WATER CONTROL PLAN
FOR
JOHN H. KERR DAM AND RESERVOIR

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A. INTRODUCTION

The water control plan for John H. Kerr Dam and Reservoir describes the proper operation of the project during floods as well as for hydropower generation, low flow regulation, and other project purposes. This plan is an updated extract from the Reservoir Regulation Manual for Kerr Reservoir, Appendix A of the Roanoke River Basin Reservoir Regulation Manual.

B. OBJECTIVES OF RESERVOIR REGULATION

1. **General**. The authorized purposes and operating objectives for Kerr Dam and Reservoir are listed below:

a. Flood control
b. Hydroelectric power
c. Low flow augmentation
d. Fish and wildlife
e. Water Supply
f. Recreation

Storage in Kerr Reservoir is comprised of a controlled flood storage pool for storage of floodwaters and a conservation pool that provides water for hydropower generation and other project purposes. The elevations and storage capacities for these pools are shown below. More detailed elevation and capacity data are available in the Pertinent Data Section of the Kerr Reservoir Regulation Manual referenced in Section A.

	Elevation (ft-NGVD29)1	Storage Capacity (acre-feet)
Controlled Flood Storage Pool	300-320	1,281,400
Conservation Pool	268-300	1,027,000

The boundary between the conservation and controlled flood storage pools remains static at elevation 300 ft-NGVD29; however, the operational guide curve varies seasonally to better support all operational objectives of the project. For instance, the guide curve in the winter drops into the conservation pool to elevation 295.5 ft-NGVD29 to provide additional flood storage capacity, while still providing sufficient storage in the conservation pool to support minimum energy commitments during droughts. In the spring, the guide curve extends into the flood pool to elevation 302 ft-NGVD29 to provide supplementary storage in the reservoir to be utilized to support striped bass spawning releases downstream of the project (discussed in Section F.1). During the summer, the guide curve drops to the normal summer pool elevation of 299.5 ft-NGVD29, which provides sufficient storage to support increased minimum energy commitments during the summer, while having the added benefit of optimizing recreational opportunities. The controlled flood storage and conservation pools, as well as the guide curve, are depicted in Plate 1. Additional discussion of the operations with respect to the guide curve is provided throughout this water control plan.

1 All elevations in this Water Control Plan are referenced to NGVD29 vertical datum. The conversion to NAVD88 is -1.02 ft (e.g., elevation 300 ft-NGVD29 converts to elevation 298.98 ft-NAVD88).

Dominion owns and operates two hydropower projects located in series directly downstream of Kerr Dam (Gaston below Kerr and Roanoke Rapids below Gaston). The extent to which Kerr Dam operates as a system with Dominion's downstream projects for each operational objective is described in detail in subsequent sections of this water control plan. (Plate A-1 and Appendix D of the Roanoke River Basin Reservoir Regulation Manual provide the geographic layout and operational descriptions of the Gaston and Roanoke Rapids Projects.)

2. **Reservoir operation for flood control**. The primary objective of the project is flood control, with a dedicated flood storage pool between elevations 300 and 320 ft-NGVD29 reserved exclusively for the detention storage of flood waters. In addition, a lower winter guide curve elevation allows the reservoir to be drawn down to elevation 295.5 ft-NGVD29, which provides additional flood control benefits.

The objective of flood control operation is to reduce flood risk along the Roanoke River below Kerr Dam. Flood waters temporarily stored in the reservoir will be released at the maximum rate possible without causing significantly damaging stages downstream. (See Kerr Reservoir Regulation Manual for more detailed information concerning flood damages for downstream interests and locations, including procedures for estimating flood damages with and without project operations.) Higher releases will be made only when forecasts of inflow indicate such releases are necessary to prevent a reservoir rise above elevation 320 ft-NGVD29. Details of flood operation are described in Section C.

3. **Reservoir operation for power**. The Kerr Hydroelectric Power Plant operates as a peaking plant, meaning most of the energy produced will be generated during hours of peak customer demand. When the headwater elevation is at or below guide curve elevation, the project will be operated to the greatest extent possible to meet minimum energy requirements and maintain dependable capacity. When releases in excess of minimum generation are necessary for flood flows or other project purposes, those releases will be made by power generation to the fullest extent possible to maximize hydropower value.

The Corps of Engineers will operate the Kerr Hydroelectric Power Plant and deliver the entire output thereof (less the power and energy required in the operation of the project) to Dominion on its 115-kv lines in the Kerr station switchyard. The power operation is subject to such regulations concerning the maximum and minimum release of water from the reservoir for flood control and flow regulation as may be established by the Wilmington District. Details of reservoir operation for power generation are described in Section D.

4. **Operation for low flow augmentation**. Kerr Reservoir is no longer specifically operated for low flow augmentation, since low flow requirements are now being met by Dominion, which owns and operates Gaston and Roanoke Rapids hydroelectric power projects immediately downstream of Kerr Dam. In accordance with their Federal Energy Regulatory Commission (FERC) license (No. 2009-18) for the Gaston-Roanoke Rapids power project, Dominion will release water from the Roanoke Rapids Dam to meet target flows for maintenance of proper quantity and quality of water in the lower Roanoke River. However, weekly releases from Kerr Reservoir to meet Kerr's minimum energy requirements are generally more than adequate to sustain the FERC minimum release requirements from the Roanoke Rapids project. Details of these FERC flow requirements related to Kerr Reservoir operations are included in Section E.

