Attachment B – Low Inflow Protocol (LIP) for the West Fork and East Fork Projects

Introduction

This Low Inflow Protocol (LIP) provides trigger points and procedures for how the East Fork Project (FERC # 2698) and West Fork Project (FERC # 2686) will be operated by the Licensee during periods of low inflow (i.e. periods when there is not enough water flowing into the East Fork and West Fork project reservoirs to meet the normal needs for power generation, recreation flows, minimum flows, any on-reservoir water withdrawals and lake level maintenance). The protocol was developed on the basis that all parties with interests in water quantity will share the impact of low inflow.

In general during periods of normal inflow, the Licensee will provide at least a prescribed number of hours per day of generation to support electric customer needs and the downstream flow needs in the main stem of the Tuckasegee River (typically during different periods each day), in addition to providing minimum flows in the Wolf Creek Bypassed Reach, scheduled Tainter gate releases from Glenville Dam for recreation and maintaining lake levels above certain prescribed minimum levels. During low inflow periods when the Licensee cannot meet all of the above conditions, it will reduce generation weekly by a prescribed amount per day during generation and/or recreation periods, along with corresponding weekly reductions in bypass flows, Tainter gate releases for recreation and minimum reservoir levels. In addition, any large (i.e. greater than or equal to one Million Gallons per Day (MGD) maximum instantaneous capacity) water intakes that are authorized on the East Fork or West Fork project reservoirs in the future will also have a reduction protocol incorporated into the easement documents that the Licensee uses to approve of such intakes. The incremental reduction of all water demands on the system will continue until inflows are restored to a point where the East Fork and West Fork lake levels return to their Normal Operating Ranges.

Key Facts and Assumptions

1. Minimum Flows in Bypassed Stream Reaches – Assume the new license for the East Fork Project will include the following normal requirements for minimum releases from hydro project works into bypassed stream reaches to enhance water quality and/or aquatic species habitat:

    a. Wolf Creek Bypassed Reach – 6 cfs continuous release from a valve to be installed at Wolf Creek Dam.

2. Minimum Flows in the Tuckasegee River Main Stem – Assume that the new licenses for the East Fork and West Fork projects will include the following minimum flow requirements for the main stem of the Tuckasegee River:

   a. 30 cfs combined minimum flow from December 1 through June 30 (assuming inflow into Tuckasegee Lake is greater than or equal to 20 cfs) and provided by the same means as the existing provision:

      1) Continue existing minimum flow at Tuckasegee (20 cfs or inflow, whichever is less).

      2) Continue existing minimum flow at Cedar Cliff (10 cfs from a valve at the hydro station during non-generation hours only). When Cedar Cliff Powerhouse is generating, the minimum flow valve is turned off.

   b. 55 cfs combined minimum flow from July 1 through November 30 (assuming inflow into Tuckasegee Lake is greater than or equal to 20 cfs) and provided by:

      1) Continue existing minimum flow at Tuckasegee (20 cfs or inflow, whichever is less).

      2) Increase the minimum flow valve capacity at Cedar Cliff and provide 35 cfs minimum flow during non-generation hours only. When Cedar Cliff Powerhouse is generating, the minimum flow valve is turned off.

3. Generation Releases for Angling and Boating Recreation Flows – Assume the new licenses for the East Fork and West Fork projects will include the following Normal Generation Schedule to Support Recreation on the main stem of the Tuckasegee River from the Cedar Cliff and Thorpe / Tuckasegee Powerhouses, with all releases being at or above the Best Efficiency Flows for the subject hydro units:

   a. Primary Angling Periods

      1) Defined - The first weekend after Labor Day through the last weekend of October and April 1st through the first weekend of June are defined as primary angling periods with actual flows at or below about 500 cfs being preferred (as measured at the reactivated or replaced USGS gage at Dillsboro).

2) During part of this time period, boating release schedules overlap. During this overlap period (the Saturday that occurs nine days before Memorial Day through the first weekend of June and Saturdays in September and October), the Normal Generation Schedule to Support Recreation will be:

   a) West Fork Release: Saturday and Sunday one week prior to Memorial Day weekend, Saturday and Monday of Memorial Day weekend and three of four Saturdays in September and October, plus Tuesday, Friday and Saturday for the period between Memorial Day weekend through the first weekend in June, each for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

   b) East Fork Release: Sunday of Memorial Day weekend plus Wednesday, Thursday and Sunday for the period between Memorial Day weekend through the first weekend in June and one of four Saturdays in September and October, each for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

b. Primary Boating Periods

1) Defined – The period after the first weekend of June through Labor Day is defined as the primary boating period, with actual flows at about 800 cfs (as measured at the reactivated or replaced USGS gage at Dillsboro) being preferred.

