOGIES (B)

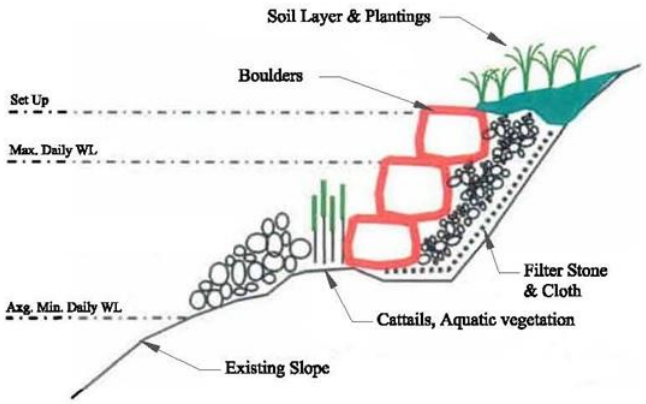
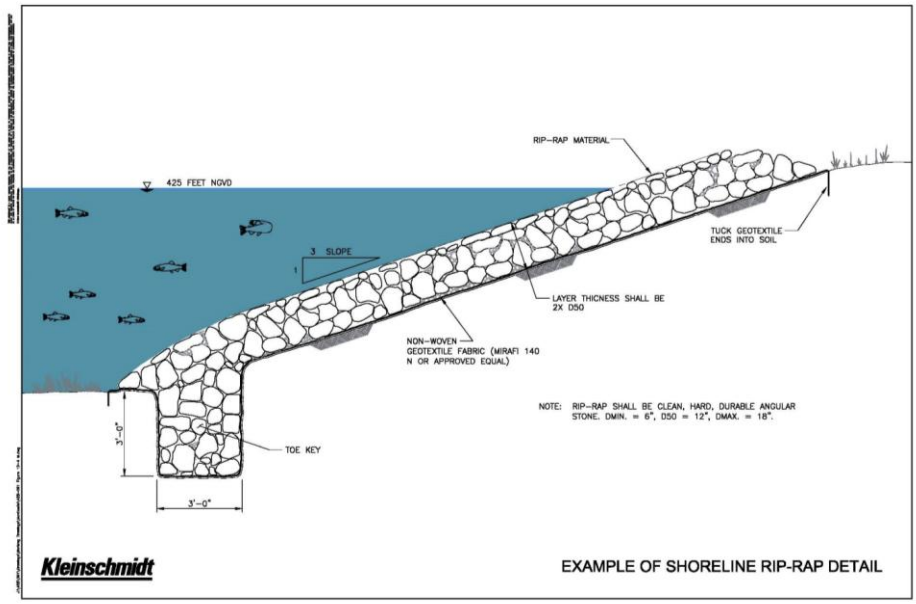


FIGURE 8-5: EXAMPLE OF SHORELINE RIP-RAP DETAIL



8.3.5 WATER WITHDRAWAL

~~Commercial and residential water~~ Water withdrawals requiring piping and other transportation/delivery equipment to be placed along the shoreline or in the littoral zone, are managed according to the terms of this SMP. Water withdrawal for residential property must be for irrigation purposes only. Permits are required, and will not be issued for any other purpose. Associated pumps and electrical service must be located outside SCE&G property. SCE&G reserves the right to prohibit withdrawal during times of drought or water drawdown.

Applications for a ~~commercial~~ permit to remove water must be submitted to SCE&G for review. ~~Large commercial water~~ Water withdrawal applications for greater than one million gallons per day (MGD) will be forwarded to the FERC for approval. Requests for withdrawal of one MGD or less may require agency consultation prior to approval. SCE&G may impose limits in granting permits for approved applications (see Permitting Handbook). The applicant may be required to bear the expenses of filing the application and will be required to compensate SCE&G for water withdrawn.

9.0 SCE&G PERMITTING FEE POLICIES

FERC allows licensees the right to charge reasonable fees to cover the costs of administering shoreline management programs, which add management responsibilities and associated costs to project operations. SCE&G administers its SMP in part through a permitting program, which does include a fee component. This ensures that activities occurring within the Project and in particular on Project land, are consistent with the overall goals for the Project, and that SCE&G's customers are not burdened with the full cost of administering programs that also have significant private, and often non-customer, benefit. Permit fees are due with applications and are required for docks, ~~boat lifts,~~ access paths, water withdrawal, and erosion control projects. Should an application be denied, associated permit fees will be returned. Periodic permit renewal fees may be required depending on the shoreline activity. ~~One-time and periodic permit~~ Permit fees for Monticello Reservoir shoreline activities are detailed in the Permitting Handbook. Failure to comply with this policy may result in, among other things, revocation of existing permits, fines, or legal action, as well as loss of consideration for future permits.

SCE&G will give reasonable public notice through appropriate communication avenues before changing the fee structure.

10.0 ENFORCEMENT OF SHORELINE MANAGEMENT PLAN

10.1 VIOLATIONS OF SHORELINE MANAGEMENT PLAN

SCE&G conducts periodic surveys of the Monticello Reservoir shoreline to inventory and inspect docks, ~~boat lifts,~~ access paths, and shoreline erosion control structures/projects. Lake Management representatives make note of unauthorized structures that they see, as well as urging residents and Reservoir visitors to report anything they believe to be unauthorized activity ~~below the 425 foot contour or within Buffer Zones~~within the Project boundary. Anyone believing that an activity violating the SMP is occurring is urged to contact SCE&G Lake Management at (803) 217-9221.

SCE&G Lake Management representatives will issue Stop Work Directives and/or Trespass Notices for any violations detected on SCE&G property. Any unauthorized clearing of trees or underbrush may result in the revocation of responsible parties' dock permits within 30 days if the violation(s) is (are) not corrected or a course of and schedule for corrective action has not been agreed to and approved by SCE&G. SCE&G may also commence legal action, if it deems it necessary, to require re-vegetation of the affected area. Removal of merchantable timber will require reimbursement to SCE&G subject to valuation of the Forestry Operations Department, including legally allowable "penalties." Consequences for violations may also include restrictions of access to SCE&G property, legal actions, fines, and loss of consideration for future permits.

11.0 SHORELINE MANAGEMENT PRACTICES

11.1 SCE&G SHORELINE MANAGEMENT PRACTICES

~~In addition to development activities, the environment around Monticello Reservoir is susceptible to impacts associated with residential and recreational activities. These include, for example only, improper fertilizer/pesticide use, boat maintenance, and debris disposal. Adjacent property owners can mitigate negative impacts otherwise associated with their property uses and instead make significant positive contributions to the Reservoir environment, and ultimately the watershed, by employing BMPs that preserve bank integrity and minimize non-point sources of pollution and contamination. Adjacent property owners should understand that using BMPs will help to preserve the scenic, environmental, and recreational qualities of the Reservoir that they so highly value. Examples of effective BMPs recommended to adjacent property owners are provided in the succeeding sections. SCE&G is available to provide more information and to assist landowners in determining effective BMPs for activities on their properties. Also, anyone may contact the Natural Resource Conservation Service or local county extension office (http://www.sc.nrcs.usda.gov/contact/).~~ SCE&G has established a set of management practices that apply to all of the lands included in the Project ~~B~~boundary. These practices are reflective of each of their developments unique qualities. The ~~current~~ management practices for the Fairfield Development (which includes Monticello Reservoir) ~~are~~ described ~~in this section~~herein, ~~but~~ may be reviewed and revised periodically during the period of the FERC license.

Comment [b17]: Define Project boundary earlier in the document.

11.1.1 FOREST MANAGEMENT SHORELINE MANAGEMENT PRACTICES (SECTION REMOVED FROM DRAFT)

Comment [b18]: Add back in as we do forest management within the PBL

11.1.2 ~~SHORELINE PERMITTING PROGRAM~~ (REMOVED, DISCUSSED IN SECTION 8.0)

11.1.3 SHORELINE STABILIZATION AND VEGETATION MANAGEMENT (REMOVED, DISCUSSED IN SECTION 8.0)

11.1.4 AQUATIC PLANT MANAGEMENT ACTIVITIES

Some species of aquatic plants can become significant nuisances to recreation and Project operations should their populations not be controlled. Some of the common problem species that may be found in Monticello Reservoir include hydrilla, water primrose, and several species of pondweed. When managing invasive and exotic aquatic plants it is important to also protect the aquatic ecosystems and fish habitat. This requires the integration and use of specific BMPs appropriate to the regional and local conditions.

SCE&G's Lake Management Department, in cooperation with the South Carolina Aquatic Plant Management Council, manages the Aquatic Weed Program on Monticello Reservoir. Because some aquatic weed control techniques can harm fish and native plant species if improperly used, it is unlawful, per state and federal regulations, for individuals to spray or treat aquatic growth in the waters of Monticello Reservoir. SCE&G joins with SCDNR to ask that any aquatic vegetation problems recognized by Reservoir visitors or adjacent property owners be reported to SCE&G's Lake Management Department and the SCDNR. In addition, to help curb the spread of invasive aquatic species, SCE&G joins with SCDNR to ask that Reservoir visitors examine their boats and trailers and remove all vegetation from boats and trailers before placing them into the waters of Monticello Reservoir and after removing them from Monticello Reservoir. This plea and advice also applies to every body of water in the State.

11.1.5 WOODY DEBRIS & STUMP MANAGEMENT (NEW SECTION)

Monticello Reservoir does not have a significant source of woody debris. ~~To the extent that w~~Woody debris and stump management ~~becomes an issue, it is~~are discussed in the Permitting Handbook.

11.2 LANDOWNER RECOMMENDED BMPS (NEW SECTION)

In addition to development activities, the environment around Monticello Reservoir is susceptible to impacts associated with residential and recreational activities. These include, for example only, improper fertilizer/pesticide use, boat maintenance, and debris disposal. Adjacent property owners can mitigate negative impacts otherwise associated with their property uses and instead make significant positive contributions to the Reservoir environment, and ultimately the watershed, by employing BMPs that preserve bank integrity and minimize non-point sources of pollution and contamination. Adjacent property owners should understand that using BMPs will

Comment [b19]: Explore options used by SCE&G to control aquatic plants. SCE&G prohibits spraying herbicides on Monticello.

Comment [b20]: Add link to SCDNR website For aquatic plant management

help to preserve the scenic, environmental, and recreational qualities of the reservoir that they so highly value. Examples of effective BMPs recommended to adjacent property owners are provided in the succeeding section. SCE&G is available to provide more information and to assist landowners in determining effective BMPs for activities on their properties. Also, anyone may contact the Natural Resource Conservation Service or local county extension office (http://www.sc.nrcs.usda.gov/contact/).

11.2.1 MINIMIZING NON-POINT SOURCE POLLUTION (NEW SECTION)

Reservoir pollution may result from a variety of activities related to residential development, agriculture, forestry, and construction. Contaminants may enter the reservoir and tributaries via overland flows carrying biological, chemical, and other substances picked up and carried by runoff from rain events. This runoff water may contain sediment, bacteria, oil, grease, detergents pesticides, fungicides, fertilizers, and other pollutants. These pollutants, depending on type, quantities, and concentrations can overwhelm a reservoir's natural ability to filter and process them ~~to at least a neutral or *de minimis* impact~~, thus leading to degraded water quality and aquatic environments.

Although a single point of impact or action may seem insignificant in its effect on the reservoir, the cumulative effects of the resource may be considerable. With this in mind, SCE&G encourages adjacent land owners to be mindful that they are members of a larger community that uses and impacts the reservoir. Employing the following BMPs can go a long way in preserving and improving reservoir water quality:

- Use permeable paving materials and reduce the area of impervious surfaces, particularly driveways, sidewalks, walkways, and parking areas;
- Dispose of vehicle fluids, paints, and/or household chemicals as indicated on their respective labels and do not deposit these products into storm drains, project waters, or onto the ground;
- Use soap sparingly when washing vehicles and wash them on a grassy areas , preferably sloping gently away from the reservoir, so the ground can filter the water naturally;
- Use hose nozzles with triggers to save water and dispose of used soapy water in sinks or other vessels that direct the materials into sewer systems, not in the street;
- Maintain septic tanks and drain fields according to the guidelines and/or regulations established by appropriate regulatory authorities;
- Remove and dispose of pet waste properly in areas that do not drain to the reservoir; and

- Use only low or no phosphorous fertilizer on lawns near the reservoir.