5. **Operation for fish and wildlife**. Additional flows from Roanoke Rapids Dam that are required during the striped bass spawning season are made possible by releasing additional water from Kerr Reservoir. These flows are reregulated by the Roanoke Rapids Dam. These spawning flows place an additional demand on the storage available in Kerr Reservoir. At present, the additional flows for the striped bass are provided by storing water in the flood control pool during the spring of the year, before

and during the striped bass spawning season. Details of the requirements and the means by which the project meets these requirements are included in Section F.

6. **Operation for water supply**. Normally, there are no special reservoir operations required for water supply withdrawals. Local interests that have contracted for water supply storage in a percentage of Kerr's conservation pool shall have the right to utilize water from Kerr Reservoir to the extent that their storage will provide. Several water supply contracts to utilize storage in Kerr Reservoir are in effect. Details of these water supply contracts are discussed in Section G.

7. **Operation for recreation**. The project will be operated for recreation in the reservoir to the maximum extent possible without serious interference with the purposes of flood control and hydropower generation. Operation in accordance with the established guide curve and rules of operation provides a full or nearly full pool during the main recreation season in all but extremely dry years. Refer to Section H for additional information.

8. **Mosquito-control operations**. Kerr Reservoir mosquito-control operations will be performed in accordance with ER 1130-2-413, Pest Control Program for Civil Works Projects. Corps of Engineers' policy is to respond whenever an authorized public health agency declares an emergency health hazard. It is against policy to participate in general pest/mosquito control programs to eliminate nuisance pests. Nuisance pest/mosquito control will only be performed on lands adjacent to Corps-managed public recreation facilities, operation and maintenance areas. Water level management will include, whenever consistent with other purposes, a gradual drawdown of the conservation pool during the hot summer months. Refer to Section I for additional information.

C. OPERATION FOR FLOOD CONTROL

1. **Method of operation.** The method of operation planned for Kerr Reservoir is generally designed to make maximum beneficial use of available storage in each flood event. Whenever the reservoir level rises into the flood storage pool (above elevation 300 ft-NGVD29) or whenever a rise into the flood storage pool is assured, the release will be such as to regulate the flow at the Roanoke Rapids gage as follows:

Table 1. Planned Flood Releases

Reservoir Elevation (ft-NGVD29)	Flood Release (cubic feet per second)
300-320	Inflow up to 35,000
320-321	85% of inflow
321	Inflow

For reservoir levels below elevation 320 ft-NGVD29, planned flood releases will generally be based on weekly average inflows into Kerr Reservoir. If weekly average inflows exceed 35,000 cubic feet per second (cfs), planned flood releases at Roanoke Rapids dam will be limited to 35,000 cfs unless reservoir levels are assured of exceeding elevation 320 ft-NGVD29. Flood release decisions will be based on weekly average inflows into Kerr Reservoir, but will also take into account operational considerations such as: special operations, including spawning releases and implementation of the Betterment Plan (both discussed later in this Plan); proximity to the seasonally-varying guide curve (e.g., releases may need to be more or less than weekly inflows in order to accommodate falling or rising guide curve, respectively); and intervening local inflows into Lake Gaston and Roanoke Rapids (e.g., if inflows into Kerr support a flood release of 35,000 cfs from Roanoke Rapids, then releases from Kerr

Reservoir may be 1000-2000 cfs less to allow release of local runoff occurring between Kerr Dam and Roanoke Rapids Dam).

Flood release decisions are typically made on a weekly basis by the Wilmington District Water Management Unit (Water Management) in concert with its weekly energy declaration procedures; however, flood releases and corresponding energy declarations can be revised as necessary throughout the week. Section D below gives more detail regarding the operation of Kerr Reservoir for power generation.

2. **Regulation within the upper conservation pool range**. The reservoir guide curve varies seasonally, being only a half-foot below the bottom of the flood storage pool in the summer but as much as 4.5 feet below in the winter. Whenever the reservoir level is in this upper conservation pool range between the bottom of the flood storage pool elevation (300 ft-NGVD29) and the guide curve elevation, this storage space will also be evacuated using releases up to 35,000 cfs at Roanoke Rapids dam based on weekly average inflows into Kerr Reservoir, consistent with the flood operations described above. While releases up to 35,000 cfs are possible, planned releases in this range of lake levels will be contingent on inflows, proximity to the seasonally-varying guide curve, and intervening local inflows to Lake Gaston and Roanoke Rapids.

3. **Control point for reservoir releases**. The control point for releases from Kerr Reservoir is at the Roanoke Rapids, NC, stream gage located about 3 miles downstream of Roanoke Rapids Dam, which is also a National Weather Service flood forecast location for Roanoke Rapids and other downstream communities along this portion of the river.

The local watershed between Kerr Dam and Roanoke Rapids Dam contains about 645 square miles and contributes a significant amount of flow to the Roanoke River. Dedicated flood storage space is available in Lake Gaston to accommodate intervening local flows into Lake Gaston and Roanoke Rapids Lake. When Kerr Reservoir is in declared flood operations, Dominion is allowed by its FERC license to utilize this storage and operate Lake Gaston up to elevation 203 ft-NGVD29. Flood operations at Kerr Reservoir will typically be designated whenever flood releases are at or above a 7-day average of 20,000 cfs. In the event that flood storage is utilized at Lake Gaston, the releases from Kerr Reservoir will take into account any planned releases to empty the flood storage in Lake Gaston; however, minimum energy generation at Kerr Dam should not be impacted.