2) During this time period, the Normal Generation Schedule to Support Recreation for three out of four weeks will be:

   a) West Fork Release: Tuesday, Friday and Sunday for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

   b) East Fork Release: Wednesday, Thursday and Saturday plus the Monday of Labor Day weekend for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

3) During this time period, the Normal Generation Schedule to Support Recreation for one out of four weeks will be:

a) West Fork Release: Tuesday, Friday and Saturday for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

b) East Fork Release: Wednesday, Thursday and Sunday for six hours per day, timed to arrive at the reactivated or replaced USGS gage at Dillsboro at approximately 10:30 AM.

c. Adjusting for Significant Baseline Flows - The Licensee will check the river flow daily at the reactivated Dillsboro USGS Gage #03510500 (or a suitable replacement gage in this vicinity as determined by USGS) and by doing so, the Licensee can project the expected river flow at the Dillsboro Gage during the next scheduled generation release to support recreation. When projected baseline river flow (i.e. the flow rate at the Dillsboro USGS gage without the Licensee making the scheduled generation release to support recreation) is expected to average more than 500 cfs over the period from 10:30 AM to 4:30 PM, specific recreation flow releases from the DPNA hydropower stations can be reduced or stopped.

d. Other Special Events - Other requests for special generation releases that require additional generation hours above the total number of hours in any given month in the Normal Generation Schedule to Support Recreation will be handled on a case-by-case basis. To the maximum practical extent, releases will be integrated with the normal release schedule so that additional release hours beyond the normal release schedule are not needed.

4. Bypass Flow Releases for Recreation – Assume the new license for the West Fork Project will include the following requirements for scheduled releases from Glenville Dam into the West Fork (Glenville) Bypassed Reach to enhance downstream recreation:

a. Release water for six hours per day for one weekend (Saturday and Sunday) per calendar year in April. Target flowrate will be approximately 250 cfs each day and releases made to arrive at the put-in point at 10:00 AM.

b. Provide five total weekend day releases per calendar year for six hrs per day, scheduled on weekend days in the months of May through September. Target flowrate will be approximately 250 cfs each day and releases made to arrive at the put-in point at 10:00 AM.

c. Target Flowrates - The target flowrates stated above are for flowrates at the put-in point. Actual release amounts from the Tainter gate need to be large enough that when combined with other tributary and accretion flows, the total is as close as possible to the target flowrates.

5. Normal Full Pond Elevation – also referred to simply as "full pond", this is the level of a reservoir that corresponds to the point at which water would first begin to spill from the reservoir's dam(s) if the Licensee took no action. This level corresponds to the lowest point along the top of the spillway (including any fuse plugs or flashboards) for reservoirs without flood gates and to the lowest point along the top of the flood gates for reservoirs that have them. To avoid confusion among the many reservoirs the Licensee operates, it has adopted the practice of referring to the Normal Full Pond Elevation for all of its reservoirs as equal to 100.0 ft relative. The Normal Full Pond Elevations for East Fork and West Fork Project reservoirs are:

Hydro Project	Reservoir	Normal Full Pond Elevation (Ft above Mean Sea Level)
East Fork	Wolf Creek	3080.0
	Tanasee Creek	3080.0
	Bear Creek	2560.0
	Cedar Cliff	2330.0
West Fork	Glenville	3491.7
	Tuckasegee	2278.75

6. Normal Minimum Elevation – the level of a reservoir (measured in ft above Mean Sea Level (msl) or feet relative to the full pond contour with 100.0 ft corresponding to full pond) that defines the bottom of the reservoir's Normal Operating Range for a given day of the year. If inflows and outflows to the reservoir are kept within some reasonable tolerance of the average or expected amounts, hydro project equipment is operating properly and no protocols for abnormal conditions have been implemented, reservoir level excursions below the Normal Minimum Elevation should not occur.

7. Normal Maximum Elevation – the level of a reservoir (measured in ft above Mean Sea Level (msl) or feet relative to the full pond contour with 100.0 ft corresponding to full pond) that defines the top of the reservoir's Normal Operating Range for a given day of the year. If inflows and outflows to the reservoir are kept within some reasonable tolerance of the average or expected amounts, hydro

project equipment is operating properly and no protocols for abnormal conditions have been implemented, reservoir level excursions above the Normal Maximum Elevation should not occur. (Note: See Item 16 below for special drought storage considerations).

8. Normal Target Elevation - the level of a reservoir (measured in ft above Mean Sea Level (msl) or feet relative to the full pond contour with 100.0 ft corresponding to full pond) that the Licensee will endeavor in good faith to achieve, unless operating in the Low Inflow or Hydro Project Maintenance & Emergency Protocol. The Normal Target Elevation will fall within the Normal Operating Range, but it may not always be the average of the Normal Minimum and Normal Maximum Elevations.