12.0 PUBLIC EDUCATION AND OUTREACH

This SMP is intended to foster management of shoreline use and development to achieve consistency with the FERC License, as well as to promote protection of public safety and environmental quality (water quality, natural habitat, aesthetics, etc.). To garner support and compliance from the public and lake users, it is key to educate them to the need and means to protect shoreline resources. Additionally, the public must be aware of the management and permitting programs put in place to provide this protection. To accomplish the task of increasing public awareness of the goals and objectives of this SMP SCE&G has developed an education and outreach program that includes the components described below.

12.1 SHORELINE MANAGEMENT PLAN EDUCATION

SCE&G's Public Education and Outreach program seeks to educate the public on various aspects of the management of Monticello Reservoir, including the Permitting Handbook, recommended BMP use, relevant Project Operations information, and the Safety Program. To accomplish this, SCE&G uses various public education measures including informational pamphlets, public meetings, newsletters, and an internet webpage.

The Internet, in particular, presents an excellent mechanism for disseminating information and improving awareness. SCE&G maintains a website designed to provide information on the SMP and the Permitting Handbook. Printed copies of the following materials may also be obtained by contacting SCE&G Lake Management at (803) 217-9221. Information and materials that will be available at the website include the following:

- Permitting Handbook;
- Permit application forms;
- Examples and information on BMPs;
- Alternative and example designs for shoreline stabilization; and
- Useful links and other related information.

Additional outreach mechanisms that SCE&G intends to employ in implementing the SMP include the following:

- Provide speakers for homeowner and other organizations' meetings;
- Provide information to realtors and encourage dissemination of this information to all potential Reservoir shoreline back-property buyers; and
- Develop and distribute new, "user friendly" brochures that include general reservoir information, permitting processes, shoreline BMPs, and relevant contact information.

12.2 PUBLIC ACCESS AREA MAPS

A figure depicting existing and future Public Access Areas on Monticello Reservoir is included as Figure 12-1~~Figure 12-1~~.

12.3 WILDLIFE MANAGEMENT AREAS/WATERFOWL ONLY

Comment [ACJ21]: I took the wording from the Classification and Prescription Sections above and meshed it into the following wording with SCDNR's suggestions.

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The waters of Monticello Reservoir, excluding the Recreation Lake, are designated as a ~~category II~~ waterfowl management area and are available for public waterfowl hunting. The designation for waterfowl management allows hunting on or in the water only and not on adjacent land. A South Carolina Wildlife Management Area (WMA) permit is required ~~is required~~ to hunt in areas with this designation. Regulations pertaining to Monticello Reservoir are available at SCDNR's website at: http://dnr.sc.gov/wma/index.html, or by contacting SCDNR at:

Waterfowl and Hunting Regulations
S.C. Department of Natural Resources
Wildlife and Fresh Water Fisheries
1000 Assembly Street
Columbia, South Carolina 29201
Telephone: 803-734-3886

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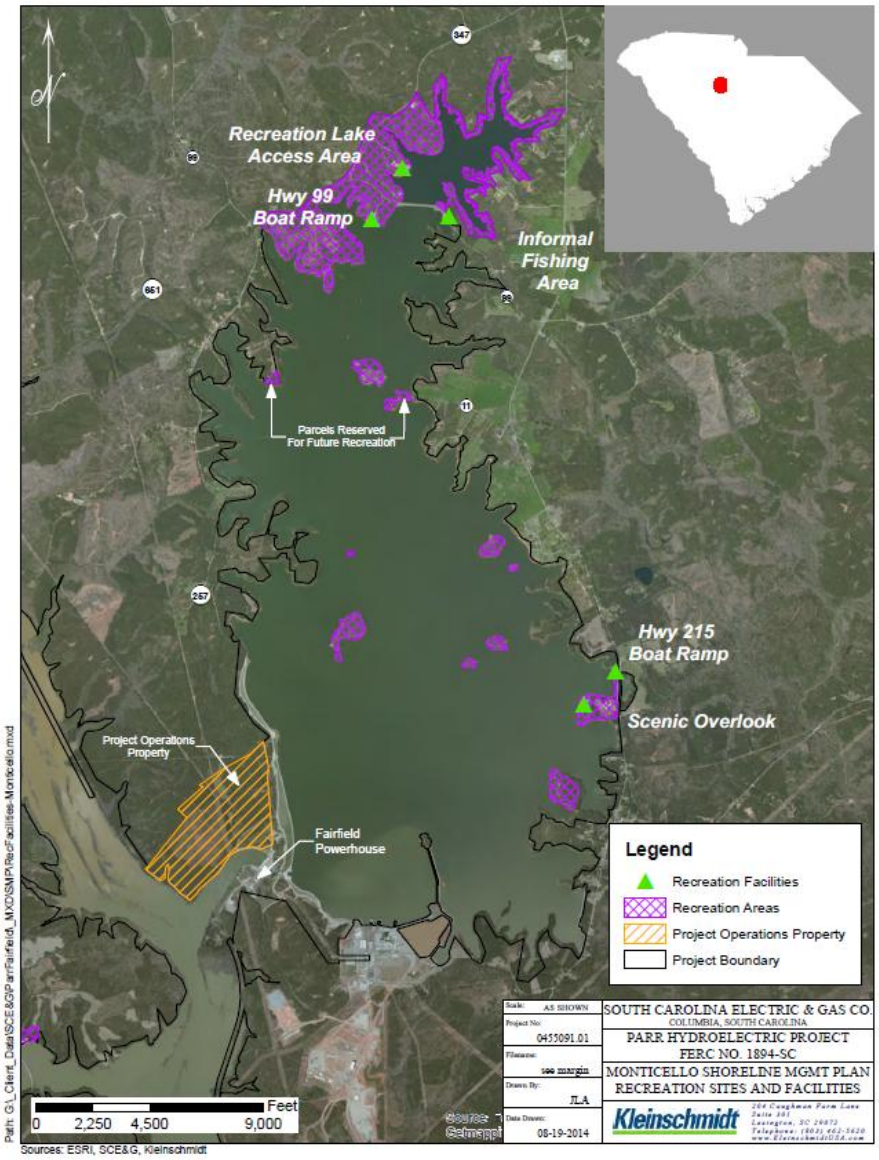
~~12.3~~12.4 WATER SAFETY ~~PROGRAMS~~

Due to operation of the pumped storage generating plant, the waters of Monticello Reservoir can fluctuate several feet in a matter of a few hours. This rapid fluctuation makes it especially important for boaters and other recreationists to exercise a high degree of care and fully assume personal responsibility for their safety by being especially aware and cautious. For public safety, hazardous areas which are marked should not be entered and any other warnings posted around the reservoir should be observed as well.

SCE&G and SCDNR cooperate to mark shoals and other hazardous areas to increase boating safety. However, boaters should not assume all shoals and hazardous areas have been marked.

SCDNR also enforces the boating laws of South Carolina. Boaters should ensure that watercraft and safety equipment are in good working condition and in compliance with all applicable state laws. ~~The boating laws of South Carolina are enforced by SCDNR. Boaters and sportsmen should be aware of dangerous areas which are marked and for public safety should not be entered. Other warnings are posted around the reservoir and should be observed as well. Due to operation of the pumped storage generating plant, the waters of Monticello Reservoir can fluctuate several feet in a matter of a few hours. This rapid fluctuation makes it especially important for boaters and other recreationists to exercise a high degree of care and fully assume personal responsibility for their safety by being especially aware and cautious. Shoals and hazardous areas are marked by the SCDNR to increase boating safetyto create a safer boating environment. However, it must not be assumed that every potentially dangerous shoal and hazardous area has been marked.~~

FIGURE 12-1: MONTICELLO RESERVOIR PUBLIC ACCESS AREA MAP



Comment [b22]: Get new map to remove recreation area upstream of Highway 34. This should not be recreation.

Change all references of Undeveloped to Non-Developed.

Update map to be consistent with SCE&G maps.

Color in waterfowl areas instead of using a triangle .

13.0 MONITORING AND REVIEW PROCESS

13.1 OVERALL LAND USE MONITORING

As demographics and user groups change within the Project area, changes in residential and commercial areas may occur. Often this type of use change is incremental and cumulative, occurring over a period of years or decades. To monitor land use around Monticello Reservoir, SCE&G will employ a geographic information system (GIS) to compare new and existing permit applications against GIS data for the land management classifications. Such monitoring will provide long-term data that should be useful in identifying areas experiencing change. Every 10 years, during the SMP review process (see Section 13.2 on Review Process below), SCE&G will report on changes in land use for the various land management classifications ~~in addition to filing Form 80 surveys~~. If it is found that material changes within the Project boundary have occurred that are not consistent with the current SMP goals, amendments to the SMP may be warranted. Such situations might include significant changes in land ownership, major commercial upgrades or uses, or new residential uses or pressures.

13.2 REVIEW PROCESS

SCE&G proposes a 10 year SMP review cycle interval. A 10 year SMP review period interval should provide reasonable opportunities for SCE&G, in concert with governmental, non-governmental, and individual stakeholders, periodically and deliberately to assess new issues that arise as a result of development around the Reservoir, and allow for analyses of cumulative effects. The SMP review process will begin sufficiently in advance of the end of each period so that it will be completed within the 10 year time frame. One month prior to the scheduled start of the review process, its occurrence will be advertised in various media formats (e.g., web site, newsletter, contact with homeowner associations, etc.). SCE&G will use those same media avenues to issue a report on the outcome of the review process. As in the past, SCE&G will solicit input from interested parties in addressing issues that arise and have a bearing on Reservoir management. This includes keeping lines of communication open during the time between review periods. Concurrently with the FERC SMP review process, SCE&G will review the Permitting Handbook periodically with interested stakeholders to ensure its effectiveness; however, changes to the permitting process may be made, as needed, outside of the scheduled review periods.

14.0 REFERENCES

Federal Power Commission (F.P.C.). 1974. Order Issuing New License for the Parr Hydroelectric Project. August 28, 1974. 52 F.P.C. 537.

Federal Energy Regulatory Commission (FERC). 2012. Guidance for Shoreline Management Planning at Hydropower Projects. Online. [URL]: http://www.ferc.gov/industries/hydropower/gen-info/guidelines/smpbook.pdf.

Federal Energy Regulatory Commission (FERC). 2001. Order Approving Land use and Shoreline Management Plan. June 4, 2001. 95 FERC ¶ 61,351.

SHORELINE MANAGEMENT PLAN
PARR RESERVOIR

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

September 2014

SHORELINE MANAGEMENT PLAN
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SOUTH CAROLINA ELECTRIC & GAS COMPANY

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PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

EXECUTIVE SUMMARY

South Carolina Electric & Gas Company ("SCE&G") is the Licensee of the Parr Hydroelectric Project (Federal Energy Regulatory Commission [FERC] No. 1894) ("Project"). The Project consists of the Parr Shoals Development and the Fairfield Pumped Storage Development. The developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project developments form two distinct Project reservoirs. Parr Reservoir is located along the Broad River, as impounded by Parr Dam, and functions as the lower reservoir for the Fairfield Development. Monticello Reservoir is located adjacent to the Broad River and functions as the upper reservoir for the Fairfield Development. Both Project reservoirs serve as popular recreation destinations and are used and enjoyed by local residents as well as visitors to the state.

In conjunction with its relicensing activities, SCE&G has assembled a diverse and inclusive group of stakeholders to advise and assist in the development of two Shoreline Management Plans ("SMPs"), each tailored to a specific reservoir. SMPs are comprehensive plans for the management of Project land and adjoining water resources and their uses, consistent with License requirements and broad Project purposes, and appropriately accessible and beneficial to adjacent shoreline residents and the recreating public. A SMP serves to identify existing and appropriate future uses and to provide plans and programs for responsible future use and management of project lands and waters as well as the flora and fauna encompassed within them. This SMP exists specifically to address shoreline uses surrounding Parr Reservoir. A SMP to address Monticello Reservoir is included under separate cover and is available from the SCE&G Lake Management Department (Lake Management).

In addition to a SMP for each Project reservoir, a Shoreline Management Handbook and Permitting Guidelines (Permitting Handbook) was developed for both developments in consultation with governmental, non-governmental, and individual stakeholders to address activities that will require consultation with and/or permits from SCE&G. These activities include construction, maintenance, and placement of docks on Monticello Reservoir, shoreline stabilization, lake access pathways and other shoreline activities.