Below the Roanoke Rapids gage, the watershed is narrow and runoff reaches the river in a few hours. Coordinating releases from Kerr Reservoir with the streamflow originating in this area is impractical because the time of travel from the dam is about 3 days.

The discharge at the Roanoke Rapids gage will be permitted to exceed 35,000 cfs only when necessary to prevent filling Kerr Reservoir above elevation 320 ft-NGVD29. Forecasts of inflow will be periodically revised as updated streamflow and rainfall data become available, and the desired outflow will be adjusted if necessary. The object of this operation will be to obtain a maximum reduction in flood crests while utilizing all the available storage up to elevation 320 ft-NGVD29 in Kerr Reservoir.

4. **Emptying operation**. In the event that a discharge greater than 35,000 cfs is established in controlling a flood in accordance with Table 1, the reservoir will be operated so as to maintain that established maximum discharge until the reservoir falls to elevation 315 ft-NGVD29, providing enough flood control storage to hold one inch of additional runoff from the drainage area above Kerr Dam. Upon reaching elevation 315 ft-NGVD29, that maximum discharge would then be reduced to 35,000 cfs until the reservoir level is near guide curve. If a maximum discharge above 35,000 cfs is not warranted in accordance with Table 1 for a flood event, that maximum discharge will be maintained until the

reservoir level is near guide curve. In all cases, discharges will be reduced toward the end of flood operations as needed to adhere to the Betterment Plan when applicable (see Section C.10) and/or to ensure that the lake level is not drawn down below guide curve.

5. **Surcharge storage**. Deliberate use of surcharge storage was not anticipated in the design of Kerr Dam or the gate operating machinery, or in the land acquisition program for the reservoir. The following features of the project, as constructed, limit the use of surcharge storage:

a. From Kerr Dam upstream to Clarksville, VA, the land has been acquired only to about elevation 320 ft-NGVD29; however, flooding of this land above elevation 320 ft-NGVD29 would not be expected to cause serious damage.

b. The motors for the water supply and sewage pumps for Clarksville and others are located slightly above elevation 320 ft-NGVD29 (approximately elevation 323 ft-NGVD29).

c. Primary highways and railroads have been raised or relocated so that the lowest steel is at elevation 325 ft-NGVD29 or above.

d. There is no freeboard on the top of the spillway gates, which are at elevation 320 ft-NGVD29 when fully closed.

e. The gate operating indicators and machinery are at about elevation 323 ft-NGVD29, and the base of the motors is at about elevation 325 ft-NGVD29. Thus a rise of the reservoir above elevation 323 ft-NGVD29 before the gates are fully open could make gate operation hazardous with the possibility that wave action might immobilize the motors and make further opening of the gates impossible.

However, surcharge storage will be used to a limited extent by discharging 85 percent of inflow whenever a rising reservoir is between elevation 320 and 321 ft-NGVD29. Inflow used as a basis for determination of discharge required shall be actual inflow in emergency operation and a forecast maximum inflow in normal operation. Rise above elevation 321 ft-NGVD29 will be resisted by discharging 100 percent of inflow. Safety considerations dictate that all spillway gates should be fully open before there is any possibility that they might be immobilized by a reservoir elevation higher than 321 ft-NGVD29.

6. **Spillway gate regulation schedules**. Generally, releases directed by Water Management will be based on inflow and lake level forecasts. A gate regulation schedule has also been developed in accordance with EM 1110-2-3600 which will enable Water Management to make a quick determination of the required release. (The Spillway Gate Regulation Schedule is provided in Plates A-34 and A-35 of the Kerr Reservoir Regulation Manual.) This schedule may also be used by the damtender as an emergency operation tool in the event that communication with Water Management fails and the only data known to the damtender is that available at the dam.

The minimum outflow required to prevent a reservoir rise above elevation 320 ft-NGVD29 for any given inflow and reservoir elevation can be determined from this schedule. The inflow to the reservoir at any time can be determined by either (1) discharge data recorded at Paces, Randolph, and Halifax, VA stream gages plus the local discharge as computed by the unit hydrograph, or (2) by the change in reservoir storage and the prevailing outflow at the dam. Determinations by each method will be made by Water Management and checked against the other as appropriate. Hourly inflow computations are available from the SCADA (supervisory control and data acquisition) system at the powerhouse. These

computations will be made manually by powerhouse personnel on form SAW-35 (provided in the Kerr Reservoir Regulation Manual) when necessary.

7. **Emergency operation and instructions to Kerr powerhouse operators**. If communication between Kerr Dam and Water Management personnel is not possible during a flood event, the dam and powerhouse operators will regulate the reservoir in accordance with the emergency procedures and specific instructions as stated in the "John H. Kerr Dam Emergency Operation for Flood Control" manual (issued separately from this water control plan).

The emergency procedure is adequate to ensure a safe, reasonably efficient operation of the reservoir throughout the flood by trained powerhouse personnel. Extended failure of communication is unlikely. However, should communications fail during a major flood, one or more persons from Water Management could be sent to the project within a few hours to direct reservoir releases.

