APPENDIX A-13

SALUDA HYDROELECTRIC PROJECT MAINTENANCE, EMERGENCY, AND LOW INFLOW PROTOCOL

PURPOSE

The Maintenance, Emergency, and Low Inflow Protocol (MELIP) for the Saluda Hydroelectric Project (FERC Project No. 516) is intended to provide operational guidance for abnormal operating situations caused by maintenance activities, emergency situations (including high inflow or flood events), and periods of sustained low inflow or drought conditions.

There are several types of maintenance activities which may require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases. Certain emergency situations involving the interconnected electric system ("grid"), project structures, equipment, or waterways may also require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases.

During periods of high inflow or flood events, the project must be operated to safely pass and/or store the high inflow without compromising the safety of the dam and other project structures. This may require temporary modifications to normal reservoir levels and/or seasonal minimum flow and scheduled recreation flow releases, either to pass higher than normal inflow, or to draw down the reservoir in advance of forecast high inflow.

During periods of low inflow, SCE&G's goal is to conserve the remaining water stored in Lake Murray, in order to delay or prevent depletion of water stored in the reservoir. This will allow the project to continue to fulfill critical functions for as long as possible during drought periods: Reserve electric generation, municipal water supply, and preserve the recreational, environmental, and economic values of the Project waters.

TARGET RESERVOIR ELEVATIONS

Normal target reservoir elevations are defined by the Normal Reservoir Operating Guidelines. These are reservoir elevations which SCE&G will endeavor in good faith to achieve, unless operating under one of the conditions listed in this Maintenance, Emergency, and Low Inflow Protocol.

MINIMUM FLOW SCHEDULE

The seasonal minimum flow schedule is as follows (excluding low inflow conditions):

January 1 – March 31:	700 CFS
April 1 – May 10:	Striped Bass Enhancement Flow Regime (See Appendix A-13-2 for details.)
May 11 – May 31:	1,000 CFS
June 1 – December 31:	700 CFS

It is agreed that a target flow of 500 CFS with a minimum flow of 400 CFS will be implemented during the MELIP.

OPERATION DURING MAINTENANCE ACTIVITIES

Under some maintenance conditions, it may be necessary to operate the project such that reservoir elevations and/or seasonal minimum or scheduled recreation flows cannot be maintained in the normal ranges, even during periods of normal inflow and hydrologic conditions. Examples of such conditions are:

- Scheduled or unscheduled project structure or hydro unit maintenance;
- Scheduled reservoir drawdown below normal minimum elevation due to required inspection or maintenance of project structures, ecological management of the lake (see Reservoir Drawdown Program), or improvements to lakeside facilities.

To the extent practical, SCE&G will avoid scheduling project structure or hydro unit maintenance that would impact the ability of SCE&G to release the required seasonal minimum flow or scheduled recreation flows, unless it is likely that further damage or unscheduled maintenance would ensue if the work is delayed. If it is determined that the seasonal minimum flows cannot be maintained due to the scheduled maintenance activities, SCE&G will consult with the resource and regulatory agencies (SCDNR, SCDHEC, USFWS, NMFS and any other appropriate resource agencies) to monitor and minimize impacts to water quality and aquatic habitat. To the extent practical, SCE&G will also endeavor to replace any scheduled recreation

flows which are impacted by the scheduled maintenance activities within the same calendar year as originally scheduled.

The reservoir may periodically be drawn down to its minimum level of el. 343.5' (el. 345.0' PD)[7] for repairs to the upstream riprap armor on the original earth dam, inspection or repairs to the intake towers or spillway structure, or to accomplish other Project improvements. Scheduled drawdowns such as this would normally occur during October through February; however the time period may vary depending on the required scope of maintenance work. SCE&G will make public notification of scheduled drawdowns via media releases and announcements on the corporate web site as far in advance as practical and engage in appropriate public outreach such as education or seeking public input from interested stakeholders.