9. Normal Operating Range for Lake Levels – the band of reservoir levels within which the Licensee normally attempts to maintain a given reservoir that it operates on a given day. Each reservoir has its own specific Normal Operating Range, and that range is bounded by a Normal Maximum Elevation and a Normal Minimum Elevation. If inflows and outflows to the reservoir are kept within some reasonable tolerance of the average or expected amounts, hydro project equipment is operating properly and no protocols for abnormal conditions have been implemented, reservoir level excursions outside of the Normal Operating Range should not occur. (Note: See Item 16 below for special drought storage considerations). Assume the new licenses for the East Fork and West Fork Projects will include requirements for the following Normal Operating Ranges (Note: All lake levels are for the first day of the month. Levels for other days of the month can be determined by linear interpolation):

   a. Lake Glenville – Maintain the following Normal Operating Range:

Month	Normal Minimum Elevation (ft)	Normal Target Elevation (ft)	Normal Maximum Elevation (ft)
Jan	85	90	94
Feb	85	90	94
Mar	88	91	94
Apr	90	93	96
May	95	97	99
Jun	95	97	99
Jul	95	97	99
Aug	93	95	98
Sep	90	93	94
Oct	90	93	94
Nov	86	90	94
Dec	85	90	94

b. Tanasee Creek & Wolf Creek Lakes – Maintain the following Normal Operating Range:

Month	Normal Minimum Elevation (ft)	Normal Target Elevation (ft)	Normal Maximum Elevation (ft)
Jan	83	85	92
Feb	83	85	92
Mar	83	85	92
Apr	86	88	96
May	90	93	100
Jun	90	93	100
Jul	90	93	100
Aug	90	93	100
Sep	90	93	100
Oct	90	93	100
Nov	86	88	96
Dec	83	85	92

c. Bear Creek Lake – Maintain the following Normal Operating Range:

Month	Normal Minimum Elevation (ft)	Normal Target Elevation (ft)	Normal Maximum Elevation (ft)
Jan	91	93	98
Feb	91	93	98
Mar	91	93	98
Apr	92	95	98
May	92	98	100
Jun	92	98	100
Jul	92	98	100
Aug	92	98	100
Sep	92	98	100
Oct	92	96	98
Nov	92	95	98
Dec	92	94	98

d. Cedar Cliff Lake – Maintain the following Normal Operating Range:

Month	Normal Minimum Elevation (ft)	Normal Target Elevation (ft)	Normal Maximum Elevation (ft)
Jan	96	98	100
Feb	96	98	100
Mar	96	98	100
Apr	96	98	100
May	96	98	100
Jun	96	98	100
Jul	96	98	100
Aug	96	98	100
Sep	96	98	100
Oct	96	98	100
Nov	96	98	100
Dec	96	98	100

e. Tuckasegee Lake – Maintain lake level as needed to provide minimum flow.

10. Net inflow – The cumulative inflow into a reservoir, usually expressed in ac-ft per week or ac-ft per month that is available for generation of hydroelectricity or for supplying non-generation water demands. Net inflow is the sum of tributary stream flow, groundwater runoff, precipitation falling on the reservoir surface, surface runoff and point-source discharge flows, less the sum of net on-reservoir water withdrawals, groundwater recharge and evaporation.

11. Normal Minimum Generation Volume – the minimum amount of net inflow, expressed in ac-ft per month, ac-ft per week or MWH of electric generation per week that is normally reserved in a hydro reservoir for release through the hydro turbines, producing hydroelectricity. For purposes of this low inflow protocol, the following are the Normal Minimum Generation Volumes for the East Fork and West Fork projects combined:

Period	Normal Minimum Generation Volume for East Fork and West Fork Projects Combined (MWH / week)
Nov-Apr	893
May (First two weeks only)	893
May (Week before Memorial Day only)	1158
May – Jun (Week after Memorial Day only)	1360
Remainder of Jun-Aug	1897
Sep (Labor Day through the following Saturday)	1228
Sep (2nd and 3rd weeks only)	1025
Sep (4th week only)	1095
Oct (First three weeks only)	1025
Oct (4th week only)	1095

Note: The above Normal Minimum Generation Volumes include both the energy produced by the hydro turbines during generation releases to support downstream recreation as well as energy produced during other periods of unit dispatch to meet the Licensee's electric customers' needs. To the maximum practical extent, when the weekly minimum generation volumes are reduced in the LIP, the reductions will be shared equally between the MWH/week that are reserved to make generation releases to support downstream recreation and generation releases (i.e. dispatch) to support electric customers' needs.

12. Threshold Minimum Flows – the minimum flow release amounts from hydro project works that may be necessary to sustain aquatic communities consistent with the resource management goals and objectives for the affected stream reaches. Since the normal minimum flow releases are for water quality and / or aquatic species habitat enhancements, the Threshold Minimum Flows are related to and lower than the normal minimum flow releases required by the FERC license. For the purposes of this protocol, it is assumed that the Threshold Minimum Flows are as follows:

    a. Wolf Creek Bypassed Reach - 2 cfs or inflow into Wolf Creek Lake, whichever is less, released from Wolf Creek Dam into the Wolf Creek Bypassed Reach.

b. Main Stem of the Tuckasegee River – the normal minimum flow provided from Tuckasegee Dam (i.e. 20 cfs or inflow into Tuckasegee Lake, whichever is less) plus the following minimum flows provided from the Cedar Cliff Spill Valve during periods of non-generation from Cedar Cliff Hydro Station:

   1) From December 1 through June 30 – 6 cfs
   2) From July 1 through November 30 – 11 cfs.