In the event that there is potential for uncontrolled releases or dam failure, the Emergency Action Plan (EAP) should be implemented. The EAP is updated annually and can be found in the Water Management, Readiness Contingency Operations, and Geotechnical Engineering offices of the Wilmington District and at the Kerr Powerhouse.

8. **Rate of change of discharge**. Discharge from Kerr Dam flows directly into Lake Gaston. Since there is no open river flow between the projects, no limit is set on the rate of change of discharge because of downstream effects. Dominion will be notified when water is to be spilled and when a substantial change is to be made in the rate of spill.

9. **Reregulation of Kerr flood releases by Gaston and Roanoke Rapids Dams**. Flood releases from Kerr and Gaston Dams can be made by operating their turbines at varying discharge rates up to approximately 40,000 cfs throughout the day. Reregulation of variable turbine releases from Kerr and Gaston Dams to the specified uniform flood release rate is done at Roanoke Rapids Dam. If the planned flood flow at the Roanoke Rapids gage is more than 20,000 cfs, the Roanoke Rapids turbines are fully loaded (20,000 cfs) and the remainder of the specified flow is spilled. Water Management specifies the start and release rate for flood releases from Roanoke Rapids. However, due to storage limitations and operational constraints at Roanoke Rapids, flood operations at Gaston and Roanoke Rapids Dams during transitions into and out of designated flood operations at Kerr Dam will be coordinated with Dominion as needed, such as timing of beginning increased flood releases from Roanoke Rapids Dam.

10. **Mitigation of hypoxic swamp water drainage into main stem of lower Roanoke River during summer months**. In the 1990s, as a result of fish kills and critically low dissolved oxygen along the main stem of the lower Roanoke River following the termination of summer flood operations, a multi-agency group developed a plan (referred to as the Betterment Plan) to mitigate these effects. The Betterment Plan is designed to lessen the negative impact of hypoxic swamp water draining into the main stem of the lower Roanoke River during the transition from flood control operation to normal hydropower peaking operations. The plan is based on the assumption that a prolonged step-down decrease in releases from the Roanoke Rapids dam will slow the rate of drainage from the lower Roanoke River swamp lands while providing enough main stem river flow with sufficient dissolved oxygen (DO) to counteract the effect of the low DO of swamp water. Since implementation of this plan in 1998, it has been effective in avoiding any significant fish kills following protracted, hot weather flood releases.

The Betterment Plan assumes the following conditions exist on the lower Roanoke River:

a. Kerr Reservoir is being operated in flood control mode, which has resulted in the flooding of the lower Roanoke River swamp lands.

b. Daytime temperatures greater than 90 degrees Farenheit (F) have occurred during the period that the swamp lands have been flooded.

If the above conditions exist or have existed, the Betterment plan will be implemented as follows:

a. During the week prior to the planned termination of flood operation, determine if hypoxic conditions (DO levels< 3mg/l) exist in the lower Roanoke River swamp waters based on consultation with Dominion biologists and state and federal fisheries and water quality resource agencies, including N.C. Wildlife Commission, U.S. Fish and Wildlife Service, and N.C. Division of Water Resources.

b. If hypoxic conditions exist in lower Roanoke River swamp waters, retain adequate flood storage in Kerr Reservoir for a step-down flow regime as described below in section (c).

c. Initiate the following step-down flow regime from Roanoke Rapids dam (if flow at the 20,000 cfs level has existed for 4 days, proceed to the next level).

Approximate Target Flow	Duration
20,000 cfs	4 days
15,000 cfs	4 days
10,000 cfs	3 days
5,000 cfs	3 days

D. **OPERATION FOR POWER GENERATION**

1. **General**. While Kerr Reservoir has been constructed primarily to provide flood control, it is also intended that the greatest possible amount of the water released will be used for power generation, regardless of whether those releases are for flood control or other purposes (such as spawning releases).

Power plant facilities at Kerr Dam include 7 units having a total operating capacity of 267 megawatts (MW) and a dependable capacity of 225 MW, with a minimum dependable capacity pool elevation of 293 ft-NGVD29. Daily/hourly generation scheduling at Kerr Dam is normally set by Dominion in coordination with generation at their Gaston and Roanoke Rapids projects, taking into account federal power customer schedules as coordinated by the Southeastern Power Administration (SEPA), the Corps-declared weekly energy totals for Kerr Reservoir (including any Corps-directed flood or spawning releases), and Dominion's FERC license requirements.

The guide curve and generation requirements will be used as the basis for power generation at the plant. The guide curve represents the lower limit of reservoir level throughout the year that provides sufficient storage to support contractual minimum energy commitments during a repeat of any drought in the period of available record. Section D.2, below, provides additional information on contractual minimum energy requirements. The reservoir guide curve is shown on Plate 1.

2. **Energy Generation Requirements.** Whenever Kerr Reservoir level is at or below the guide curve, the power plant will be operated to produce only the minimum energy required to guarantee dependable capacity. When the power plant is not in operation to meet customer load, only water required to generate energy for station use will be released. Such an operation will ensure that

dependable power (energy and capacity) can be supplied during a repeat of any drought on record. Minimum weekly energy requirements for Kerr Reservoir per current SEPA contracts are shown below in Table 2:

Table 2. Minimum Weekly Energy Contract Amounts for John H. Kerr

Month	John H. Kerr Effective 1 January 1997		
	Dominion (MWH/week)	Duke Energy Progress (MWH/week)	Total (MWH/week)
JAN	1550	1450	3000
FEB	1370	975	2345
MAR	1275	975	2250
APR	1275	975	2250
MAY	1275	975	2250
JUN	1900	975	2875
JUL	1910	1470	3380
AUG	1910	1470	3380
SEP	1900	1470	3370
OCT	1275	975	2250
NOV	1275	975	2250
DEC	1550	1450	3000

When an energy declaration week (Saturday through Friday) falls within two months, minimum energy for the month that includes Wednesday is used.