The classification of Pproject lands surrounding Parr Reservoir is described in Section 5.0 and includes four management classifications. These classifications are as follows: Project Operations; Public Recreation; Waterfowl Areas; and, Undeveloped Areas. Public Recreation land includes land within SCE&G developed recreation areas~~, waterfowl hunting areas,~~ and islands that are owned by SCE&G. Undeveloped areas are areas protected from development to preserve the environmental resources and aesthetic values. Lands reserved for Project operations are those lands that are specifically required for operation of the Project. They include areas such as plant facility locations, dams, electrical substations, etc. Land use prescriptions associated with these land management classifications are discussed in further detail in Section 6.0. Prescriptions are administered through the Permitting Handbook.

SCE&G maintains a strong commitment to the management of the waters and shoreline of Parr Reservoir, focusing on the social, ecological, and economic impacts of activities on and near the shoreline and water, taking into consideration in particular the environmental, aesthetic, and recreational character of the shoreline and lake. Section 7.0 details the activities and structures on and adjacent to Parr Reservoir that require SCE&G consultation and/or approval. The permitting procedures for shoreline activities or structures are set out in more detail in Section 8.0 and in the Permitting Handbook.

Section 9.0 details SCE&G's fee structure for the shoreline management program. Such fees can be one-time or periodic.

Periodic surveys of the Parr Reservoir shoreline are conducted by SCE&G and include, among other things, inventories of unauthorized structures. These represent violations of the SMP. SMP violations will be dealt with as deemed by SCE&G, in its sole discretion, to be appropriate. Consequences of violations may range from required removal of unauthorized structure, fines, and/or legal action, and are discussed more fully in Section 10.0.

SCE&G Shoreline Management Practices include actions taken to lessen or mitigate for potential impacts to a particular resource resulting from its direct or indirect use. These include but may not be limited to landowner Best Management Practices ("BMP"). Shoreline Management Practices are further described in Section 11.0 of this document.

Public education and outreach on the protection of valuable shoreline resources is integral to the effectiveness of the SMP. Section 12.0 of this document details specific measures to be undertaken to help educate both adjacent shoreline residents and other Project resource users. Among included objectives will be SMP education and BMP education.

In its Application for New License, SCE&G is proposing 10 year review periods for the SMP. The 10 year SMP review periods provide reasonable opportunities for SCE&G, in concert with governmental, non-governmental, and individual stakeholders, periodically and deliberately to assess new issues that arise as a result of development around the Reservoir, and allow for analyses of cumulative effects. Concurrently with the FERC SMP review process, SCE&G will review the Permitting Handbook with interested stakeholders periodically to ensure its effectiveness; however, changes to the permitting process may be made as it deems necessary and appropriate. This is discussed in Section 13.0.

1.0 INTRODUCTION

The Parr Hydroelectric Project ("Project") is located on the Broad River in Fairfield and Newberry Counties, South Carolina (Figure 1-1~~Figure 1-1~~). The Project is located approximately 31 river miles downstream of the Neal Shoals Hydroelectric Project (Federal Energy Regulatory Commission ["FERC" or "Commission"] No. 2315) and 24 river miles upstream of the Columbia Diversion Dam. The Project consists of two developments: the Parr Shoals Development ("Parr Development") and the Fairfield Pumped Storage Development ("Fairfield Development"). Subsequently, two reservoirs are included as part of the Project, Monticello Reservoir[1] and Parr Reservoir. The normal maximum water level in Monticello Reservoir is El. 425.0 feet National Geodetic Vertical Datum ("NGVD"), which corresponds to a surface area of 6,800 acres~~ feet~~, and a gross storage of 400,000 acre-feet. Monticello Reservoir has approximately ~~54~~ 56 miles of shoreline within the Project boundary[2]. Parr Reservoir's normal maximum water level is at El. 266.0 feet NGVD, with a corresponding surface area of 4,400 acres. The gross storage is estimated to be 32,000 acre-feet. Parr Reservoir has 94 miles of shoreline within the Project boundary.

Comment [b1]: Revise to FERC throughout document. Remove "Commission" from rest of document.

An active storage of up to 29,000 acre-feet is transferred between the two reservoirs by the pumped storage operations of the Fairfield Development. Fairfield Development's alternate cycles of generation and pumping results in daily fluctuations in the water levels of both Monticello and Parr Reservoirs. Monticello, when beginning at normal maximum pool elevation, drops 4.5 to 5 feet over a 10 to 12 hour period during the generating phase of operation. At the same time, the water from Monticello and from the Broad River is flowing into Parr Reservoir, causing it to rise as much as 10 feet. During the pumping cycle, the reverse occurs - the water level rises in Monticello Reservoir and drops in Parr Reservoir.

The Project boundary encompasses land around each reservoir, extending between 50 and 200 horizontal feet from the high water mark. South Carolina Electric & Gas Company ("SCE&G") manages SCE&G-owned lands within the Project boundary to comply with the FERC License

[1] The State of South Carolina considers Monticello Reservoir waters of the State and refers to it as "Lake Monticello".

[2] Standard License Article 5 requires licensees to acquire and retain sufficient property and rights to construct, maintain, and operate their projects, as identified in their specific license, including any property or rights needed to accomplish all designated project purposes. As such, Project lands are those lands within the FERC project boundary owned by SCE&G in fee title and those lands for which SCE&G has acquired or retained an easement.

for the Project (the "Licensee"). The goal of project land management is to serve the public interest by providing recreational access and opportunities, protecting wildlife habitat and water quality, producing electricity, and protecting and preserving cultural and aesthetic resources. The Shoreline Management Plan ("SMP") provides a set of administrative policies, procedures, and practices by which SCE&G seeks to manage the Project shoreline to achieve these goals. Future proposals for specific shoreline related developments or activities will be reviewed for consistency with the SMP.

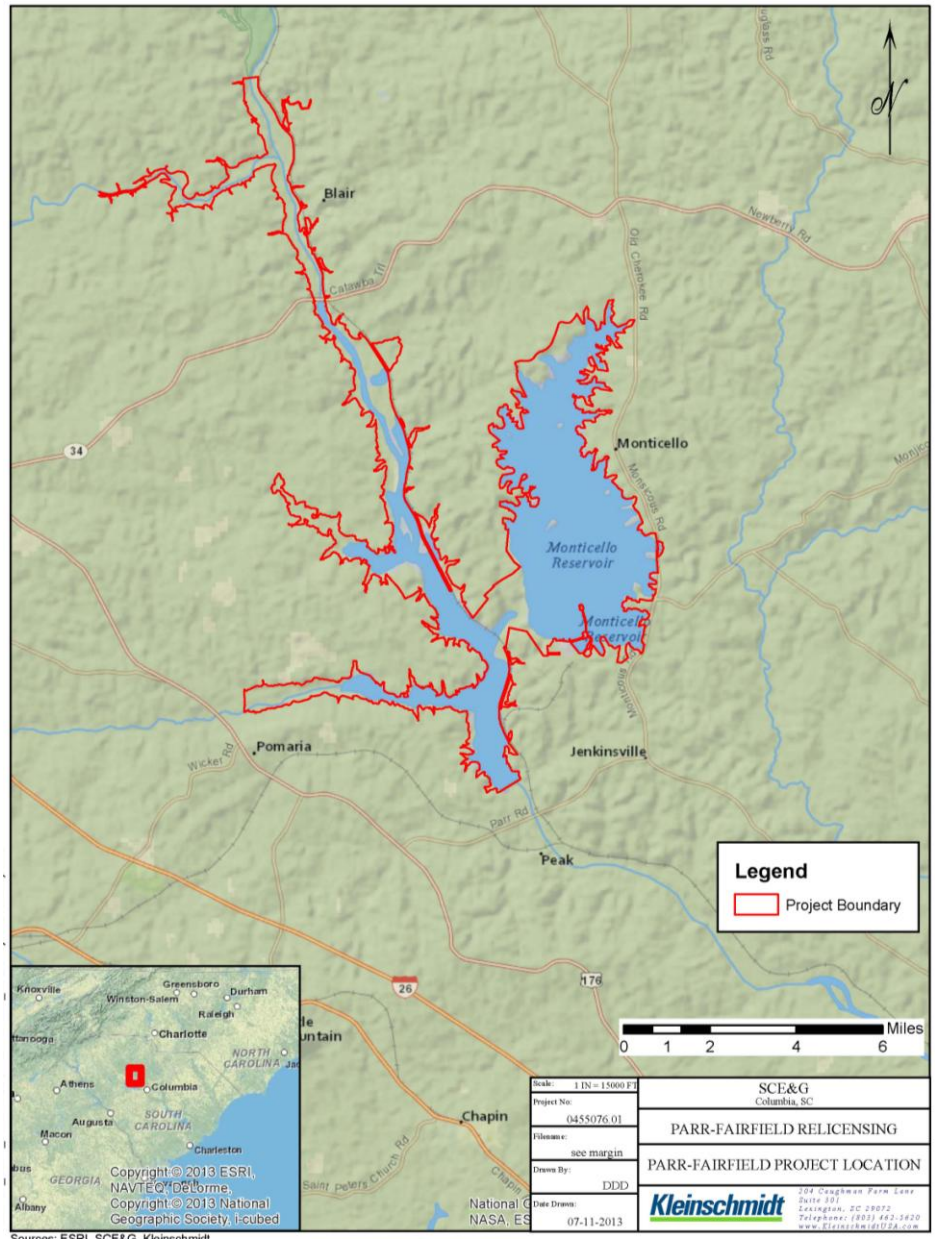
A draft of the initial Project SMP was filed with the ~~Commission~~ FERC in 1991. After several years of discussion and revisions, the initial SMP was approved by the ~~Commission~~ FERC on June 4, 2001. The history of the Project's SMP is described in more detail in Section 3.0 (History of the Shoreline Management Plan). The current relicensing[3] of the Project provides a near term impetus and opportunity for SCE&G to review the existing SMP in cooperation with relicensing stakeholders, including federal and state regulatory agencies, interested non-governmental organizations ("NGO"s), and individuals. Through discussions with these parties, it was decided that the existing FERC approved SMP, which encompasses both Parr and Monticello Reservoirs, should be divided into two distinct SMP's, one for each reservoir. Hence, this SMP has been prepared for Parr Reservoir and is being submitted to FERC as part of SCE&G's Parr Hydroelectric Project comprehensive relicensing package. A SMP for Monticello Reservoir is included under separate cover.

The management guidelines set forth in this SMP are applicable to all lands within the Project boundary surrounding Parr Reservoir. Among other things, the current document includes the following components:

- Detailed descriptions, management prescriptions and mapping of land classifications;
- Summary information on the Permitting Handbook and fee policies;
- Best management practices ("BMP"s);
- Public education and outreach;
- Reservoir monitoring; and,
- A proposed review process.

[3] The current operating License for the Project is due to expire on June 30, 2020. As such, SCE&G will file for a new License with FERC on or before June 30, 2018.

FIGURE 1-1: PROJECT LOCATION AND BOUNDARY MAP



2.0 PURPOSE AND SCOPE OF THE SHORELINE MANAGEMENT PLAN

The Project has served as a major source of power generation for SCE&G's customers and recreation for local residents and visitors to South Carolina for several decades. Consistent with FERC's Standard Land Use Article, a licensee may authorize specific non-project uses and occupancies of a project's shoreline. Examples of non-project uses at Parr Reservoir include access paths across SCE&G property, and water withdrawal. SCE&G has a responsibility to ensure that non-Project uses remain consistent with Project purposes, including protection and enhancement of the Project's scenic, recreational, and environmental values.

As development increases in areas surrounding the Project, so too does stress placed upon Project reservoirs and the surrounding watershed. Thus, a comprehensive SMP for each reservoir that recognizes and addresses sources of potential environmental impact is essential to managing each reservoir for the benefit of all interests and to ensure that non-Project uses remain consistent with the License.

The implementation of the SMP by SCE&G will help to maintain and conserve the area's natural and man-made resources. The SMP will comply with the terms of the License, as well as the regulations and orders of FERC, and is intended to assist in providing a balance between recreational use and development, environmental protection, and energy production.