An unscheduled reservoir drawdown due to unforeseen equipment damage or other reason is very unlikely; however it is possible that this would occur at some time. To the extent practical, SCE&G will take steps to limit the magnitude and duration of any unscheduled reservoir drawdown.

OPERATION DURING EMERGENCIES

During emergency conditions, it may be necessary to operate the project such that reservoir elevations and/or seasonal minimum or scheduled recreation flows cannot be maintained in the normal ranges, even during periods of normal inflow and hydrologic conditions. Examples of such emergencies are:

- Grid voltage or capacity emergency declared by SCE&G's System Operations Center or Transmission Operations Center;
- Dam safety emergency;
- Emergency plant shutdown due to equipment failure, fire, or other situations which endanger human health and safety or the environment;
- River access special circumstances (e.g., emergency rescue or recovery operations).

[7] All elevation references in this MELIP are given in North American Vertical Datum 1988 (NAVD 88); conversion to traditional plant datum (PD, used in numerous supporting studies for this license application and often erroneously referred to as MSL) requires the addition of 1.5 ft.

During a declared grid voltage or capacity emergency, SCE&G will operate the project as required to maintain or restore the reliability of the electrical system, with due regard to the safety of both the public and the project structures. This may result in deviation from scheduled recreation flows and/or normal reservoir operation levels.

During a dam safety emergency, the safety of the downstream population is paramount, and SCE&G will take actions as required to maintain or restore the integrity of all project water retaining structures. This may result in deviation from seasonal minimum flow, scheduled recreation flows and/or normal reservoir operation levels.

In the event of serious equipment failure, fire, releases or spills, or other conditions which endanger plant personnel, the public, or the environment, it may be necessary to completely shut down the Saluda Hydro plant and limit discharge from the facility to the minimum possible. This may result is deviation from seasonal minimum flow and/or scheduled recreation flows.

Upon request from local emergency response agencies, it may be necessary to decrease or increase the discharge from the Saluda Hydro plant in order to facilitate access to the lower Saluda River (LSR) for rescue or recovery operations. This may result in deviation from seasonal minimum flow and/or scheduled recreation flows.

If it is determined that the seasonal minimum flows cannot be maintained due to an emergency condition, SCE&G will consult with the resource and regulatory agencies (SCDNR, SCDHEC, USFWS, NMFS and any other appropriate resource agencies) as soon as is practical to monitor and minimize impacts to water quality and aquatic habitat. To the extent practical, SCE&G will also endeavor to replace any scheduled recreation flows which are impacted by the emergency situation within the same calendar year as originally scheduled.

OPERATION DURING HIGH INFLOW PERIODS OR FLOODS

SCE&G has developed a Flow Forecast Model (FFM) for the purpose of anticipating high inflow events due to large amounts of rainfall in the Saluda River basin draining to Lake Murray. The FFM uses precipitation forecasts from the National Weather Service (NWS) and near real time data from the U.S. Geological Survey (USGS) to estimate inflow to Lake Murray up to 5 days in advance. SCE&G's System Operators also monitor the National Weather Service on a routine basis. In the event a weather system capable of producing heavy precipitation is forecast to impact the Saluda Project, SCE&G's engineering staff runs the FFM using the latest precipitation forecast and current streamflow data from the USGS gauge network. Based on the magnitude and duration of the inflow hydrograph computed by the FFM, the System Operators are advised as to what action to take in order to safely pass and/or store the projected inflow. Such actions may include:

- Reducing reservoir level below the existing target elevation in advance of or during the weather system to provide storage volume for the forecast inflow;
- Operating one or more spillway gates to pass inflow in excess of that which can be passed by generation and prevent the reservoir from rising above el. 358.5' (360.0' PD);
- Allowing the reservoir to rise above the existing target elevation in order to store all or a portion of the inflow;
- Making reasonable efforts to minimize downstream fluctuations in flow that may adversely affect habitat.