Kerr project power will be marketed in accordance with the SEPA contracts with Dominion and Duke Energy Progress. Power generated at Kerr Dam, in excess of that used at the project, is made available for sale by Southeastern Power Administration (SEPA), the marketing agency of the Department of Energy. SEPA has a contract with Dominion which provides for taking all of the project power from Kerr Dam. Minimum energy and any excess (secondary) energy resulting from flood operations or spawning releases shall be distributed as follows:

a. Fifty-eight percent (58%) or 130 megawatts (MW) of dependable capacity at Kerr Dam and two-thirds of the excess (secondary) project power is to be used by Dominion and preference customers in the area served by Dominion.

b. The remaining 95 MW (42%) dependable capacity and one-third of the excess (secondary) project power is provided for transmission by Dominion from Kerr switchyard to Duke Energy Progress for use by Duke Energy Progress and preference customers in the area served by Duke Energy Progress (also per contract with SEPA).

c. Provision is made for interchange of energy between Philpott and Kerr projects.

3. **Mechanics of project operation for power**. On Wednesday of each week, Water Management personnel prepare an energy declaration for the upcoming Saturday-through-Friday energy week. The total amount of energy (minimum plus secondary) declared for the upcoming week is based on the release required to meet the operational objectives of Kerr Reservoir. These releases consider recent and expected inflows (usually without additional rainfall), lake levels, minimum energy requirements, and necessary releases for flood operations or spawning flows. Other considerations include any necessary limitations on discharges (e.g., allowance for local inflows into Gaston and Roanoke Rapids projects)

and Dominion's energy storage account balance. The energy declaration is emailed to SEPA and is also posted on Water Management's website. SEPA provides the power customers' schedule for the declared energy amount to Dominion, which Dominion uses to schedule generation at Kerr Powerhouse in coordination with its operations at Gaston and Roanoke Rapids projects. Dominion then provides the following day's schedule to Kerr powerhouse and Water Management personnel each day. Water Management also coordinates the declaration with Dominion personnel during flood operations to ensure the proper flow from Roanoke Rapids.

Energy declarations may be revised at any time. Generally, revisions can be implemented in 2 business days (i.e., a revision submitted to SEPA on Monday would be incorporated into the Wednesday through Friday schedule); however, an urgent revision can possibly be implemented the following day if necessary.

E. **OPERATION FOR LOW FLOW AUGMENTATION**

As previously indicated, minimum downstream flows are now maintained by Dominion's Roanoke Rapids Dam per its FERC license requirements, with Kerr Reservoir's minimum energy requirements generally being more than adequate to sustain those license requirements. Those target flow and minimum flow requirements are intended to protect the water quality standards and enhance the biological integrity of the Roanoke River downstream of the dam. Table 3 (Table FL2-1 from Article FL2 of Dominion's FERC License 2009-018) summarizes those release requirements from Roanoke Rapids Dam.

Table 3. Minimum and Target Flow Releases from Roanoke Rapids Dam (Table FL2-1)

Timeframe	Condition	Minimum Flow
Jan. 1 – 15	Declaration < 6000 cfs	2000 cfs
	Declaration ≥ 6000 cfs	2500 cfs
Jan. 15 – Feb. 28/29	Declaration < 6000 cfs	2500 cfs
	Declaration ≥ 6000 cfs	3000 cfs
March	Declaration ≤ 3500 cfs	Minimum flow = declaration
	Declaration > 3500 cfs	Minimum flow = 3500 for peaking days
		5 peaking days during month
		3 peaking day limit per week
		3 consecutive peaking day limit
		Can only peak in two of the weeks
	Ramp up	Ramp up from min. by 5000 cfs, hold for one hour then go to full load
	Ramp down	Ramp down to min. flow + 5000 cfs, hold for one hour then go to minimum flow
April 1 – June 15	All conditions	Flow = mean of weekly declaration, no peaking
	Ramp	Change from one to next weekly declaration cannot exceed 5000 cfs per hour
June 16 – June 30	All conditions	2800 cfs
July 1 – Sep. 15	All conditions	2000 cfs
Sept. 16 – Nov. 15	All conditions	1500 cfs
Nov. 16 – Nov. 30	All conditions	2000 cfs
Dec. 1 – Dec. 31	Declaration < 6000 cfs	2000 cfs
	Declaration ≥ 6000 cfs	2500 cfs

In addition, whenever Water Management declares a drought, Article FL2 further indicates the drought minimum flows shown in Table 4 (Table FL2-2 from Article FL2), unless otherwise directed by Water Management in consultation with State of North Carolina water quality and fisheries agencies.