3.0 HISTORY OF THE SHORELINE MANAGEMENT PLAN

Parr Reservoir is formed by the Parr Shoals Dam ("Dam"), which was originally constructed between 1912 and 1914. The Dam is situated across the Broad River and houses a 14.88 megawatt (MW) hydroelectric facility, located in an integral powerhouse. On August 28, 1974, the Federal Power Commission (FPC), predecessor to the FERC, issued SCE&G a new operating License for the Parr Shoals Development. In addition to relicensing the existing facilities, the new License authorized the construction of the 511.2 MW Fairfield Pumped Storage Development. This resulted in the creation of the Fairfield Development's upper pool, Monticello Reservoir. The new License also authorized the enlargement of the existing Parr Reservoir to serve as the lower pool to the Fairfield Development. This involved raising the height of the Dam approximately 9 feet, thereby nearly doubling Parr Reservoir's surface area. The construction of newly licensed facilities was completed in 1978, with the facilities beginning commercial operation that same year (F.P.C., 1974). The newly developed Project, including both Parr and Fairfield Developments, was subsequently referred to as the Parr Hydroelectric Project.

Article 48 of the Project License issued in 1974 required that SCE&G purchase in fee and include within the Project boundary all lands necessary or appropriate for project operations, including lands for recreational use and shoreline control. The lands encompassed by the project boundary shall include, but not be limited to: the islands in the Parr and Monticello Reservoirs formed by the 266-foot and 425-foot contour intervals, respectively; shoreline lands up to the 270-foot contour, or 50 feet (measured horizontally) from the Parr Reservoir's 266-foot contour, whichever is greater; and, shoreline lands up to the 430-foot contour interval, or 50 feet (measured horizontally) from Monticello Reservoir's 425-foot contour, whichever is greater. Provided that the Project boundary, except with respect to land necessary or appropriate for recreational purposes, shall not exceed 200 feet, horizontally measured, from the 266-foot or the 425-foot contour, unless satisfactory reasons to the contrary are given. This area is referred to as the "Buffer Zone". The FPC determined that acquiring these lands would provide SCE&G with adequate shoreline control around the reservoirs, in addition to serving the purposes of Project operation and recreation (F.P.C., 1974).

Comment [b2]: Bill A to provide additional wording from Article 48.

Comment [b3]: Take out reference to Buffer Zone, just refer to Project property.

Furthermore, Article 20 of the Project License orders that SCE&G allow public access, to a reasonable extent to Project waters and adjacent Project lands (with the exception of lands

necessary for the protection of life, health, and property) for navigation and outdoor recreational purposes. This Article also allows SCE&G to grant permits for public access to the reservoirs subject to FERC approval (F.P.C., 1974).

In 1991, SCE&G recognized that appropriate policies and procedures should be in place to govern shoreline activities at the Project. Utilizing experience gained at their Saluda Hydroelectric Project (FERC No. 516), SCE&G filed a proposed SMP with the Commission to regulate the use of Project shorelines. After extensive stakeholder consultation, an amended SMP was filed with the Commission. It was approved on June 4, 2001. The SMP was included as part of the Project's Exhibit R (FERC, 2001).

The SMP approved in 2001 primarily covered activities associated with Monticello Reservoir. It dealt with the following matters: water quality management; forest management; waterfowl management; nuclear exclusion zone restrictions for the operation of SCE&G's V.C. Summer Nuclear Station; fishing, boating, and hunting; public access and recreation; private boat docks and access; vegetation removal; erosion control; and, prohibited activities.

In 2006, SCE&G amended the SMP's policy regarding common docks on Monticello Reservoir. The original policy allowed for two to five property owners to share a single common dock if the shoreline frontage requirement of 200 feet was met. The policy was amended to allow no more than two individual, adjacent single family residential lots to share a common dock. The shoreline frontage requirement of 200 feet was retained.

As noted, the previous SMP included very little pertaining to Parr Reservoir. As such, the need for a new SMP specifically pertaining to Parr Reservoir was identified.

3.1 CURRENT SMP DOCUMENT AND SHORELINE CLASSIFICATIONS

The SMP serves as a reference document for SCE&G in implementing the Standard Land Use Article, which authorizes SCE&G to permit certain non-project uses of project lands and waters. FERC did not begin including the Standard Land Use Article in new licenses until the early 1980's; thus, it was not included in the Project License issued in 1974 (FERC, 2012). However, FERC granted SCE&G the authority to permit certain non-Project uses through the approval of the 2001 SMP, and added the Standard Land Use Article to the License (Article 62) in 2011, as revised in 2013 (Article 63). This present document, submitted in conjunction with SCE&G's

License application, presents a management plan, covering only Parr Reservoir (a SMP for Monticello Reservoir is included under separate cover), while adhering to the historical management goals agreed to and developed with agencies and stakeholders.

In addition to an updated SMP for each Project reservoir, a Permitting Handbook was developed in consultation with stakeholders and agencies to address activities requiring consultation with and/or permits from SCE&G. These activities include, but are not limited to the following: shoreline stabilization, access path development, and other shoreline activities. SCE&G will review the Permitting Handbook with interested stakeholders periodically to evaluate its effectiveness; however, SCE&G may make changes to the permitting process at any time as it determines in its sole judgment to be necessary and appropriate.

3.2 PROJECT BOUNDARY

Comment [b4]: Reword to address Article 48 condition. Bill A to provide

SCE&G owns all lands or obtained flowage rights within the Project boundary surrounding Parr Reservoir. As noted, this area ~~is referred to as the "Buffer Zone" and may~~ encompasses but is not limited to an area up to the 270-foot contour or measuring up to 50 feet but no greater than 200 feet horizontally from the 266-foot contour on Parr Reservoir, whichever is greater.

3.3 ~~ACREAGE OF PROJECT LANDS~~ (SECTION TO BE MOVED TO TABLE UNDER SECTION 5.0)

4.0 SHORELINE MANAGEMENT PLAN GOALS AND OBJECTIVES

The overall goal of this SMP is to define, document, and present the processes and criteria that SCE&G will employ to manage and balance private and public access to and uses of Project lands, specifically including Parr Reservoir's shoreline, consistent with public safety, energy production operations, environmental protection for Project land as well as Project waters, and reasonable recreational opportunities. This SMP will help to ensure the protection and enhancement of the Project's scenic, environmental, recreational, natural and cultural resources over the term of the License.

This SMP represents a consensus-based, updated management plan intended for submittal with the Project No. 1894 License Application. Specific goals relative to the SCE&G relicensing process that are discussed under this SMP include the following:

1. Provide for reasonable current and future public access;
2. Provide for current and future ~~Preserve opportunities to meet~~ recreational needs within the Project;
3. Protect fish and wildlife habitat;
4. Protect cultural resources;
5. Protect the ability to meet operational needs;
6. Facilitate compliance with License articles;
7. Minimize adverse impacts to water quality;
8. Protect scenic values~~Minimize adverse, manageable scenic impacts~~;
9. Monitor and permit shoreline activities~~Guide the control and permitting of shoreline development~~;
10. Provide a summary catalogue of the types and locations of existing recreational opportunities;
11. Establish Land Management Classifications and Land Use Prescriptions to help in the management of non-Project uses of the Parr Reservoir shoreline lands within the Project boundary;
12. Describe the SMP amendment and monitoring process; and
13. Educate and encourage property owners who own property adjacent to or adjoining Project Property (herein referred to as "adjacent property owners") on the use of voluntary BMPs.

4.1 CONSULTATION

The Project relicensing provides an opportunity for SCE&G to seek input on Project-related shoreline management issues from interested stakeholders. SCE&G recognizes that successfully completing the relicensing process requires identifying and resolving Project issues in consultation with federal and state resource agencies, local and national NGOs, homeowner associations, and individuals who have an interest in the Parr Hydroelectric Project (Table 4-1: ~~Table 4-1~~). SCE&G began public outreach efforts in January 2013 by holding a series of public workshops in Winnsboro, Newberry, Columbia, and Jenkinsville, SC. Since that time, SCE&G has sought active public involvement in the process and fostered commitment to issue resolution among SCE&G and stakeholders.

TABLE 4-1: PARTICIPATING GROUPS IN PARR HYDROELECTRIC PROJECT RELICENSING

STAKEHOLDER GROUPS
American Rivers
American Whitewater
Catawba Indian Nation
City of Columbia
Chestnut Hill Plantation HOA
Coastal Conservation League
Congaree Riverkeeper
Environmentalists Inc.
Fairfield County
Gills Creek Watershed
National Marine Fisheries Service
National Park Service
Newberry County
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
South Carolina Department of Parks, Recreation and Tourism
South Carolina Electric & Gas Company
South Carolina Historic Preservation Office
Town of Winnsboro, SC
Tyger-Enoree River Alliance
United States Fish and Wildlife Service
United States Forest Service
University of South Carolina

4.1.1 RECREATION/LAKE AND LAND MANAGEMENT RESOURCE CONSERVATION GROUP

In support of the relicensing effort, SCE&G formed three Resource Conservation Groups ("RCG"s) to identify, address and resolve Project-related issues by resource area. The RCGs are as follows: the Fish, Wildlife and Water Quality RCG; the Project Operations RCG; and the Lake & Land Management and Recreation RCG. Consideration of potential issues by resource area allows for more focused topic discussion and targeted issue resolution. Some RCGs have established sub-groups, or Technical Working Committees ("TWC"s), for issues requiring special knowledge, education, or experience. Consequently, the Lake & Land Management and Recreation RCG has a Lake and Land Management TWC as well as a Recreation TWC. The Lake and Land Management TWC is discussed further below.

4.1.2 LAKE AND LAND MANAGEMENT TECHNICAL WORKING COMMITTEE

The primary mission of the Lake and Land Management TWC is to revise the existing Parr Hydroelectric Project SMP to provide a management framework within which Project resources can be effectively protected while assuring appropriate public and private access to the Project resources and the recreational opportunities they present. Another important focus of the TWC is to allow interested parties an effective opportunity to provide input on resource issues and the overall future management of shoreline resources. The resulting collaboration has resulted in the contribution of valuable information by entities and individuals familiar with the Project. The forum was instrumental in addressing important issues relevant to the operation and management of the Project over the term of the new License. In working collaboratively, the members of the TWC (Table 4-2~~Table 4-2~~) aimed to blend the objectives of the state and federal resource agencies with other stakeholder interests.

TABLE 4-2: ORGANIZATIONS PARTICIPATING ON THE LAKE AND LAND MANAGEMENT TWC

STAKEHOLDER GROUPS
American Rivers
American Whitewater
Coastal Conservation League
Congaree Riverkeeper
Fairfield County
Gills Creek Watershed
Adjacent Property Owners

STAKEHOLDER GROUPS
National Marine Fisheries Service
National Park Service
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
South Carolina Department of Parks, Recreation and Tourism
South Carolina Electric & Gas Company
Tyger-Enoree River Alliance
United States Fish and Wildlife Service
United States Forest Service

4.1.3 MEETING SCHEDULE

Between October of 2013 and January of 2018, SCE&G has held ~~over X~~numerous meetings of the Lake and Land Management and Recreation RCG and Lake and Land Management TWC to discuss the details of the Project SMPs. The efforts of the TWC are reflected herein.