Any of these actions may result in deviation from scheduled recreation flows and/or normal reservoir operation levels. To the extent practical, SCE&G will endeavor to replace any scheduled recreation flows which are impacted by the high inflow conditions within the same calendar year as originally scheduled.

OPERATION DURING LOW INFLOW PERIODS

For operation during periods of sustained low inflow or drought, the MELIP defines trigger points and procedures for incremental reductions in seasonal minimum flow and downstream recreation flows based on gauged inflow to the project. During periods of normal inflow, SCE&G will operate the Saluda Project to maintain the reservoir level at or near the current target elevation within the proposed normal operating range of el. 352.5' (354.0' PD) to el. 356.5.0' (358.0' PD), while providing the normal seasonal minimum downstream flow and normal scheduled recreation and safety training flows. During times when inflow to the project exceeds the seasonal minimum flow and scheduled recreation flows, the project will generate on an as-needed basis to maintain the reservoir at or near the current target elevation.

Under all hydrologic conditions, the project will be available for reserve generation as required by SCE&G's system and obligations under the Virginia-Carolinas Electric Reliability Council (VACAR, or its successor) Reserve Sharing Agreement (VRSA).

If hydrologic conditions in the Saluda River basin draining to Lake Murray worsen and the 14 day average gauged inflow less estimated municipal usage ("net inflow")[8] falls below the scheduled minimum flow, water stored in Lake Murray will be used to augment project inflow to provide the normal seasonal minimum flow until the reservoir level falls to more than (1 or 2 ft. TBD by FERC) below the current target elevation. At that time, SCE&G will discharge target minimum flow as follows:

14 Day Average Net Inflow	Target Flow (except April 1st – May 10th)
< 1,000 CFS	700 CFS minimum flow
< 700 CFS	500 CFS target flow with 400 CFS minimum flow

If 14 day average net inflow falls below the scheduled minimum flow during the April 1st through May 10th period when the striped bass enhancement flow regime is in effect (as described in Appendix A-13-2), reduced striped bass flows or continuous minimum flow will be implemented

[8] Gauged inflow will be computed each day as the sum of three scaled USGS gauge values for the Saluda River, Little River, and Bush River, less estimated municipal usage from the reservoir. The 14 day average of these daily values will be computed each day. See Appendix A-13-1 for details of inflow scaling and computing net inflow.

as follows, once the reservoir falls to more than (1 or 2 ft. TBD by FERC) below the current target elevation:

14 Day Average Net Inflow	Target Flow Provided April 1st – May 10th
< Striped Bass Flow Request (See Appendix A-13-2 for Details)	1,000 CFS minimum flow
< 1,000 CFS	700 CFS minimum flow
< 700 CFS	500 CFS target flow with 400 CFS minimum flow

If 14 day average net inflow should fall below the scheduled minimum flow between December 16 and January 17 (for the 1 ft Trigger), or between December 1 and February 1 (for the 2 ft. trigger), when the target reservoir elevation is within (1 or 2 ft. TBD by FERC) of el. 352.5' (354.0' PD), the reservoir will not be required to drop (1 or 2 ft. TBD by FERC) below the current target elevation before reducing the minimum flow. Additionally, at any time during a low inflow period (when 14 day average net inflow is less than the scheduled minimum flow), should the reservoir level fall below el. 352.5' (354.0' PD), the minimum flow from the project will be reduced to a target flow of 500 CFS (400 CFS minimum), and will remain at that value regardless of any increase of inflow until the reservoir level has risen above el. 352.5' (354.0' PD).

During periods where the inflow falls below the scheduled minimum flow and the reservoir level is below the target elevation range, SCE&G will make reasonable efforts to conserve the remaining water stored in Lake Murray to achieve its goal of allowing the lake level to reach the guide curve and re-establish normal minimum flows.