Table 4. Drought Minimum Flows (Table FL2-2)

January – August	2000 cfs
September – November	1500 cfs
December	2000 cfs

F. **OPERATION FOR FISH AND WILDLIFE**

1. **Striped Bass Spawning Releases.** The striped bass fishery in the Roanoke River downstream from Kerr Dam is extremely important from an ecological, recreational, and economic standpoint. The major spawning ground for the striped bass in North Carolina waters is in the vicinity of Weldon, N.C. The striped bass require high water conditions to move up the river in the spring to the spawning ground. Continued high water even after spawning occurs is necessary for survival and transport of eggs and juvenile fish. The annual spawning run usually begins about April 15 and is completed by about May 15 with the peak of activity occurring about May 1.

Soon after Kerr Reservoir went into operation in 1953, objections to minimum flows provided during the striped bass spawning season were voiced. Although efforts were made to improve conditions, the objections persisted. On January 30, 1957, the Chief of Engineers authorized, on an interim basis, the use of storage in Kerr Reservoir between elevation 302 ft-NGVD29 and the guide curve to provide increased minimum flows during the striped bass spawning season.

In 1971 a memorandum of understanding was signed by representatives of Virginia Power (now Dominion), the Wilmington District U.S. Army Corps of Engineers, and the N.C. Wildlife Resources Commission, which identifies reserved storage in Kerr Reservoir between 299.5 and 302 ft-NGVD29 for augmentation flow for striped bass spawning and a 13-foot minimum stage at Weldon during the spawning period. The telemark gage at Weldon was discontinued in July 1985. The releases to meet the 13-foot stage at Weldon have been measured at the Roanoke Rapids, N.C., gage since July 1985. The 13-foot stage at Weldon is the equivalent of about 4.8 feet on the Roanoke Rapids gage.

In cooperation with state and federal fish and wildlife agencies, the Wilmington District agreed to test a new fish flow regime in the lower Roanoke River to enhance striped bass fish reproduction. On April 1, 1989, a schedule of regulated releases at Roanoke Rapids Dam was implemented over a 4-year trial period to benefit striped bass spawning, and was subsequently implemented on a permanent basis in 1995. The schedule of spawning flow target releases measured at the Roanoke Rapids gage is shown below in Table 5.

Table 5. Lower Roanoke River Spawning Flow Targets

Dates	Lower Target Flow Rate (cfs)	Median Target Flow Rate (cfs)	Upper Target Flow Rate (cfs)
April 1-15	6600	8500	13,700
April 16-30	5800	7800	11,000
May 1-15	4700	6500	9500
May 16-31	4400	5900	9500
June 1-15	4000	5300	9500

In addition to the above, outflow from Roanoke Rapids Dam is limited to a maximum hourly variation of 1500 cfs. This schedule is followed each year to the extent that water available from natural flow plus spawning storage at Kerr will permit. However, when flood operations at Kerr Reservoir become necessary during the spawning release period, releases from Roanoke Rapids can exceed the upper target flow rates.

Since flows released from Kerr Reservoir are reregulated by Gaston and Roanoke Rapids, all spawning releases from Kerr Reservoir for the striped bass should typically be made during on-peak hours. As a result, Dominion must store a portion of this water during the week and release it on weekends. In order to reduce the drawdown of Gaston and Roanoke Rapids Reservoirs over the weekends, the Corps has agreed to allow Dominion to use a one-foot portion of the 3 feet of flood storage in Lake Gaston for storing water for spawning releases, which is also reflected in its FERC license.

2. **Mechanics of project operation during striped bass spawning season**. During operations to support the striped bass spawning releases (April 1 through June 15), any energy declaration in excess of the weekly minimum energy for the purposes of providing increased spawning releases is contingent on water being available from spawning storage and/or having sufficiently high inflows. Prior to each spawning season, an overall plan of operation is discussed with N.C. Wildlife Resources Commission (NCWRC) and other interested agencies (e.g., U.S. Fish & Wildlife Service), based on Water Management forecasts of available storage and inflows during the upcoming spawning season. Water Management will consult each week with NCWRC to coordinate planned releases based on available/forecast spawning storage and inflows and the status of the spawn, consistent with other operational considerations (e.g., flood operations). Release schedules are coordinated with Dominion as necessary to ensure that sufficient water is provided and releases from Kerr Reservoir are appropriately reregulated by their projects. These releases are incorporated into Water Management's weekly energy declaration (see Section D.3).

3. **Fish Passage through Turbines**. Passing of striped bass through the turbines at Kerr Dam is a fisheries concern during high inflow events following spawning upstream of the dam. As a result, whenever Kerr Reservoir is forecast to exceed elevation 303 ft-NGVD29 during the month of June and weekly average releases exceed 10,000 cfs, coordination with fisheries agencies, such as the Virginia Department of Game and Inland Fisheries, will be increased. Monitoring will include downstream fish pickup transects and chart fathometer transects at the upstream face of the dam, as frequently as daily during a passage event. (A flowchart is available from Water Management that was developed in conjunction with fisheries agencies during the 1990s. This flowchart helps identify when conditions exist for fish passage through turbines and indicates procedures to be used to reduce fish passage.) Potential temporary operational changes to reduce fish passage include turbine shutdown and spillway releases; however, any significant operational changes would be coordinated with South Atlantic Division (SAD).

4. **In-Lake Fisheries**. To ensure success of bass spawning activities in the reservoir itself, a reasonably steady reservoir level is desirable for a 3 to 4 week period after the water temperature near the reservoir surface reaches 60 degrees F (about mid-April). This will be accomplished whenever practical; however, drawdown of the spawning storage to maintain target striped bass flows downstream often makes this impractical.