5.0 LAND USE CLASSIFICATIONS

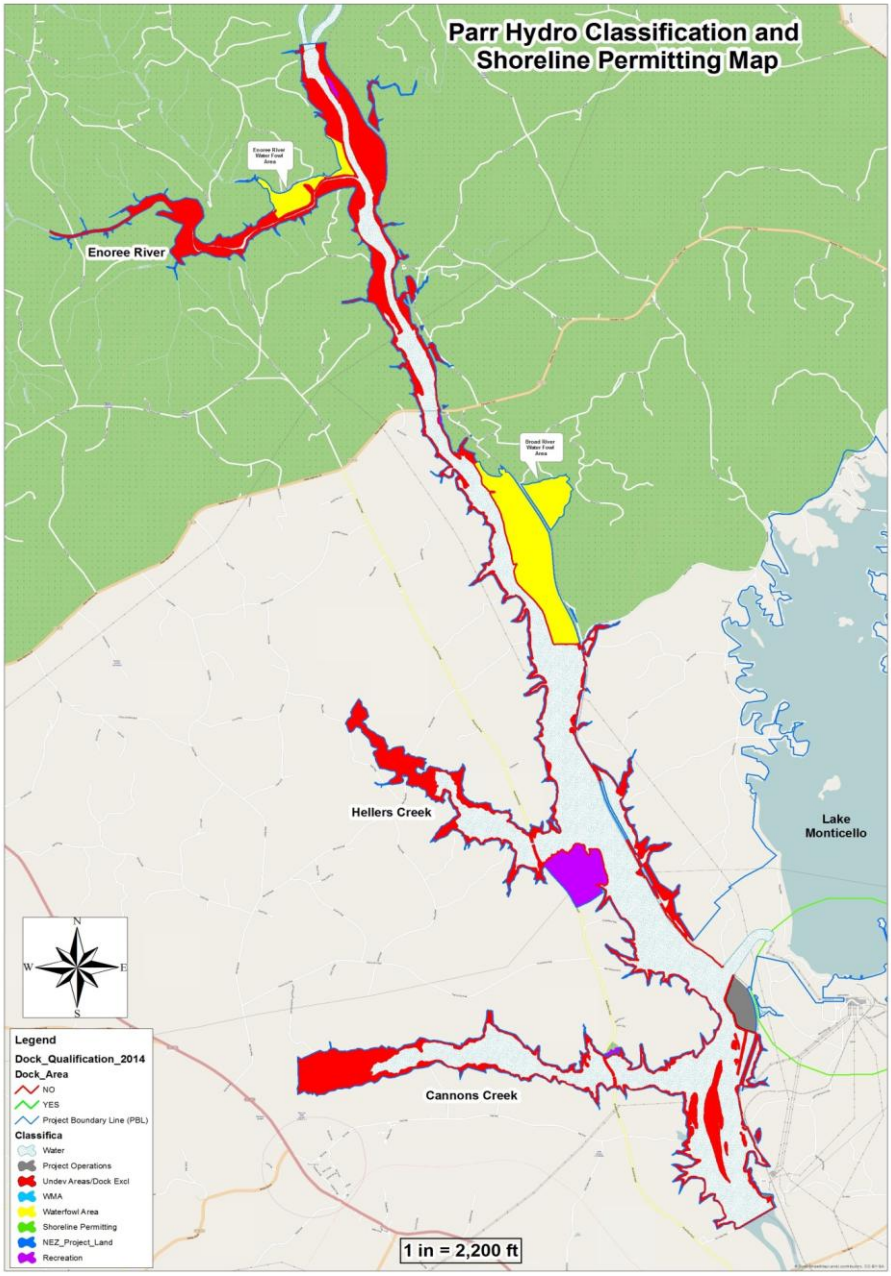
Four distinct land management classifications have been developed for the shorelines surrounding Parr Reservoir. These land management classifications are as follows: Project Operations; Public Recreation; ~~Waterfowl Areas;~~ and, Undeveloped Areas. The Public Recreation Classification includes designated public recreation areas, WMA and ~~as well as~~ some islands within Parr Reservoir. Although SCE&G intends to manage its lands according to this classification system, the public generally will not be precluded from access to SCE&G-owned lands regardless of classification, with the exception of lands reserved and used for Project operations or other areas specifically protected from public access and posted as such. The sections below explain/define the land management classifications. The acreages and parcels for each of the classifications are provided in Table 5-1:~~Table 5-1~~. Figure 5-1~~Figure 5-1~~ depicts their distribution around Parr Reservoir.

TABLE 5-1: SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION

CLASSIFICATION	SHORELINE MILES	ACRES
Project Operation	2.26	90
Public Recreation	2.84	219
~~Waterfowl Areas~~	2.46	723
~~Undeveloped~~ Non-Development Areas	81.79	2,188
Total	**89.35**	**3,220**

Comment [b5]: Be consistent with 94 in other places of SMP.

FIGURE 5-1: SHORELINE CLASSIFICATIONS MAP FOR PARR RESERVOIR



5.1 PROJECT OPERATIONS

Areas under this classification include SCE&G-owned and managed lands required for operation of the Parr Development. Public access to these lands is restricted to ensure public safety or to assure the security of the infrastructure system.

5.2 SHORELINE PERMITTING (SECTION REMOVED)

5.3 PUBLIC RECREATION

Project lands under this classification serve as recreational resources for the public and include areas managed expressly for recreation as well as those with recreation as a secondary usage. Public recreation lands include the following:

- Public boat launches, and other areas currently being managed as public access;
- Islands owned by SCE&G;
- Properties owned by SCE&G that are set aside for future recreational development.
- Hunting
- ~~Wildlife Management Areas ("WMA") (Water Only)~~

Comment [b6]: Add sub-sections that discuss each of these bullets.

5.3.1 ISLANDS AND SHOALS (NEW SECTION)

Pearson's Island is located within Parr Reservoir and is available for public recreational use in accordance with authorized activities (See the Permitting Handbook for authorized activities). Due to the fluctuation of Parr Reservoir associated with the Fairfield Development's pumped storage operations, shoals (areas of exposed, or nearly exposed, shallow lake bottom) in Parr Reservoir may be dewatered and are open for passive recreational activities.

5.3.2 WILDLIFE MANAGEMENT AREAS

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Portions of Project lands are included in the South Carolina Department of Natural Resources ("SCDNR") statewide Wildlife Management Areas (WMA) Program. These areas are open to the public for hunting and other recreational activities (visit http://dnr.sc.gov/wma/index.html for additional information). The Broad River and Enoree River WMA's are open to public hunting only on specified days. Hunting is not allowed on SCE&G property unless designated under SCDNR's Wildlife Management Areas (WMA) Program. For additional information on these areas, please visit the SCDNR website at http://dnr.sc.gov/wma/index.html.

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~~5.3.2 WILDLIFE MANAGEMENT AREA (WATER ONLY)~~

~~Certain portions of Parr Reservoir are included in the South Carolina Department of Natural Resources ("SCDNR") statewide WMA Program. These areas are open to the public for hunting or other recreational activities. The designation for WMA allows hunting on or in the water only and not on adjacent land. For additional information on these areas please visit the SCDNR website at http://dnr.sc.gov/wma/index.html.~~

Comment [ACJ7]: Suggest deleting this section and moving discussion under Section 12.3

~~5.4 WATERFOWL AREAS~~

~~Portions of Project lands are under the management jurisdiction of SCDNR under its Wildlife Management MA Program. Waterfowl management areas are located on the Broad River (Broad River Waterfowl Sub-impoundment), and the Enoree River (Enoree River Waterfowl Sub-impoundment), and Parr Reservoir.~~

~~5.5~~5.4 ~~UNDEVELOPED~~ NON-DEVELOPMENT AREAS

Project lands under this classification are protected from private development. This is done for the protection of the environmental and aesthetic integrity of the shoreline.

6.0 LAND USE PRESCRIPTIONS

Land use prescriptions are based upon and reflect the guiding principles regarding the management of the SCE&G-owned lands within each classification. SCE&G publishes a detailed Permitting Handbook (included under separate cover) that contains descriptions of the permitting processes and specifications for various shoreline developments. Activities that require consultation with and/or permits from SCE&G include the following: construction, maintenance and placement of docks and boat lifts, shoreline stabilization; construction and maintenance of shoreline pathways, and other shoreline activities. Persons interested in shoreline development must contact SCE&G's Lake Management Department (803) 217-9221, or at https://www.sceg.com/about-us/lake-murray to obtain permitting guidance and a copy of the Permitting Handbook. Section 8.0 of this document discusses the Permitting Handbook in greater depth. General information regarding permitting requirements is included where applicable within the scope of each management prescription below.

6.1 PROJECT OPERATIONS

Properties classified as Project Operation contain project works critical to the operation of the Parr Shoals Development. Public access to, or activities upon, these lands is restricted for reasons of safety and security.

6.2 PUBLIC RECREATION

Project lands devoted to public recreation include developed park sites, properties set aside for future recreational development, Pearson's Island and shoals on Parr Reservoir owned by SCE&G. With the exception of the islands, which are maintained in their natural condition, SCE&G manages the areas based on the specific, designated recreational activities including swimming, fishing, picnicking, and boat launching. SCE&G developed and maintained access areas on Parr Reservoir are depicted in Figure 12-1~~Figure 12-1~~. Private permitted activities are excluded.

Comment [b8]: Add primitive camping under public recreation section.

6.2.1 ISLAND AND SHOALS

Pearson's Island is located on Parr Reservoir and is open for passive public recreational use, such as fishing, walking, and bird watching. Hunting is prohibited on SCE&G owned islands. Due to the fluctuation of Parr Reservoir resulting from the Fairfield Development's pumped storage

operations, shoals (areas of exposed or nearly exposed, shallow lake bottom) in Parr Reservoir may be dewatered and are open for passive recreational activities.

~~**6.2.2 WILDLIFE MANAGEMENT AREA (WATER ONLY)**~~

~~Portions of Parr Reservoir are available for public hunting and wildlife management as part of the SCDNR statewide Wildlife Management Program. These public hunting areas are shown on Wildlife Management Area Maps available through the SCDNR. Permitted activities are excluded from this classification. Permitted activities are excluded from this classification. Regulations pertaining to Parr Reservoir are available at SCDNR's website at: http://dnr.sc.gov/wma/index.html, or by contacting SCDNR at:~~

~~Waterfowl and Hunting Regulations~~
~~S.C. Department of Natural Resources~~
~~Wildlife and Fresh Water Fisheries~~
~~1000 Assembly Street~~
~~Columbia, South Carolina 29201~~
~~Telephone: 803-734-3886~~

6.2.2 ~~WATERFOWL AREAS~~ WILDLIFE MANAGEMENT AREAS

~~**6.3 (New Section)**~~

Hunting is not allowed on SCE&G property unless designated under SCDNR's WMA Program. WMA Program areas may be available for hunting of waterfowl, small game and/or deer. Other recreational activities are allowed as well. See SCDNR website for regulations and WMA maps.

Portions of Parr Reservoir are designated as a waterfowl management area under the WMA program, and is discussed under Section 12.3.

~~Approximately 730 acres of land along Parr Reservoir are located in the Broad River and Enoree River Waterfowl Areas and are leased to SCDNR for public hunting and wildlife management as part of the statewide WMA Wildlife Management Program. Portions of Parr Reservoir (water only) are also designated as a category II waterfowl management area and area available for public waterfowl hunting as described under Section 12.3. These public hunting areas are shown on Wildlife Management Area (WMA) Maps available through the SCDNR. Permitted activities~~

Comment [ACJ9]: My suggestion would be to delete this Section 6.2.2, "Water Only classification", out of the Land Classification and Prescription Sections and include it under 12.3. I have also included a sentence below. I recommend spelling out waterfowl management area, and using the acronym for Wildlife Management Area (WMA).

Comment [WU10]: We might want to combine this paragraph with the following paragraph to reduce redundancy. We may also need some clarification between WMA's and wma's.

Comment [WU11]: How many acres of Project lands are leased to DNR? I am thinking 5,123 (4,400 plus 730) of approximately 7,311 (reservoir plus undeveloped plus Broad And Enoree waterfowl areas.

Comment [ACJ12]: I believe we should keep the land and the water numbers separate.

Comment [b13]: This will be a sub-section under Public Recreation

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Comment [WU14]: Parr Reservoir is also a waterfowl management area and it includes 4400 acres.

Comment [ACJ15]: As noted above, I would suggest keeping the land and water acreages separate.

~~are excluded from this classification. Regulations pertaining to these areas and Parr Reservoir, proper, are available at SCDNR's website at: http://dnr.sc.gov/wma/index.html, or by contacting SCDNR at:~~

~~Waterfowl and Hunting Regulations~~

~~S.C. Department of Natural Resources~~

~~Wildlife and Fresh Water Fisheries~~

~~1000 Assembly Street~~

~~Columbia, South Carolina 29201~~

~~Telephone: 803-734-3886~~

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~~6.4~~6.3 ~~UNDEVELOPED~~ NON-DEVELOPMENT AREAS

Comment [ACJ16]: Comment to stakeholders: currently DNR allows hunting on the land around Parr, however, we would like to discuss changing this to hunting only on the water.

Comment [WU17]: We are discussing this with DNR staff and should have a response by 2018.

Lands under this classification warrant special protection because they may provide important habitat or aesthetic values. Meandering paths and water withdrawals must be permitted and may be considered on a case-by-case basis.

7.0 SHORELINE ACTIVITIES REQUIRING SCE&G APPROVAL

SCE&G maintains a strong commitment to managing the shoreline of Parr Reservoir for multiple resources by considering the impact of various activities on the environmental, aesthetic, and recreational character of the lands. SCE&G owns and manages the Buffer Zone around the entire periphery of Parr Reservoir. Thus, any activity occurring on the "shoreline" is occurring on SCE&G property. ~~Any~~ A~~a~~ctivities~~y~~ not in compliance with the shoreline activity parameters outlined in this SMP and in the Permitting Handbook may constitute~~s~~ a trespass which SCE&G may elect to prosecute.