During an MELIP implementation, scheduled recreation flows will be reduced in two stages. First stage is when the reservoir falls more than 2 feet below target elevation or reaches 352.5' (354.0' PD) and the 14 day average net inflow is less than scheduled minimum flow; the recreation flow volume in acre-feet will be reduced by 30 percent. This can be accomplished either by reducing the flow or duration of a given event. Second stage begins once the reservoir level falls below el. 352.5' (354.0' PD); all scheduled recreation flows will be reduced to target minimum flow until the reservoir level has risen above el. 352.5' (354.0' PD). The 51 recreation days will remain protected from reserve operations during MELIP implementation.

Scheduled fall releases for the Columbia Fire Department (CFD) swift water rescue safety training will be provided in full if the reservoir level is at least 353.5' (355.0' PD) on December 1 for the December safety training flows. If after installation and performance testing of proposed new turbines, it is determined that the requested flows can be provided at other times during the last quarter of each year without negatively impacting Dissolved Oxygen (DO) in the LSR, SCE&G will provide swift water rescue safety training flows in full so long as the reservoir elevation is within one foot of the guide curve target elevation for the period for which safety training flows are requested.

When the MELIP is in effect and the lake elevation is below 353.5' (355.0' PD) on December 1 for the December safety training flows the 45,000 acre-feet will be reduced by one third. Therefore, only approximately 30,000 acre-feet will be available for safety training. Further, while under the MELIP, if it is determined that the requested safety training flows can be provided at other times during the last quarter of each year without negatively impacting DO in the LSR, then reduced flows of approximately 30,000 acre-feet will be implemented so long as the lake elevation is more than one foot below the guide curve target elevation for that time of the year but above 352.5' (354.0' PD).

Safety training flows will be eliminated for that year if the lake elevation is at or below 352.5' (354.0' PD) on the date these flows are scheduled.

During extended periods of low inflow, when depletion of the reservoir below el. 348.5' (350.0' PD) is imminent, SCE&G will consult with the South Carolina Department of Natural Resources (SCDNR), the South Carolina Department of Health and Environmental Control (SCDHEC), US Fish and Wildlife Service (USFWS) and other applicable resource agencies to determine if further reductions in minimum flow below the target flow of 500 CFS (400 CFS minimum) should be considered. At that time, SCE&G will also coordinate a joint meeting with consulting agencies and the managers of the municipal water systems which withdraw water from Lake Murray, to determine a drought management plan that could include voluntary or mandatory water conservation measures, as determined by the agencies.

COORDINATION OF LOW INFLOW PROTOCOL WITH MAINTENANCE ACTIVITIES OR EMERGENCY CONDITIONS

If maintenance or emergency conditions require modifications to the normal reservoir target elevations and/or the normal minimum flow schedule during low inflow periods, the requirements of the maintenance activity or emergency condition may supersede the Low Inflow Protocol operation if necessary.

Drawdown of the reservoir due to maintenance or emergency conditions will not automatically trigger reductions in minimum flow, unless 14 day average inflow falls below the scheduled minimum flow. During refilling of the reservoir after a drawdown, if 14 day average inflow falls below the scheduled minimum flow while the reservoir is below el. 352.5' (el. 354.0' PD), the target flow will be reduced to 500 CFS (400 CFS minimum) until the reservoir exceeds el. 352.5' (el. 354.0' PD).

During periods of maintenance or emergency conditions if the reservoir elevation is below 352.5' (el. 354.0' PD), a meeting will be convened with the Recreational Advisory Flow Team (RAFT) to determine if recreation flow reductions are necessary in order to allow the reservoir to reach target levels.

It should also be noted that the SCDNR has certain statutory authority under the South Carolina Drought Response Act and Regulations, and nothing in this LIP is intended to abrogate that authority.

PERIODIC REVIEW OF PROTOCOL

SCE&G will consult with the SCDNR, the SCDHEC, USFWS, other applicable resource agencies and other relicensing stakeholders with relevant experience and interests that are signatories to the Comprehensive Relicensing Settlement Agreement every 5 years during the license term to evaluate the effectiveness of the MELIP during the previous 5 years, and to determine if any modifications to the MELIP are required.