G. OPERATION FOR WATER SUPPLY

In accordance with the provisions of the Water Supply Act of 1958, Public Law 85-500, the Government is authorized to include storage in any reservoir project constructed by the Corps of Engineers to impound water for municipal or industrial water use. Water supply storage space within

Kerr Reservoir has been reallocated from the power pool for some water supply users, while other users have grandfathered withdrawal rights due to pre-impoundment withdrawals. Current water supply agreements in effect at Kerr Reservoir are described below, along with a storage summary in Table 6.

Table 6. John H. Kerr Water Supply Storage Summary

Agreement Holder	Estimated Water Supply Storage (acre-feet)	Percent of Conservation Storage
City of Henderson	10,292	1.050
City of Virginia Beach	10,447	1.066
Virginia Department of Corrections	24	0.0024
Mecklenburg Cogeneration	617	0.063
Total	21,380	2.181

a. The Town of Clarksville, Virginia is allowed to make grandfathered water supply withdrawals from Kerr Reservoir at no cost in accordance with pre-project agreements. Burlington Industries near Clarksville also had a grandfathered withdrawal, but is no longer in operation.

b. A water use agreement between the Federal Government and the City of Henderson, North Carolina, was entered into on February 12, 1974, allowing withdrawals from Kerr Reservoir at a rate not to exceed 20 million gallons per day (MGD). This water use agreement was converted to a water storage contract on March 17, 2006, giving the City of Henderson the right to utilize 1.050 percent of the conservation storage in Kerr Reservoir between elevations 268 and 300 ft-NGVD29. This space is currently estimated to contain 10,292 acre-feet of storage.

c. A water supply storage contract with the City of Virginia Beach, Virginia, for releases from Kerr Reservoir was signed on January 13, 1984. The City of Virginia Beach has a FERC-approved water supply intake in Lake Gaston, located downstream of Kerr Dam. The Kerr contract stipulates that the City of Virginia Beach has the right to utilize 1.066 percent of the conservation storage in Kerr Reservoir between elevations 268 and 300 ft-NGVD29, currently estimated to contain 10,447 acre-feet. This storage is not intended to directly provide water supply to Virginia Beach, but rather to provide limited mitigation storage to help meet downstream spawning or minimum releases on a short-term basis during severe droughts to offset concerns related to the City's interbasin transfer of water from Lake Gaston. Releases from this storage will be made following coordination with the City of Virginia Beach and the State of North Carolina.

d. On January 25, 1989, a water storage contract was approved for the Virginia Department of Corrections (VDOC) for water supply storage space in Kerr Reservoir. VDOC has the right to utilize an undivided 0.0024 percent of the conservation storage from elevation 268 to 300 ft-NGVD29 in Kerr Reservoir or approximately 24 acre-feet. The specified withdrawal rate is not to exceed 60,000 gallons per day. This water supply allocation has not yet been utilized.

e. On June 5, 1991, a water supply storage contract was approved for the Mecklenburg Cogeneration Limited Partnership (MCLP), now operated by Dominion. The 120 megawatt coal-fired cogeneration facility at Clarksville, Virginia, uses raw water from Kerr Reservoir as process water, cooling water, and steam supply for the facility, with maximum water use of approximately 3 mgd. MCLP has the right to utilize an undivided 0.063 percent (approximately 617 acre-feet) of the conservation storage in Kerr Reservoir.

H. **OPERATION FOR RECREATION**

A reservoir level near the guide curve would be desirable throughout the recreation season to provide the greatest lake area and most attractive shoreline. This water level requirement will be met when consistent with other flow regulation requirements. The reservoir will normally be near guide curve level from June through August; however, summer drawdown below guide curve enough to impact recreation can be expected to occur during droughts.

I. **OPERATION FOR MOSQUITO CONTROL**.

In the interest of mosquito control, the following is desirable:

a. Rapid drawdown of a 1- or 2-foot surcharge above the maximum conservation pool in the spring to strand drift (floating vegetative debris).

b. Maintain reservoir at the maximum conservation pool elevation from April through June to curb shoreline vegetation growth.

c. Gradually draw reservoir down from July through September at a rate equal to 0.2 feet per week or more to keep the shoreline below the advancing growth.

The one or two feet of drift-stranding surcharge is provided by the storage of water for the striped bass. While a faster drawdown would be more effective in stranding the drift, a separate drawdown for each purpose would not be practical. The other water level requirements will usually be met by normal power operations when consistent with flow regulation requirements.