13. Simultaneous Reductions of Minimum Flows – when making reductions in minimum flows, the Licensee will make simultaneous reductions in the Wolf Creek Bypassed Reach and on the main stem with each stage of the Low Inflow Protocol.

14. Normal Minimum Non-Generation Volume – the minimum amount of net inflow, usually expressed in ac-ft per month or ac-ft per week that is normally reserved in a hydro reservoir to account for the portion of net inflow that leaves the reservoir without producing hydroelectricity. Examples include leakage from the main dam(s), diversion dam(s), penstock(s) or hydro turbine(s) into surface water; releases from flood, sluice and trash gates; and releases from minimum flow devices.

15. Low inflow period - any period when net inflow to a reservoir is not sufficient to maintain the reservoir's elevation above the Normal Minimum Elevation, while still providing the Normal Minimum Generation Volume, and the Normal Minimum Non-Generation Volume.

16. Drought Storage Considerations - the Licensee will be allowed to raise the reservoirs to levels above the Normal Maximum Elevation when water is available during periods of extended drought.

17. Threshold Bypass Whitewater Recreation Release – the duration and target flowrate below which Tainter gate releases in the bypassed reach to support whitewater boating can no longer achieve their intended purpose due to very short run times or too much contact with the riverbed. For the purpose of this protocol, the Threshold Bypass Whitewater Recreation Release is 200 cfs (target flowrate at the put-in point) for two hours duration. If there is a 2-hr release planned for each of two consecutive days, then it's preferable to have a single 4-hr release rather than two, 2-hr releases.

18. Important Lake Levels for Tainter Gate and Minimum Flow Operation – Lake levels could possibly be lowered to the point where lake level is below the levels needed to allow bypass flows for recreation purposes or minimum flows. The important lake levels for these uses are:

Hydro Project	Lake	Relative Elevation of the Tainter Gate Sill (ft with 100.0 = full pond)	Relative Elevation at Which Normal Minimum Flow Device No Longer Works (ft with 100.0 = full pond)
East Fork	Wolf Creek / Tanasee Creek	81.0	81.0 (assumed)
	Bear Creek	75.0	N/A
	Cedar Cliff	75.0	N/A
West Fork	Glenville	88.5	N/A
	Tuckasegee	97.0 (flashboards and trash sluice gate)	97.0

19. Relative Storage Amounts Available – The following are the approximate surface areas and storage amounts available in each lake:

Hydro Project	Lake	Relative Elevation (ft)	Lake Surface Area (ac)	Storage Volume (ac-ft)
East Fork	Wolf Creek / Tanasee Creek	100.0	223	11,407
		81.0	144	7600
	Bear Creek	100.0	476	34,715
		75.0	385	23,620
	Cedar Cliff	100.0	121	6319
		75.0	79	3742
West Fork	Glenville	100.0	1462	72,000
		88.5	1290	55,600

Hydro Project	Lake	Relative Elevation (ft)	Lake Surface Area (ac)	Storage Volume (ac-ft)
	Tuckasegee	100.0	8	35
		97.0	-	15

Notes:

a. Cedar Cliff Lake and Tuckasegee Lake have limited storage and the amount of water in the reservoirs changes very quickly, depending on operation of the upstream hydro station. Therefore, these two reservoirs do not provide reliable storage.

b. Lake Glenville has roughly twice the storage volume per foot of lake depth as do Wolf Creek Lake, Tanasee Creek Lake and Bear Creek Lake combined. Therefore, lake level reduction increments of two ft for the larger East Fork reservoirs and one foot for West Fork (Lake Glenville) are appropriate.

20. Priority of Reducing Tainter Gate Releases for Whitewater Recreation – when making reductions in Tainter gate releases for whitewater recreation in the West Fork (Glenville) Bypassed Reach, the duration of the release should be reduced first until it reaches the above stated threshold duration, then the target flowrates should be reduced until the threshold flowrate is reached.

21. Relationship Between this Protocol and the Hydro Project Maintenance & Emergency Protocol (HPMEP) – The HPMEP outlines the general approach the Licensee will take under certain emergency and equipment failure and maintenance situations to continue practical and safe operation of the hydro project, to mitigate any related impacts to license conditions and to communicate with resource agencies and the affected parties. Under the HPMEP, temporary modifications of minimum flow releases in bypassed stream reaches, generation releases, Tainter gate releases for recreation and the lake level operating range are allowed. Lowering levels of East Fork and West Fork Project reservoirs caused by situations addressed under the HPMEP will not invoke implementation of this Low Inflow Protocol (LIP). Also, if the LIP has already been implemented at the time that a situation covered by the HPMEP is initiated, the Licensee will typically suspend implementation of the LIP until the HPMEP situation has been eliminated. The Licensee may however choose to continue with the LIP if desirable.

22. Organizational abbreviations include the NC Division of Water Resources (NCDWR), NC Wildlife Resources Commission (NCWRC), United States Forest Service (USFS), United States Fish & Wildlife Service (USFWS), the Tuckasegee Gorge Association (TGA), United States Geological Survey (USGS) and the American Whitewater Affiliation (AW).