Comment [WU18]: I think some activities that are not in compliance with either SMP or SMG were "Grandfathered" and do not constitute a trespass.

Comment [ACJ19]: Correct.

7.1 AUTHORIZED ACTIVITIES REQUIRING APPROVAL THROUGH THE PERMITTING HANDBOOK

Only the following activities and structures may be permitted on Parr Reservoir:

- Construction of a meandering access path;
- Water withdrawal for non-commercial agricultural/landscaping irrigation purposes.

7.2 PROHIBITED STRUCTURES AND ACTIVITIES

Activities and structures that SCE&G does not allow include, but are not limited to, the following:

- Private boat docks;
- Private shoreline stabilization;
- Jet skiing;
- Water skiing;
- Boathouses;
- Private boat ramps;
- Mooring;
- Excavations/dredging (except commercial operations permitted by the state~~authorized by SCE&G~~);
- Effluent discharges;
- Commercial marinas;
- Marine rails;
- Sea walls;

- Fences within the Buffer Zone;
- Electrical service within the Buffer Zone;
- Permanent structures;
- Land-based structures, storage buildings, shelters, patios, gazebos, fences, swimming pools, satellite dishes, signs, storage of boats, canoes or other watercraft or automobiles;
- Septic tanks and/or drain fields;
- Storage or stockpiling of construction material;
- Vegetation removal of any type except in a permitted access path to the shoreline; and,
- Limbing or trimming of Buffer Zone vegetation to create views or visual corridors.

8.0 PERMITTING PROCESS FOR SHORELINE ACTIVITIES OR STRUCTURES

8.1 ~~LAND MANAGEMENT CLASSIFICATION OF PROPOSED PROJECT LOCATION~~ (SECTION REMOVED FROM DRAFT)

8.2 ~~ALLOWABLE AND PROHIBITED FACILITIES AND USES FOR PROPOSED PROJECT LOCATION~~ (SECTION REMOVED FROM DRAFT)

8.3 SHORELINE PERMITTING PROCEDURES

Applicants must obtain the proper permit(s), per the SCE&G's Permitting Handbook, prior to the initiation of any construction or activity on the Parr Reservoir shoreline, which consists of the lands below the 266-foot contour interval and in designated Buffer Zones. As noted above, some activities may also require local, state, and/or federal permits.

Whether a non-Project use is approved under the Standard Land Use article or through prior FERC approval, SCE&G is responsible for ensuring that the use is consistent with the purposes of protecting or enhancing the scenic, recreational, and other environmental values of the Project. To assist applicants in the permitting process, the staff at the SCE&G Lake Management Department is available to answer questions regarding documentation, permits, and specification requirements for their particular project. Permits from SCE&G are required for the following activities:

- Construction of a meandering access path;
- Water withdrawal for non-commercial agricultural/landscaping irrigation purposes.

It is highly advisable to begin the consultation process with SCE&G Lake Management staff at the planning stage of a project. SCE&G staff will be available to discuss specific permitting requirements with the property owner. Depending on the proposed new facility or activity, local, state and federal resource agencies may impose requirements on construction start/stop dates, the placement of erosion control devices, treatment plans, remedial measures, submittal of start construction notifications, and/or best management practices. Any permit applicant should be aware of such conditions, as violations may nullify a permit.

An overview of permitted activities is included below. Detailed information on SCE&G's permitting process, guidelines, and specifications, is provided in SCE&G's Permitting

Handbook available at https://www.sceg.com/about-us/lake-murray, by calling (803) 217-9221), or by writing:

SCE&G Lake Management Department
6248 Bush River Road
Columbia, SC 29212

8.3.1 ~~Docks~~ (Removed from Draft)

8.3.2 Shoreline Vegetation Management

In general, SCE&G maintains a policy of non-disturbance of any vegetation below the 266-foot contour or within a Buffer Zone without approval from SCE&G. Permission to remove vegetation within a permitted access path will only be granted by SCE&G Lake Management after a site visit with the applicant. Once clearing of the access path is completed according to the permit, the applicant may maintain the site in the permitted condition. Any unauthorized removal of shoreline vegetation may result in the cancellation of permits issued by SCE&G, as well as legal action. Violators may be required to replant and restore the disturbed area with such plantings and/or shoreline manipulation as SCE&G determines is necessary to mitigate and correct the situation. SCE&G will review areas that are currently manicured, or that were previously pasture land, and will meet with the adjacent property owner to develop a re-vegetation plan. See Figure 8-1~~Figure 8-1~~ for an example of target coverage for understory vegetation.

8.3.3 Access Path (New Section)

A single pedestrian access path may be cleared from the adjacent property owner's land upon approval of SCE&G. The access path must follow a meandering route to prevent erosion and to protect the aesthetics of the shoreline. No trees larger than 10-inches at breast height may be removed within the access path. A SCE&G Lake Management representative will identify and designate the location of all access paths. Access path restrictions are included in the Permitting Handbook. An example of a permitted access path is included as Figure 8-2~~Figure 8-2~~

FIGURE 8-1: TARGET COVERAGE FOR UNDERSTORY VEGETATION

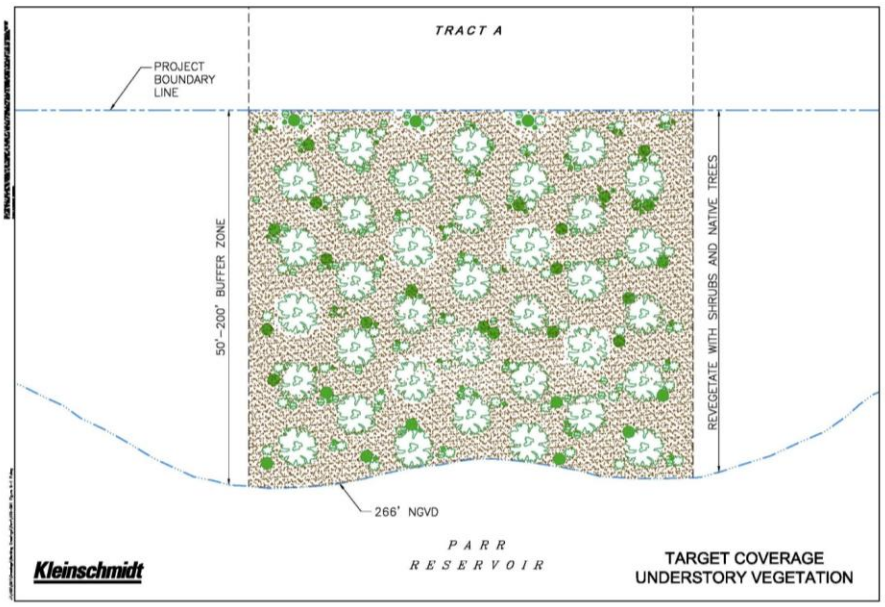
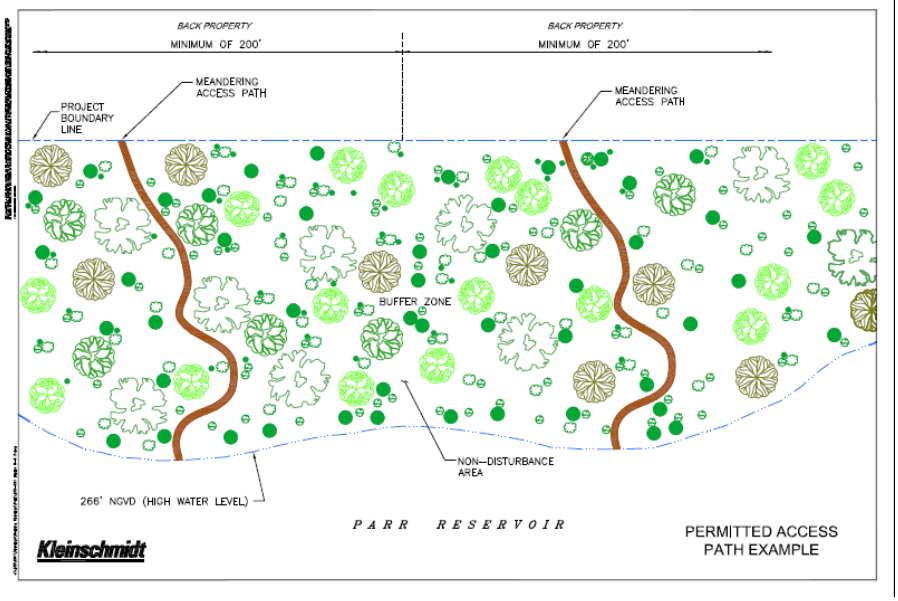


FIGURE 8-2: PERMITTED ACCESS PATH



8.3.4 SHORELINE STABILIZATION (REMOVED FROM DRAFT)

8.3.5 WATER WITHDRAWAL

~~Commercial and residential water~~ Water withdrawals requiring piping and other transportation/delivery equipment to be placed along the shoreline or in the littoral zone, are managed according to the terms of this SMP. Water withdrawal for residential property must be for irrigation purposes only. Permits are required, and will not be issued for any other purpose. Associated pumps and electrical service must be located outside SCE&G property. SCE&G reserves the right to prohibit withdrawal during times of drought or water drawdown.

Applications for a ~~commercial~~ permit to remove water must be submitted to SCE&G for review. ~~Large commercial water~~ Water withdrawal applications for greater than one million gallons per day (MGD) will be forwarded to the FERC for approval. Requests for withdrawal of one MGD or less may require agency consultation prior to approval. SCE&G may impose limits in granting permits for approved applications (see Permitting Handbook). The applicant may be required to bear the expenses of filing the application and will be required to compensate SCE&G for water withdrawn.

9.0 SCE&G PERMITTING FEE POLICIES

FERC allows licensees the right to charge reasonable fees to cover the costs of administering shoreline management programs, which add management responsibilities and associated costs to project operations. SCE&G administers its SMP in part through a permitting program, which does include a fee component. This ensures that activities occurring within the Project and in particular on Project land, are consistent with the overall goals for the Project, and that SCE&G's customers are not burdened with the full cost of administering programs that also have significant private, and often non-customer, benefit. Permit fees are due with applications and are required for docks, boat lifts, access paths, water withdrawal, and erosion control projects. Should an application be denied, associated permit fees will be returned. Periodic permit renewal fees may be required depending on the shoreline activity. One-time and periodic permit fees for Parr Reservoir shoreline activities are detailed in the Permitting Handbook. Failure to comply with this policy may result in, among other things, revocation of existing permits, fines, or legal action, as well as loss of consideration for future permits.

SCE&G will give reasonable public notice through appropriate communication avenues before changing the fee structure.

10.0 ENFORCEMENT OF SHORELINE MANAGEMENT PLAN

10.1 VIOLATIONS OF SHORELINE MANAGEMENT PLAN

SCE&G conducts periodic surveys of the Parr Reservoir shoreline to inventory and inspect permitted uses throughout the year. Lake Management representatives make note of unauthorized structures that they see, as well as urging residents and Reservoir visitors to report anything they believe to be unauthorized activity below the 266-foot contour, or within Buffer Zones. Anyone believing that an activity violating the SMP is occurring is urged to contact SCE&G Lake Management at (803) 217-9221.

SCE&G Lake Management representatives will issue Stop Work Directives and or Trespass Notices for any violations detected on SCE&G property. Any unauthorized clearing of trees or underbrush will result in the revocation of any SCE&G issued permits within 30 days if the violation(s) is (are) not corrected or a course of and schedule for corrective action has not been agreed to and approved by SCE&G. SCE&G may also commence legal action, if it deems it necessary, to require re-vegetation of the affected area. Removal of merchantable timber will require reimbursement to SCE&G subject to valuation of the Forestry Operations Department, including legally allowable "penalties." Consequences for violations may also include restrictions of access to SCE&G property, legal actions, fines, and loss of consideration for future permits.