APPENDIX A-13 – 1

NET INFLOW COMPUTATION

INFLOW SCALING

The three USGS gauge stations used to compute inflow to Lake Murray are:

02167000 Saluda River at Chappells (gauged drainage area = 1,360 mi^2)
02167450 Little River near Silverstreet (gauged drainage area = 230 mi^2)
02167582 Bush River near Prosperity (gauged drainage area = 115 mi^2)

Since the total drainage area of the Saluda River basin at the Saluda Dam is 2,420 mi^2, the discharge values recorded at the gauge sites must be scaled to provide an estimate of the total inflow to Lake Murray. The project drainage basin has been divided into seven sub-basins, five of which are downstream of Lake Greenwood and represent inflow to Lake Murray. Two sub-basins (nos. 6 & 7) are un-gauged, and inflow from these areas is estimated based on the Bush River gauge using the scale factors in the table below. [Note: a streamflow gauge was installed in 2008 on the Little Saluda River near Saluda (No. 02167705), however there has been insufficient flow for the USGS to calibrate (rate) the gauge since it was installed. When this gauge has been rated, it will replace the Bush River gauge for estimating flow from sub-basins 6 & 7.]

Basin No.	Name	Area (SM)	Cum. Area (SM)	Gage No.	DA at Gage	Scale Factor		
1	Upper Saluda R.	1,034.0	1,034.0					
2	Lake Greenwood	126.0	1,160.0					
3	Chappells	227.3	1,387.3	02167000	1,360.0	**1.020**		
4	Little River	283.5	1,670.8	02167450	230.0	**1.233**		
5	Bush River	140.1	1,810.9	02167582	115.0	1.218	}	6.515
6	Little Saluda River	331.0	2,141.9	Scaled from 7582	115.0	2.878		
7	Lake Murray Direct	278.1	2,420.0	Scaled from 7582	115.0	2.418		

Using these scale factors, the total inflow (Q_{total}) to Lake Murray is computed as:

$$Q_{total} = (1.02)(Q_{Chappells}) + (1.233)(Q_{Little\ R.}) + (6.515)(Q_{Bush\ R.})$$

ESTIMATED MUNICIPAL WITHDRAWALS

Five municipal water intakes are permitted to withdraw water from Lake Murray. The total maximum withdrawal rate for these intakes is estimated to be approximately 120 CFS as of 2008[9]. The actual withdrawal rate varies throughout the year, as estimated in the following table.

Month	Estimated Withdrawal Rate (CFS)	Month	Estimated Withdrawal Rate (CFS)
January	60	July	120
February	60	August	120
March	60	September	120
April	90	October	100
May	100	November	60
June	120	December	60

The above withdrawal rates are subtracted from the total inflow to Lake Murray to compute the net inflow to the project. The 14 day running average of net inflow is used to determine minimum flow during low inflow periods.

[9] The existing municipal water intakes are approved for higher withdrawal rates than those shown in the table, which represent estimates of actual withdrawals as of 2008. If water withdrawal rates change or new intakes are approved, the Licensee may modify the estimated withdrawal rates used to compute net inflow.