23. Safety and Electric System Integrity are of Utmost Importance – Nothing in this protocol will limit the Licensee's ability to take any and all lawful actions necessary at its hydro projects to protect human health and safety, protect its equipment from major damage and ensure the stability of the regional electric grid. It is recognized that the Licensee may take the steps that are necessary to protect these things without prior consultation or notification.

Procedure

During low inflow periods as defined above, the Licensee will follow the protocol set forth below for the East Fork and West Fork Projects regarding adjustments to generation amounts, minimum flow releases, Tainter gate releases for recreation and minimum reservoir elevations and will make the adjustments set forth below on a **weekly** basis so as to equitably allocate the impacts of reduced water availability:

Stage 1 Reductions:

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above their Normal Minimum Elevations for the time of year specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 1 Minimum Generation Volume and expressed in MWH/wk) as determined below:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 1 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	781	12.5
May (First two weeks only)	893	781	12.5
May (Week before Memorial Day only)	1158	1024	11.5
May – Jun (Week after Memorial Day only)	1360	1210	11.1
Remainder of Jun-Aug	1897	1702	10.3
Sep (Labor Day through the following Saturday)	1228	1088	11.4
Sep (2nd and 3rd weeks only)	1025	903	12.0
Sep (4th week only)	1095	967	11.7
Oct (First three weeks only)	1025	903	12.0
Oct (4th week only)	1095	967	11.7

Note: The above reductions in generation from the normal schedules represent a ½ hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 1 hour per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a ½ hour per day reduction during the recreation flow release period.

2. At the same time, the Licensee will reduce the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee as follows:

Period	**Normal combined minimum flow in Main Stem (cfs)**	**Stage 1 combined minimum flow in Main Stem (*)(cfs)**	**Total % Reduction From Normal**
December-June	Tuckasegee-20 Cedar Cliff-10	Tuckasegee-20 Cedar Cliff-6	13.3
July-November	Tuckasegee-20 Cedar Cliff-35	Tuckasegee-20 Cedar Cliff-27	14.5

Note: * Cedar Cliff Minimum Flow is at its Threshold Level in December through June.

3. At the same time, the Licensee will reduce the minimum flow release from Wolf Creek Dam to 5 cfs. This reduction represents a 16.7% reduction.

4. At the same time, the Licensee will reduce the Bear Creek, and Wolf Creek / Tanasee Creek Lakes' Normal Minimum Elevations by two feet and Lake Glenville's Normal Minimum Elevation by one foot for the relevant time period as shown above. The newly modified minimum elevations are referred to as the Stage 1 Minimum Elevations. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, this Stage 1 Minimum Elevation for the Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. At the same time, if recreation releases from the Glenville Dam are scheduled during Stage 1 reductions, then the releases will be reduced as noted below:

Tainter Gate Release	**Normally Scheduled Duration and Target Flowrates (hrs and cfs)**	**Stage 1 Duration and Target Flowrates (hrs and cfs)**	**% Reduction From Normal Water Volume Used**
Spring Weekend in April	Sat. - 6-hr release @ 250 cfs Sun. - 6-hr release@ 250 cfs	Sat. - 5-hr release @ 250 cfs Sun. - 5-hr release@ 250 cfs	16.7
Summertime Weekend Days in May, June, July, August, September	6-hr release @ 250 cfs	5-hr release @ 250 cfs	16.7

6. The Licensee will directly notify NCDWR, NCWRC, USFWS and the USFS when Stage 1 reductions are implemented. If these Stage 1 reductions occur in December through June, the Licensee will note to the agencies that the minimum flow from Cedar Cliff is at its Threshold Level for this time of year. The TGA President and the AW representative will be added to this notification when the angling and boating recreation flows or bypass flow releases for recreation are affected during this stage. The Licensee will endeavor in good faith to provide at least 24 hours advance notification.

7. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Stage 2 Reductions

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above the Stage 1 Minimum Elevations specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 2 Minimum Generation Volume and expressed in MWH/wk) as determined below:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 2 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	670	25.0
May (First two weeks only)	893	670	25.0
May (Week before Memorial Day only)	1158	891	23.1
May – Jun (Week after Memorial Day only)	1360	1059	22.1
Remainder of Jun-Aug	1897	1507	20.6
Sep (Labor Day through the following Saturday)	1228	949	22.7
Sep (2nd and 3rd weeks only)	1025	780	23.9
Sep (4th week only)	1095	838	23.5
Oct (First three weeks only)	1025	780	23.9
Oct (4th week only)	1095	838	23.5

Note: The above reductions in generation from the normal schedules represent a 1 hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 2 hours per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a 1 hour per day reduction during the recreation flow release period.

2. At the same time, the Licensee will reduce the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee as follows:

Period	Normal combined minimum flow in Main Stem (cfs)	Stage 2 combined minimum flow in Main Stem (*)(cfs)	Total % Reduction From Normal
December-June	Tuckasegee-20 Cedar Cliff-10	Tuckasegee-20 Cedar Cliff-6	13.3
July-November	Tuckasegee-20 Cedar Cliff-35	Tuckasegee-20 Cedar Cliff-19	29

Note: * Cedar Cliff Minimum Flow is at its Threshold Level in December through June.