11.0 SHORELINE MANAGEMENT PRACTICES

11.1 SCE&G SHORELINE MANAGEMENT PRACTICES

~~In addition to development activities, the environment around Parr Reservoir is susceptible to impacts associated with residential and recreational activities. These include, for example only, improper fertilizer/pesticide use, boat maintenance, and debris disposal. Adjacent property owners can mitigate negative impacts otherwise associated with their property uses and instead make significant positive contributions to the Reservoir environment, and ultimately the watershed, by employing BMPs that preserve bank integrity and minimize non-point sources of pollution and contamination. Adjacent property owners should understand that using BMPs will help to preserve the scenic, environmental, and recreational qualities of the Reservoir that they so highly value. Examples of effective BMPs recommended to adjacent property owners are provided in the succeeding sections. SCE&G is available to provide more information and to assist landowners in determining effective BMPs for activities on their properties. Also, anyone may contact the Natural Resource Conservation Service or local county extension office (http://www.sc.nrcs.usda.gov/contact/).~~ SCE&G has established a set of management practices that apply to all of the lands included in the Project Boundary. These practices are reflective of each of their developments unique qualities. The current management practices for the Parr Development (which includes Parr Reservoir) are described in this section, but may be reviewed during the period of the FERC license.

11.1.1 FOREST MANAGEMENT SHORELINE MANAGEMENT PRACTICES (SECTION REMOVED FROM DRAFT)

Comment [b20]: Add this back in and add text

11.1.2 ~~SHORELINE PERMITTING PROGRAM~~ (REMOVED, DISCUSSED IN SECTION 8.0)

11.1.3 Shoreline Stabilization and Vegetation Management (Removed, Discussed in Section 8.0)

11.1.4 Aquatic Plant Management Activities (Removed From Draft Not Applicable To PARR)

11.2 Landowner Recommended BMPs (New Section)

Comment [WU21]: See section 11.1 above.

Comment [ACJ22]: This section should remain. The wording in Section 11.1 was meant to be removed.

In addition to development activities, the environment around Monticello Reservoir is susceptible to impacts associated with residential and recreational activities. These include, for example only, improper fertilizer/pesticide use, boat maintenance, and debris disposal. Adjacent property owners can mitigate negative impacts otherwise associated with their property uses and instead make significant positive contributions to the Reservoir environment, and ultimately the watershed, by employing BMPs that preserve bank integrity and minimize non-point sources of pollution and contamination. Adjacent property owners should understand that using BMPs will help to preserve the scenic, environmental, and recreational qualities of the reservoir that they so highly value. Examples of effective BMPs recommended to adjacent property owners are provided in the succeeding section. SCE&G is available to provide more information and to assist landowners in determining effective BMPs for activities on their properties. Also, anyone may contact the Natural Resource Conservation Service or local county extension office (http://www.sc.nrcs.usda.gov/contact/).

11.2.1 Minimizing Non-Point Source Pollution (New Section)

Reservoir pollution may result from a variety of activities related to residential development, agriculture, forestry, and construction. Contaminants may enter the reservoir and tributaries via overland flows carrying biological, chemical, and other substances picked up and carried by runoff from rain events. This runoff water may contain sediment, bacteria, oil, grease, detergents pesticides, fungicides, fertilizers, and other pollutants. These pollutants, depending on type, quantities, and concentrations can overwhelm a reservoir's natural ability to filter and process them, ~~to at least a neutral or *de minimis* impact~~, thus leading to degraded water quality and aquatic environments.

Although a single point of impact or action may seem insignificant in its effect on the reservoir, the cumulative effects of the resource may be considerable. With this in mind, SCE&G

encourages adjacent land owners to be mindful that they are members of a larger community that uses and impacts the reservoir. Employing the following BMPs can go a long way in preserving and improving reservoir water quality:

- Use permeable paving materials and reduce the area of impervious surfaces, particularly driveways, sidewalks, walkways, and parking areas;
- Dispose of vehicle fluids, paints, and/or household chemicals as indicated on their respective labels and do not deposit these products into storm drains, project waters, or onto the ground;
- Use soap sparingly when washing vehicles and wash them on a grassy areas , preferably sloping gently away from the reservoir, so the ground can filter the water naturally;
- Use hose nozzles with triggers to save water and dispose of used soapy water in sinks or other vessels that direct the materials into sewer systems, not in the street;
- Maintain septic tanks and drain fields according to the guidelines and/or regulations established by appropriate regulatory authorities;
- Remove and dispose of pet waste properly in areas that do not drain to the reservoir; and
- Use only low or no phosphorous fertilizer on lawns near the reservoir.

12.0 PUBLIC EDUCATION AND OUTREACH

This SMP is intended to foster management of shoreline use and development to achieve consistency with the FERC License, as well as the promote protection of public safety and environmental quality (water quality, natural habitat, aesthetics, etc.). To garner support and compliance from the public and lake users, it is key to educate them to the need and means to protect shoreline resources. Additionally, the public must be aware of the management and permitting programs put in place to provide this protection. To accomplish the task of increasing public awareness of the goals and objectives of this SMP SCE&G has developed an education and outreach program that includes the components described below.

12.1 SHORELINE MANAGEMENT PLAN EDUCATION

SCE&G's Public Education and Outreach program seeks to educate the public on various aspects of the management of Parr Reservoir, including the Permitting Handbook, recommended BMP use, relevant Project Operations information, and the Safety Program. To accomplish this, SCE&G uses various public education measures including informational pamphlets, public meetings, newsletters, and an internet webpage.

The Internet, in particular, presents an excellent mechanism for disseminating information and improving awareness. SCE&G maintains a website designed to provide information on the SMP and the Permitting Handbook. Printed copies of the following materials may also be obtained by contacting SCE&G Lake Management at (803) 217-9221. Information and materials that will be available at the website include the following:

- Permitting Handbook;
- Permit application forms;
- Examples and information on BMPs;
- Alternative and example designs for shoreline stabilization on Monticello Reservoir; and
- Useful links and other related information.

Additional outreach mechanisms that SCE&G intends to employ in implementing the SMP include the following:

- Provide speakers for homeowner and other organizations' meetings;
- Provide information to realtors and encourage dissemination of this information to all potential adjacent property buyers; and
- Develop and distribute new, "user friendly" brochures that include general reservoir information, permitting processes, shoreline BMPs, and relevant contact information.

12.2 PUBLIC ACCESS AREA MAPS

A figure depicting existing and future Public Access Areas on Parr Reservoir is included as Figure 12-1~~Figure 12-1~~. Waterfowl area maps are available from the SCDNR at: http://dnr.sc.gov/wma/maps.html.

12.3 ~~WILDLIFE MANAGEMENT AREAS~~WATERFOWL HUNTING ON PARR RESERVOIR

Portions of Parr Reservoir are open for public waterfowl hunting only during specified days and times during state waterfowl seasons. ~~are available for public hunting and wildlife management as part of the SCDNR statewide Wildlife Management Program. These public hunting areas are designated as a category II waterfowl management area and are shown on WMA Maps available through the SCDNR.~~ Regulations and maps pertaining to Parr Reservoir are available at SCDNR's website at: http://dnr.sc.gov/wma/index.html, or by contacting SCDNR at:

Waterfowl and Hunting Regulations

S.C. Department of Natural Resources
Wildlife and Fresh Water Fisheries
1000 Assembly Street
Columbia, South Carolina 29201
Telephone: 803-734-3886

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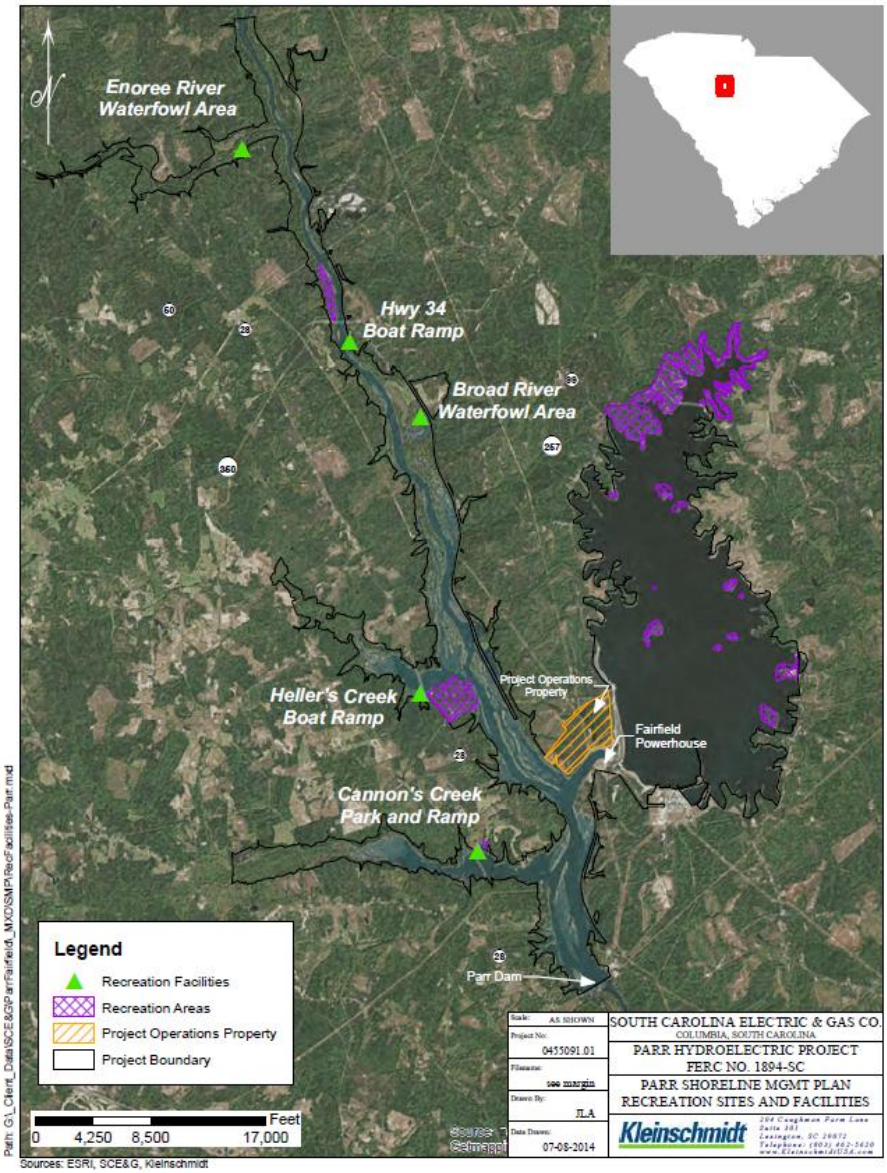
~~12.3~~12.4 SAFETY PROGRAMS

Comment [b23]: Revise based on Monticello comments.

The boating laws of South Carolina are enforced by SCDNR. Boaters and sportsmen should be aware of dangerous areas which are marked and for public safety should not be entered. Other warnings are posted around the reservoir and should be observed as well. Due to operation of the pumped storage generating plant, the waters of Parr Reservoir can fluctuate several feet in a matter of a few hours. This rapid fluctuation makes it especially important for boaters and other recreationists to exercise a high degree of care and fully assume personal responsibility for their safety by being especially aware and cautious. Shoals and hazardous areas are marked by the

SCDNR to create a safer boating environment. However, it must not be assumed that every potentially dangerous shoal and hazardous area has been marked.

FIGURE 12-1: PARR RESERVOIR PUBLIC ACCESS AREA MAP



Comment [ACJ24]: Comment to stakeholders: Currently, the property adjacent to the Fairfield powerhouse and dams is under the Recreation classification, and is set aside for future recreation. However, as discussed during previous TWC meetings, SCE&G intends to change this land classification to Project Operations due to its proximity to Project structures. This property is depicted as Project operations on Figure 12-1.

Comment [b25]: Get new map to remove recreation area upstream of Highway 34. This should not be recreation.

Change all references of Undeveloped to Non-Developed.

Update map to be consistent with SCE&G maps.

Color in waterfowl areas instead of using a triangle .

13.0 MONITORING AND REVIEW PROCESS

13.1 OVERALL LAND USE MONITORING

As demographics and user groups change within the Project area, changes in residential and commercial areas may occur. Often this type of use change is incremental and cumulative, occurring over a period of years or decades. To monitor land use around Parr Reservoir, SCE&G will employ a geographic information system (GIS) to compare new and existing permit applications against GIS data for the land management classifications. Such monitoring will provide long-term data that should be useful in identifying areas experiencing change. Every 10 years, during the SMP review process (see Section 13.2 on Review Process below), SCE&G will report on changes in land use for the various land management classifications in addition to filing Form 80 surveys. If it is found that material changes within the Project boundary have occurred that are not consistent with the current SMP goals, amendments to the SMP may be warranted. Such situations might include significant changes in land ownership, major commercial upgrades or uses, or new residential uses or pressures.