J. **DEVIATION FROM NORMAL REGULATION**.

a. **General**. The District Engineer is occasionally requested to deviate from normal regulation of Kerr Reservoir. Prior approval for a deviation is obtained from SAD, except as noted in the following emergencies, unplanned minor deviations and planned deviations which are discussed below. Requirements and guidance on deviations are provided in ER 1110-2-240, Water Control Management, dated 8 October 1982 with special updates on 1 March 1994.

b. **Emergencies**. Some emergencies that can be expected are drownings and other accidents, failure of operation facilities, and flushing of pollution during fish kills. Necessary action under emergency conditions is taken immediately unless such action would create equal or worse conditions. In emergency situations, SAD will be informed as soon as practicable, and a written confirmation showing the deviation and conditions will be furnished to SAD.

c. **Unplanned Minor Deviations**. These are unplanned instances that create a temporary need for minor deviations from the normal regulation of the reservoir, although they are not considered emergencies. Construction accounts for the major portion of incidents and includes utility stream crossings, bridge work, and major construction contracts. Changes in releases are sometimes necessary for maintenance and inspection. Requests for changes of release rates are generally for a few hours to a few days. Each request is analyzed on its own merits. Consideration is given to reservoir and watershed conditions, potential flood threat, and possible alternative measures. These requests are generally accommodated, provided there are no adverse effects on the overall regulation of the project for the authorized purposes. Water Management will obtain approval for these minor deviations from SAD normally by telephone or email, with a follow-up written confirmation showing the deviation and conditions.

d. **Planned Deviations**. Each planned deviation is analyzed on its merits. Sufficient data on flood potential, reservoir and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes will be submitted in writing to SAD along with recommendations for review and approval.

e. **Drought Contingency**. Normal project operating procedures may be altered during critical drought situations to address both upstream and downstream water resource needs and impacts. Detailed instructions on operating procedures during times of drought can be found in the Drought Contingency Plan for John H. Kerr. Guidance on developing Drought Contingency Plans is found in TL 1110-2-335 Development of Drought Contingency Plans dated 01 Apr 93 and ER 1110-2-1941 Drought Contingency Plans dated 15 Sep 81.

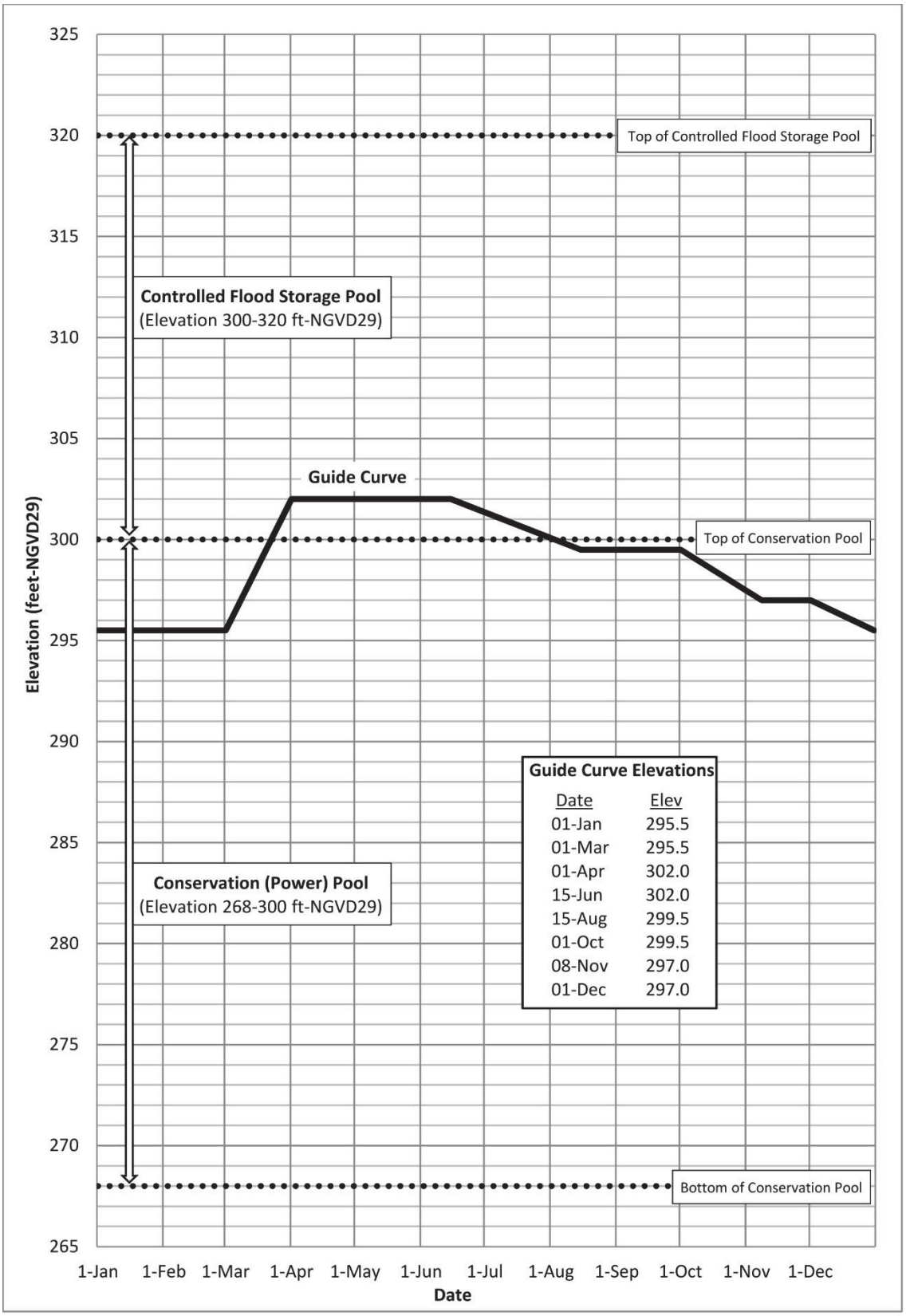

Plate 1. John H. Kerr Reservoir Guide Curve