3. At the same time, the Licensee will reduce the minimum flow release from Wolf Creek Dam to 4 cfs. This reduction represents a 33.3% reduction from the normal minimum flow release.

4. At the same time, the Licensee will reduce the Bear Creek and Wolf Creek / Tanasee Creek Lakes' minimum elevations by two additional feet (four feet below the Normal Minimum Elevations) and Lake Glenville's minimum elevation by one additional foot (two feet below the Normal Minimum Elevation) for the relevant time period as shown above. The newly modified minimum elevations are referred to as the Stage 2 Minimum Elevations. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, this Stage 2 Minimum Elevation for the Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. At the same time, if recreation releases from the Glenville Dam are scheduled during Stage 2 reductions and if the Stage 2 Minimum Elevation for Lake Glenville is at or above 88.5 ft (i.e. the minimum lake level needed to allow releasing water from a Tainter gate), then the releases will be reduced as noted below; otherwise, any scheduled Tainter gate releases to support whitewater recreation in the West Fork (Glenville) Bypassed Reach will be cancelled:

Tainter Gate Release	Normally Scheduled Duration and Target Flowrates (hrs and cfs)	Stage 2 Duration and Target Flowrates (hrs and cfs)	% Reduction From Normal Water Volume Used
Spring Weekend in April	Sat. - 6-hr release @ 250 cfs Sun. - 6-hr release@ 250 cfs	Sat. - 4-hr release @ 250 cfs Sun.-4-hr release@ 250 cfs	33.3
Summertime Weekend Days in May, June, July, August, September	6-hr release @ 250 cfs	4-hr release @ 250 cfs	33.3

6. The Licensee will directly notify the TGA President and the AW representative when Stage 2 reductions are implemented if the angling and boating recreation flows or bypass flow releases for recreation will be affected during this stage. The Licensee will endeavor in good faith to provide at least 24 hours advance notification.

7. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Stage 3 Reductions

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above the Stage 2 Minimum Elevations specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 3 Minimum Generation Volume and expressed in MWH/wk) as determined below:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 3 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	558	37.5
May (First two weeks only)	893	558	37.5
May (Week before Memorial Day only)	1158	757	34.6
May – Jun (Week after Memorial Day only)	1360	909	33.2
Remainder of Jun-Aug	1897	1311	30.9
Sep (Labor Day through the following Saturday)	1228	809	34.1
Sep (2nd and 3rd weeks only)	1025	657	35.9
Sep (4th week only)	1095	710	35.2
Oct (First three weeks only)	1025	657	35.9
Oct (4th week only)	1095	710	35.2

Note: The above reductions in generation from the normal schedules represent a 1½ hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 3 hours per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a 1½ hours per day reduction during the recreation flow release period.

2. At the same time, the Licensee will reduce the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee as follows:

Period	**Normal combined minimum flow in Main Stem (cfs)**	**Stage 3 combined minimum flow in Main Stem (*)(cfs)**	**Total % Reduction From Normal**
December-June	Tuckasegee-20 Cedar Cliff-10	Tuckasegee-20 Cedar Cliff-6	13.3
July-November	Tuckasegee-20 Cedar Cliff-35	Tuckasegee-20 Cedar Cliff-11	43.6

Note: * Cedar Cliff Minimum Flow is at its Threshold Level all year.

3. At the same time, the Licensee will reduce the minimum flow release from Wolf Creek Dam to 3 cfs. This reduction represents a 50 % reduction from normal minimum flow release.

4. At the same time, the Licensee will reduce the Bear Creek and Wolf Creek / Tanasee Creek Lakes' minimum elevations by two additional feet (six feet below the Normal Minimum Elevations) and Lake Glenville's minimum elevation by one additional foot (three feet below the Normal Minimum Elevation) for the relevant time period as shown above. The newly modified minimum elevations are referred to as the Stage 3 Minimum Elevations. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, this Stage 3 Minimum Elevation for the Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. At the same time, if recreation releases from the Glenville Dam are scheduled during Stage 3 reductions and if the Stage 3 Minimum Elevation for Lake Glenville is at or above 88.5 ft (i.e. the minimum lake level needed to allow releasing water from a Tainter gate), then the releases will be reduced as noted below; otherwise, any scheduled Tainter gate releases to support whitewater recreation in the West Fork (Glenville) Bypassed Reach will be cancelled:

Tainter Gate Release	**Normally Scheduled Duration and Target Flowrates (*) (hrs and cfs)**	**Stage 3 Duration and Target Flowrates (*) (hrs and cfs)**	**% Reduction From Normal Water Volume Used**
Spring Weekend in April	Sat. - 6-hr release @ 250 cfs Sun. - 6-hr release@ 250 cfs	Sat. – 3 hr release @ 250 cfs Sun.- 3-hr release@ 250 cfs	50
Summertime Weekend Days in May, June, July, August, September	6-hr release @ 250 cfs	3-hr release @ 250 cfs	50

6. The Licensee will directly notify the TGA President and the AW representative when Stage 3 reductions are implemented if the angling and boating recreation flows or bypass flow releases for recreation will be affected during this stage. If these Stage 3 reductions occur in July through November, the Licensee will also notify the NCDWR, NCWRC, USFWS and the USFS that the minimum flow from Cedar Cliff is at its Threshold Level year-round. The Licensee will endeavor in good faith to provide at least 24 hours advance notification.

7. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Stage 4 Reductions

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above the Stage 3 Minimum Elevations specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 4 Minimum Generation Volume and expressed in MWH/wk) as determined below:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 4 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	446	50
May (First two weeks only)	893	446	50
May (Week before Memorial Day only)	1158	623	46.2
May – Jun (Week after Memorial Day only)	1360	758	44.3
Remainder of Jun-Aug	1897	1116	41.2
Sep (Labor Day through the following Saturday)	1228	670	45.5
Sep (2nd and 3rd weeks only)	1025	535	47.8
Sep (4th week only)	1095	581	46.9
Oct (First three weeks only)	1025	535	47.8
Oct (4th week only)	1095	581	46.9

Note: The above reductions in generation from the normal schedules represent a 2 hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 4 hours per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a 2 hours per day reduction during the recreation flow release period.

2. At the same time, the Licensee will maintain the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee at the Threshold Levels as noted in Stage 3 above.

3. At the same time, the Licensee will reduce the minimum flow release from Wolf Creek Dam to the Threshold Minimum Flow of 2 cfs for the Wolf Creek Bypassed Reach. This reduction represents a 66.7 % reduction from normal minimum flow release.

4. At the same time, the Licensee will reduce the Bear Creek and Wolf Creek / Tanasee Creek Lakes' minimum elevations by two additional feet (eight feet below the Normal Minimum Elevations) and Lake Glenville's minimum elevation by one additional foot (four feet below the Normal Minimum Elevation) for the relevant time period as shown above. The newly modified minimum elevations are referred to as the Stage 4 Minimum Elevations. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, this Stage 4 Minimum Elevation for the Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. At the same time, if recreation releases from the Glenville Dam are scheduled during Stage 4 reductions and if the Stage 4 Minimum Elevation for Lake Glenville is at or above 88.5 ft (i.e. the minimum lake level needed to allow releasing water from a Tainter gate), then the releases will be reduced as noted below; otherwise, any scheduled Tainter gate releases to support whitewater recreation in the West Fork (Glenville) Bypassed Reach will be cancelled:

Tainter Gate Release	**Normally Scheduled Duration and Target Flowrates (hrs and cfs)**	**Stage 4 Duration and Target Flowrates (hrs and cfs)**	**% Reduction From Normal Water Volume Used**
Spring Weekend in April	Sat. - 6-hr release @ 250 cfs Sun. - 6-hr release@ 250 cfs	Sat. – 4 hr release @ 250 cfs Sun.- No release	66.7
Summertime Weekend Days in May, June, July, August, September	6-hr release @ 250 cfs	2-hr release @ 250 cfs	66.7

6. The Licensee will directly notify the TGA President and the AW representative when Stage 4 reductions are implemented if the angling and boating recreation flows or bypass flow releases for recreation will be affected during this stage. The Licensee will also notify the NCDWR, NCWRC, USFWS and the USFS that the minimum flow from Wolf Creek Dam is at its Threshold Level. The Licensee will endeavor in good faith to provide at least 24 hours advance notification.

7. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Stage 5 Reductions

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above the Stage 4 Minimum Elevations specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 5 Minimum Generation Volume and expressed in MWH/wk) as determined below:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 5 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	335	62.5
May (First two weeks only)	893	335	62.5
May (Week before Memorial Day only)	1158	467	59.6
May – Jun (Week after Memorial Day only)	1360	569	58.2
Remainder of Jun-Aug	1897	921	51.5
Sep (Labor Day through the following Saturday)	1228	530	56.8
Sep (2nd and 3rd weeks only)	1025	412	59.8
Sep (4th week only)	1095	453	58.7
Oct (First three weeks only)	1025	412	59.8
Oct (4th week only)	1095	453	58.7

Note: The above reductions in generation from the normal schedules represent a 2½ hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 5 hours per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a 2½ hours per day reduction during the recreation flow release period.

2. At the same time, the Licensee will maintain the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee at the Threshold Levels as noted in Stage 3 above.

3. At the same time, the Licensee will maintain the minimum flow release from Wolf Creek Dam at the Threshold Level of 2 cfs.