13.2 REVIEW PROCESS

SCE&G proposes a 10 year SMP review cycle interval. A 10 year SMP review period interval should provide reasonable opportunities for SCE&G, in concert with governmental, non-governmental, and individual stakeholders, periodically and deliberately to assess new issues that arise as a result of development around the Reservoir, and allow for analyses of cumulative effects. The SMP review process will begin sufficiently in advance of the end of each period so that it will be completed within the 10 year time frame. One month prior to the scheduled start of the review process, its occurrence will be advertised in various media formats (e.g., web site, newsletter, contact with homeowner associations, etc.). SCE&G will use those same media avenues to issue a report on the outcome of the review process. As in the past, SCE&G will solicit input from interested parties in addressing issues that arise and have a bearing on Reservoir management. This includes keeping lines of communication open during the time between review periods. Concurrently with the FERC SMP review process, SCE&G will review the Permitting Handbook periodically with interested stakeholders to ensure its effectiveness; however, changes to the permitting process may be made periodically, as needed, outside of the scheduled review periods.

14.0 REFERENCES

Federal Power Commission (F.P.C.). 1974. Order Issuing New License for the Parr Hydroelectric Project. August 28, 1974. 52 F.P.C. 537.

Federal Energy Regulatory Commission (FERC). 2012. Guidance for Shoreline Management Planning at Hydropower Projects. Online. [URL]: http://www.ferc.gov/industries/hydropower/gen-info/guidelines/smpbook.pdf.

Federal Energy Regulatory Commission (FERC). 2001. Order Approving Land use and Shoreline Management Plan. June 4, 2001. 95 FERC ¶ 61,351.

SHORELINE MANAGEMENT HANDBOOK AND PERMITTING GUIDELINES

~~PARR~~ MONTICELLO AND PARR ~~MONTICELLO~~ RESERVOIRS

Comment [b1]: Change throughout the document

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtGroup.com

September 2014

SHORELINE MANAGEMENT HANDBOOK AND PERMITTING GUIDELINES

PARR AND MONTICELLO RESERVOIRS

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

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September 2014

SHORELINE MANAGEMENT HANDBOOK AND PERMITTING GUIDELINES
PARR AND MONTICELLO RESERVOIRS

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

SOUTH CAROLINA ELECTRIC & GAS COMPANY

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[Provide DNR contact info up-front, include discussions of boating safety public hunting and fishery management (if applicable)]

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[Identify public access sites on Parr Reservoir]

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[Include general discussion paragraph under main Section 2.4 Header]

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[Provide DNR contact info up-front, include discussions of boating safety public hunting and fishery management (if applicable)]

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[Identify public access sites on Monticello Reservoir]

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[Include general discussion paragraph under main Section 3.4 Header]

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South Carolina Electric & Gas Company
Lake Management Department
6248 Bush River Road
Columbia, South Carolina 29212

Published X

USFWS Comments on the meeting notes for the Parr and Monticello LLM TWC meeting held on November 5-6, 2014.

Hi Kelly,

The Service provides the following comments regarding the Parr and Monticello LLM TWC meeting notes:

Page 2, regarding "natural areas classification": I think I was trying to get some clarification on what kinds of shoreline and activities (e.g. silvaculture, livestock access, natural vegetation, riprap etc.) occur in "Undeveloped Areas/Dock Exclusion" land use classes for each reservoir.

I intended to express why this kind of clarification and specificity is helpful for me, but I may not have explained this very well. I need to determine if the SMPs offer a balanced consideration for ecological priorities as well as for development. I think that this could be evaluated by delineating and quantifying naturally vegetated shoreline that will remain undisturbed. Delineating this kind of shoreline should be done independently from the other classifications since not all "Undeveloped Areas/Dock Exclusion" areas are naturally vegetated. Moreover, naturally vegetated shoreline likely occurs adjacent to "Recreation" and other land use classes.

I am not so much concerned about the definition of "natural areas" at this time. I think that if the SMPs had an independent "natural areas" classification or sub-classification, we could reach an agreement on the definition without too much deliberation.

Thank you for considering these comments. The Service appreciates the opportunity to participate in the development of these SMPs and the Permitting Handbook.

Thank you,

Byron Hamstead

From:	Kelly Miller
To:	Alan Stuart; Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall (marshallb@dnr.sc.gov); Bill Stangler (CRK@congareeriverkeeper.org); Brandon Kulik; Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); Dick Christie (dchristie@comporium.net); Frank_Henning@nps.gov; Gerrit Jobsis (gjobsis@americanrivers.org); Henry Mealing; Jay Maher; Jim Glover (gloverjb@dhec.sc.gov); Karla Reece (Karla.Reece@noaa.gov); Kelly Miller; Kerry Castle (castlek@dnr.sc.gov); Ley, Amanda; Pace Wilber (Pace.Wilber@noaa.gov); QUATTLEBAUM, MILTON; rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); Ron Ahle; Rusty Wenerick (weneriwr@dhec.sc.gov); Scott Harder; Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); "Vivianne Vejdani"
Subject:	FW: Mesohabitat Study Plan
Date:	Thursday, August 29, 2013 2:24:54 PM
Attachments:	001-Parr FF Mesohab Study Plan Memo.pdf

All,

Please submit any suggested edits or comments to the attached memo via email. If you have no edits, please submit your approval of the study plan to me by Friday, September 6th.

Thanks,
Kelly

Kelly Miller
Regulatory Coordinator
Kleinschmidt
Office: 803.462.5633
www.KleinschmidtUSA.com

From: Kelly Miller
Sent: Thursday, August 29, 2013 11:15 AM
To: Alan Stuart; Alison Jakupca; ARGENTIERI, WILLIAM R; Bill Marshall (marshallb@dnr.sc.gov); Bill Stangler (CRK@congareeriverkeeper.org); Brandon Kulik; Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); Dick Christie (dchristie@comporium.net); Frank_Henning@nps.gov; Gerrit Jobsis (gjobsis@americanrivers.org); Jim Glover (gloverjb@dhec.sc.gov); Karla Reece (Karla.Reece@noaa.gov); Kelly Miller; Kerry Castle (castlek@dnr.sc.gov); Ley, Amanda; Pace Wilber (Pace.Wilber@noaa.gov); QUATTLEBAUM, MILTON; rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); Ron Ahle; Rusty Wenerick (weneriwr@dhec.sc.gov); Scott Harder; Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); 'Vivianne Vejdani'
Subject: Mesohabitat Study Plan

All,

For your information, attached is a memo regarding the Mesohabitat Study Plan, reflecting points discussed at the previous Instream Flows TWC meeting, held on July 31st.

Thanks,
Kelly

Kelly Miller
Regulatory Coordinator

Kleinschmidt
Office: 803.462.5633
www.KleinschmidtUSA.com

MISCELLANEOUS

From:	Kelly Miller
To:	Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall (marshallb@dnr.sc.gov); Bill Stangler (CRK@congareeriverkeeper.org); Brandon Kulik; Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); Dick Christie (christied@dnr.sc.gov); Frank_Henning@nps.gov; Fritz Rohde (Fritz.Rohde@noaa.gov); Gerrit Jobsis (gjobsis@americanrivers.org); Henry Mealing; Jay Maher; Jim Glover (gloverjb@dhec.sc.gov); Karla Reece (Karla.Reece@noaa.gov); Kelly Miller; Kerry Castle (castlek@dnr.sc.gov); Ley, Amanda; Pace Wilber (Pace.Wilber@noaa.gov); QUATTLEBAUM, MILTON; rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); randy mahan (rmahan@sc.rr.com); Ron Ahle; Rusty Wenerick (weneriwr@dhec.sc.gov); Scott Harder; Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); "Vivianne Vejdani"
Subject:	Final Mesohabitat Assessment Report
Date:	Thursday, April 03, 2014 4:18:42 PM
Attachments:	001-Parr FF Mesohab Memo Report final.pdf

All,

Attached for your record is the final Mesohabitat Assessment Report. This report is also available at the project website at www.parrfairfieldrelicense.com.

Thanks,
Kelly

Kelly Miller
Regulatory Coordinator
Kleinschmidt
Office: 803.462.5633
www.KleinschmidtUSA.com

From:	Kelly Miller
To:	Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall (marshallb@dnr.sc.gov); Bill Stangler (CRK@congareeriverkeeper.org); Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); Dick Christie (christied@dnr.sc.gov); Fritz Rohde (Fritz.Rohde@noaa.gov); Gerrit Jobsis (gjobsis@americanrivers.org); Hal Beard (BeardH@dnr.sc.gov); Henry Mealing; Jay Maher; Jim Glover (gloverjb@dhec.sc.gov); Karla Reece (Karla.Reece@noaa.gov); Kelly Miller; QUATTLEBAUM, MILTON; rammarell@scana.com; Randy Mahan (randolph.mahan@scana.com); randy mahan (rmahan@sc.rr.com); Robert Stroud (StroudR@dnr.sc.gov); Ron Ahle; Sam Stokes (stokess@dnr.sc.gov); Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); "Vivianne Vejdani"; Brandon Kulik; Frank_Henning@nps.gov; Kerry Castle (castlek@dnr.sc.gov); Ley, Amanda; Pace Wilber (Pace.Wilber@noaa.gov); Rusty Wenerick (weneriwr@dhec.sc.gov); Scott Harder
Subject:	Parr/FF Robust Redhorse Memo
Date:	Friday, May 02, 2014 11:21:43 AM
Attachments:	Parr FF Robust Redhorse Spawning Memo 04-29-2014 Final.pdf

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All,

Attached is the final Robust Redhorse Memo for the Parr/Fairfield Project. Please note that this memo will also be included as an appendix to the final IFIM Study Plan. It will also be available on the project website at www.parrfairfieldrelicense.com.

Thanks,
Kelly

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From:	Kelly Miller
To:	Chestnut, David; Alison Jakupca; BARGENTIERI@scana.com; Bill Marshall (marshallb@dnr.sc.gov); Bill Stangler (CRK@congareeriverkeeper.org); Byron Hamstead (Byron_hamstead@fws.gov); Chad Altman (altmankc@dhec.sc.gov); David Eargle (eargleda@dhec.sc.gov); Gerrit Jobsis (gjobsis@americanrivers.org); Henry Mealing; Jaclyn Daly (Jaclyn.Daly@noaa.gov); Jay Maher; Jim Glover (gloverjb@dhec.sc.gov); Kelly Miller; Kerry Castle (castlek@dnr.sc.gov); Ley, Amanda; Malcolm Leaphart (mwleapjr@att.net); QUATTLEBAUM, MILTON; Randy Mahan (randolph.mahan@scana.com); Ron Ahle; Rusty Wenerick (weneriwr@dhec.sc.gov); Scott Castleberry (castlews@dhec.sc.gov); Shane Boring; Steve Summer; Tom McCoy (thomas_mccoy@fws.gov); "Vivianne Vejdani"
Subject:	revised Final Water Quality Report
Date:	Friday, January 17, 2014 10:14:11 AM
Attachments:	Parr_FF Water Quality Report_Final_011614.pdf

All,

The revised final version of the Water Quality Report for the Parr/Fairfield Project is attached to this email, as well as available on the Project website at www.parrfairfieldrelicense.com. After further consultation with SCDHEC, USFWS and other members of the Water Quality TWC, the following edits have been made to the report.

- Regarding the vertical profile data collected by SCANA for Parr and Monticello Reservoirs, tables were added summarizing the max, min and mean values for temperature, pH, dissolved oxygen, and conductivity.
- Data was added from all base and random SCDHEC monitoring sites within the Project Boundary. Parameters include water temperature, dissolved oxygen, pH, turbidity, total phosphorus and total nitrogen, chlorophyll-a, and metals.
- Information on SCDHEC sites listed on the 2012 303(d) list was included.
- USGS data from the Carlisle gage was included.
- Turbidity data collected by SCDNR was included.
- Data from four SCDHEC monitoring sites located at various points throughout the Project Boundary was graphically compared.
- Appendix B was added, which consists of the Thermal Mixing Zone Evaluation at VC Summer Nuclear Plant.

Additionally, for anyone who is interested, the raw data used in the report is available upon request. SCE&G and Kleinschmidt would like to thank SCDHEC, specifically David Chestnut and Rusty Wenerick, for all the time and effort they spent helping with the revisions of this report. We will be discussing this report at the upcoming Water Quality TWC meeting scheduled for the afternoon of February 4th. If you have any questions or concerns in the meantime, please let me know.

Thanks,
Kelly

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