APPENDIX A-13 – 2

STRIPED BASS ENHANCEMENT FLOW REGIME

STRIPED BASS ENHANCEMENT FLOW REGIME

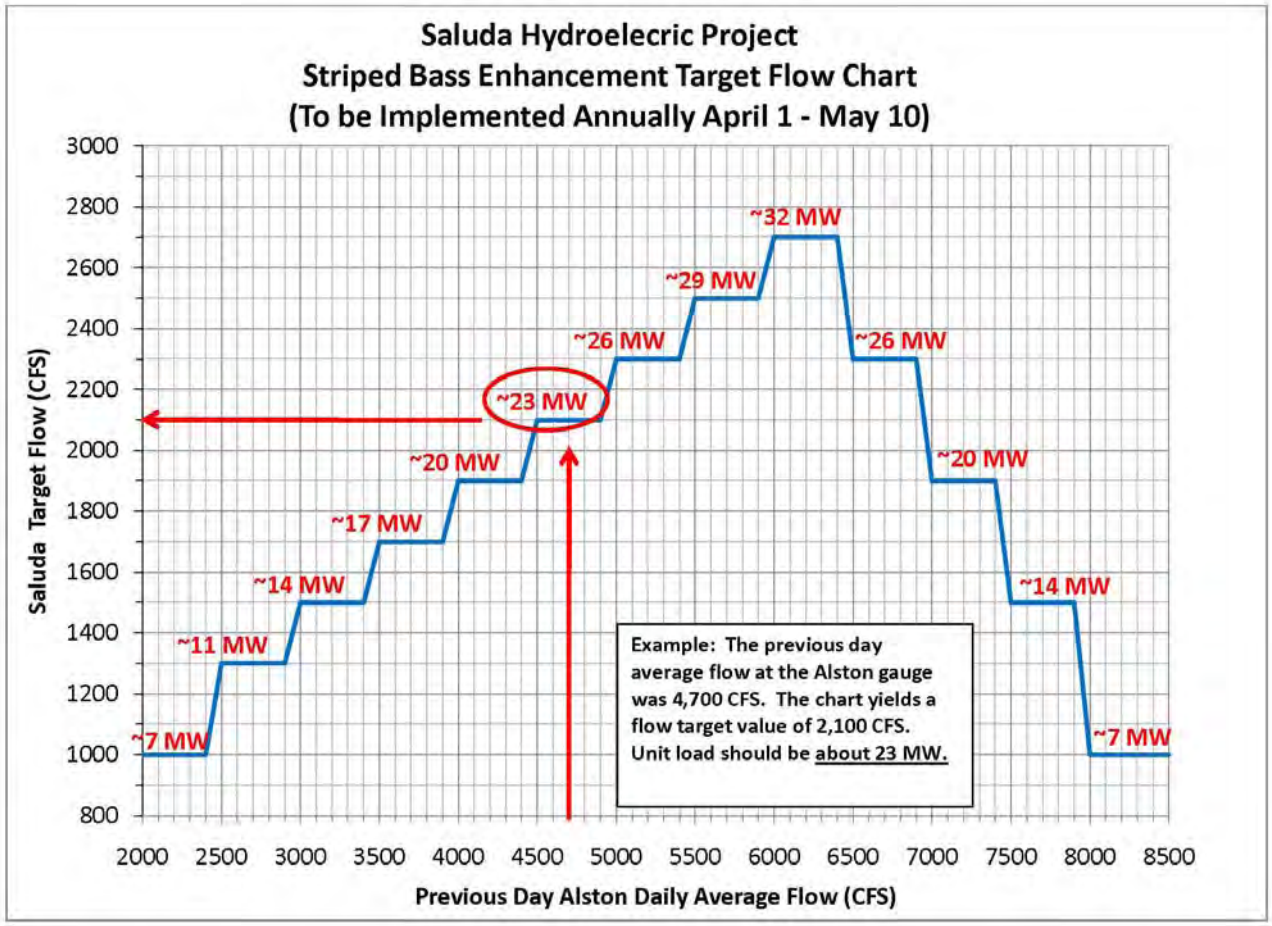
The Striped Bass Enhancement Flow Regime (STB Flows) was originally proposed by the SCDNR as a means of improving conditions for striped bass spawning in the Congaree River, which is formed by the confluence of the Broad and Saluda Rivers. It is SCDNR's contention that conditions most favorable to striped bass spawning have historically occurred when flow in the Congaree River near the I-77 bridge was approximately 9,000 CFS during the April 1 through May 10 period. Favorable conditions are also thought to have occurred when the Saluda River contributes approximately 30 percent of the total flow in the Congaree River at Columbia. This corresponds to a flow in the Saluda River which would be approximately 45 percent of the flow in the Broad River as measured at the USGS Broad River at Alston, SC gage site (No. 02161000). The SCDNR developed a target flow regime for the Saluda Project designed to maintain a Saluda River 30% flow contribution to the Congaree River when flow in the Broad River at Alston is between 2,500 and 8,000 CFS during the April 1st – May 10th period each year. The STB target flow request is summarized as follows:

- April 1st – May 10th: Each day that the previous day's daily average flow in the Broad River (measured at Alston gage) is between 2,500 CFS and 8,000 CFS, Saluda will release as a continuous target flow equal to the lesser of:
- 45% of the previous day's daily average flow in the Broad River at the Alston gage, or
- The balance of what is required to create a 9,000 CFS flow in the Congaree River.
- The striped bass request flows are intended to be released continuously 24 hours per day and will be treated as target flows subject to a 1,000 CFS minimum flow to be released from Saluda Hydro when the previous day's daily average flow in the Broad River (measured at Alston gage) is less than 2,500 CFS or greater than 8,000 CFS.

The STB target flow for a given day will be released to the extent possible as a continuous flow. It is recognized that STB habitat enhancement flows will vary on a day to day basis. For compliance purposes SCE&G will be granted a plus or minus 100 CFS variance of the STB target habitat enhancement flows. Determination of compliance shall be subject to matters beyond the reasonable control of SCE&G. The STB target flows will be determined on a daily

basis using the previous day's average flow in the Broad River measured at the Alston gage as shown in Table 1 and Chart 1. There will be no restriction on additional generation by Saluda Hydro if required during the STB flow period each year; when additional generation is no longer required on a given day, the STB target flow for the given day will be resumed. During the period from April 1 – May 10 when the previous day's average flow in the Broad River at the Alston gage is less than 2,500 CFS or greater than 8,000 CFS, STB target flows will not be in effect and a continuous flow of 1,000 CFS will be released.

The chart on the following page was prepared to correlate the Broad River flow with the STB target flow request.


Saluda Hydroelecric Project
Striped Bass Enhancement Target Flow Chart
(To be Implemented Annually April 1 - May 10)
Saluda Target Flow (CFS)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
~7 MW
~11 MW
~14 MW
~17 MW
~20 MW
~23 MW
~26 MW
~29 MW
~32 MW
~26 MW
~20 MW
~14 MW
~7 MW
Example: The previous day average flow at the Alston gauge was 4,700 CFS. The chart yields a flow target value of 2,100 CFS. Unit load should be about 23 MW.
2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500
Previous Day Alston Daily Average Flow (CFS)

Striped Bass (STB) Enhancement Target Flow Schedule To be implemented annually April 1 – May 10 when Broad River daily average flow is between 2,500 and 8,000 CFS		
Previous Day's Average Flow in Broad River at USGS Alston Gauge (CFS)	STB Enhancement Target Discharge from Saluda Hydro (CFS)	STB Enhancement Allowable Discharge Range from Saluda Hydro (CFS)
<2,500	1,000 minimum	1,000 minimum
2,500 – 2,999	1,300	1,200 – 1,400
3,000 – 3,499	1,500	1,400 – 1,600
3,500 – 3,999	1,700	1,600 – 1,800
4,000 – 4,499	1,900	1,800 – 2,000
4,500 – 4,999	2,100	2,000 – 2,200
5,000 – 5,499	2,300	2,200 – 2,400
5,500 – 5,999	2,500	2,400 – 2,600
6,000 – 6,499	2,700	2,600 – 2,800
6,500 – 6,999	2,300	2,200 – 2,400
7,000 – 7,499	1,900	1,800 – 2,000
7,500 – 7,999	1,500	1,400 – 1,600
≥8,000	1,000 minimum	1,000 minimum