4. At the same time, the Licensee will reduce the Bear Creek and Wolf Creek / Tanasee Creek Lakes' minimum elevations by two additional feet (ten feet below the Normal Minimum Elevations) and Lake Glenville's minimum elevation by one additional foot (five feet below the Normal Minimum Elevation) for the relevant time period as shown above. The newly modified minimum elevations are referred to as the Stage 5 Minimum Elevations. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, this Stage 5 Minimum Elevation for the Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. At the same time, if recreation releases from the Glenville Dam are scheduled during Stage 5 reductions and if the Stage 5 Minimum Elevation for Lake Glenville is at or above 88.5 ft (i.e. the minimum lake level needed to allow releasing water from a Tainter gate), then the releases will be reduced as noted below; otherwise, any scheduled Tainter gate releases to support whitewater recreation in the West Fork (Glenville) Bypassed Reach will be cancelled:

Tainter Gate Release	**Normally Scheduled Duration and Target Flowrates (hrs and cfs)**	**Stage 5 Duration and Target Flowrates (hrs and cfs) (*)**	**% Reduction From Normal Water Volume Used**
Spring Weekend in April	Sat. - 6-hr release @ 250 cfs Sun. - 6-hr release@ 250 cfs	Sat. – 4 hr release @ 200 cfs Sun.- No release	73.3
Summertime Weekend Days in May, June, July, August, September	6-hr release @ 250 cfs	2-hr release @ 200 cfs	73.3

Note: * Both the duration and flowrates for Tainter gate releases to support whitewater recreation are at their Threshold Levels.

6. The Licensee will directly notify the TGA President and the AW representative when Stage 5 reductions are implemented if the angling and boating recreation flows or bypass flow releases for recreation will be affected during this stage. The Licensee will endeavor in good faith to provide at least 24 hours advance notification.

7. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Stage 6 Reductions and Beyond

1. Upon a determination by the Licensee that the reservoir elevations for either (a) Lake Glenville, or (b) Bear Creek Lake and Wolf Creek / Tanasee Creek lakes cannot be maintained at or above the Stage 5 Minimum Elevations specified above, the Licensee will reduce the minimum generation volume to a lower amount (referred to as the Stage 6 Minimum Generation Volume and expressed in MWH/wk) as determined below. Also note that for all stages beyond Stage 6, the Minimum Generation Volumes will stay constant at this Stage 6 level:

Period	Normal Min. Gen. Volume for East Fork and West Fork Projects Combined (MWH / week)	Stage 6 Min. Generation Volume (MWH/wk)	% Reduction From Normal Water Volume Used
Nov-Apr	893	223	75
May (First two weeks only)	893	223	75
May (Week before Memorial Day only)	1158	378	67.4
May – Jun (Week after Memorial Day only)	1360	496	63.5
Remainder of Jun-Aug	1897	725	61.8
Sep (Labor Day through the following Saturday)	1228	391	68.2
Sep (2nd and 3rd weeks only)	1025	290	71.8
Sep (4th week only)	1095	324	70.4
Oct (First three weeks only)	1025	290	71.8
Oct (4th week only)	1095	324	70.4

Note: The above reductions in generation from the normal schedules represent a 3 hour per day reduction in hours of generation from each powerhouse for the Licensee's dispatch periods, except at Tennessee Creek, where the reduction will be 6 hours per day. For periods where downstream recreation flow releases are scheduled, the reduction represents a 3 hours per day reduction during the recreation flow release period.

2. If recreation releases from the Glenville Dam are scheduled during Stage 6 and beyond, they will be held constant at the Threshold Levels as noted in the Stage 5 reductions above until the reduced minimum lake elevation for Lake Glenville falls below 88.5 ft (i.e. the minimum lake level needed to allow releasing water from a Tainter gate), at which point the releases will be cancelled.

3. At the same time, the Licensee will maintain the combined minimum flow in the Main Stem below Cedar Cliff and Tuckasegee at the threshold minimum flows as noted in Stage 3 above.

4. Once the minimum generation has been reduced to Stage 6 and beyond, all Glenville Dam Tainter gate releases for recreation have been cancelled and all main stem minimum flows are being maintained at the threshold minimum flows, the minimum lake elevation requirements for Lake Glenville and Bear Creek Lake will no longer apply. Note however that in order to maintain minimum flow in the Wolf Creek Bypassed Reach, the minimum elevation for Wolf Creek / Tanasee Creek lakes must not be reduced below 81.0 ft.

5. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.

Recovery from the Low Inflow Protocol

1. When inflows have increased to a point where the Licensee can maintain lake level above the minimum elevation established in the previous stage reduction, operation of the projects can begin transitioning out of the LIP. The transitioning procedure will follow the stage reductions outlined above in reverse order (i.e. "stage increases" going from the last stage achieved back toward Stage 1 and then finally returning to normal operation).

2. The Licensee will perform the direct notifications as identified in each stage above as the stages are transitioned.

3. The Licensee will directly notify the NCDWR, NCWRC, USFWS, USFS, and, if required, the TGA President and the AW representative when lake levels have been restored to within the Normal Operating Range with a normal generation schedule, normal minimum flows in the bypassed reaches and a normal schedule for Tainter gate releases to support whitewater boating.

4. The Licensee will update its website and telephone messages to account for the impacts of the above LIP on schedules for generation and bypass recreational releases and lake levels.