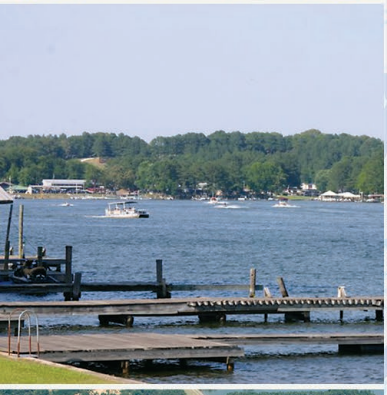
November 2019



Allatoona Lake Water Supply Storage Reallocation Study and Updates to Weiss and Logan Martin Reservoirs Project Water Control Manuals

Draft Feasibility Report and Integrated Supplemental Environmental Impact Statement

Appendix B. Plan Formulation

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APPENDIX B

PLAN FORMULATION

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APPENDIX B. PLAN FORMULATION

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B.1 Planning Strategy

An update of the ACT River Basin Master Water Control Manual (WCM) and individual project WCMs, supported by an Environmental Impact Statement (EIS), was completed in May 2015. During the WCM update process, USACE deferred consideration of two specific requests pending completion of further detailed studies and analyses: (1) a January 2013 updated request from the state of Georgia to reallocate additional reservoir storage in Allatoona Lake to municipal and industrial (M&I) water supply and (2) an Alabama Power Company (APC) request for changes to flood operations at the APC Weiss and Logan Martin projects (including associated updates to the WCMs for those projects).

The following sections outline the planning process used and provide descriptions of the formulated alternatives and the evaluation to identify the Tentatively Selected Plan (TSP).

B.1.1 Six Step Planning Process

The U.S. Army Corps of Engineers (USACE) maintains adherence to the six-step planning process as defined in the 1983 Principles and Guidelines (P&G) and the 22 April 2000 Planning Guidance Notebook (ER 1105-2-100) to:

1. Define the Problems, Opportunities, Objectives, and Constraints
2. Inventory the study area and forecast future with-out project and conditions
3. Formulate alternative plans
4. Evaluate alternative plans
5. Compare alternative plans
6. Select a recommended plan

The Project Delivery Team (PDT) follows this planning process as laid out in the final report.

B.1.2 SMART Planning Process

Beginning in 2012 USACE underwent a Civil Works Transformation process. As part of this transformation, USACE instituted the **"SMART"** planning paradigm for feasibility studies. Under this paradigm, USACE will deliver a study that has **Specific** and **Measurable** objectives and provides a recommendation that is **Attainable and Risk-informed** over a **Timely** study period (maximum of three years). USACE has identified key decision points, called milestones, throughout the study period. These milestones bring together the USACE Vertical Team (VT) and the non-Federal sponsor and confirm concurrence on the formulation, decision making, and risk evaluation, prior to moving forward. The five feasibility study milestones representing key planning decisions are shown in **Figure B-1.** below and are the following: Alternatives milestone; TSP milestone; Agency Decision milestone; Senior Leader Panel milestone; Chief's Report milestone.

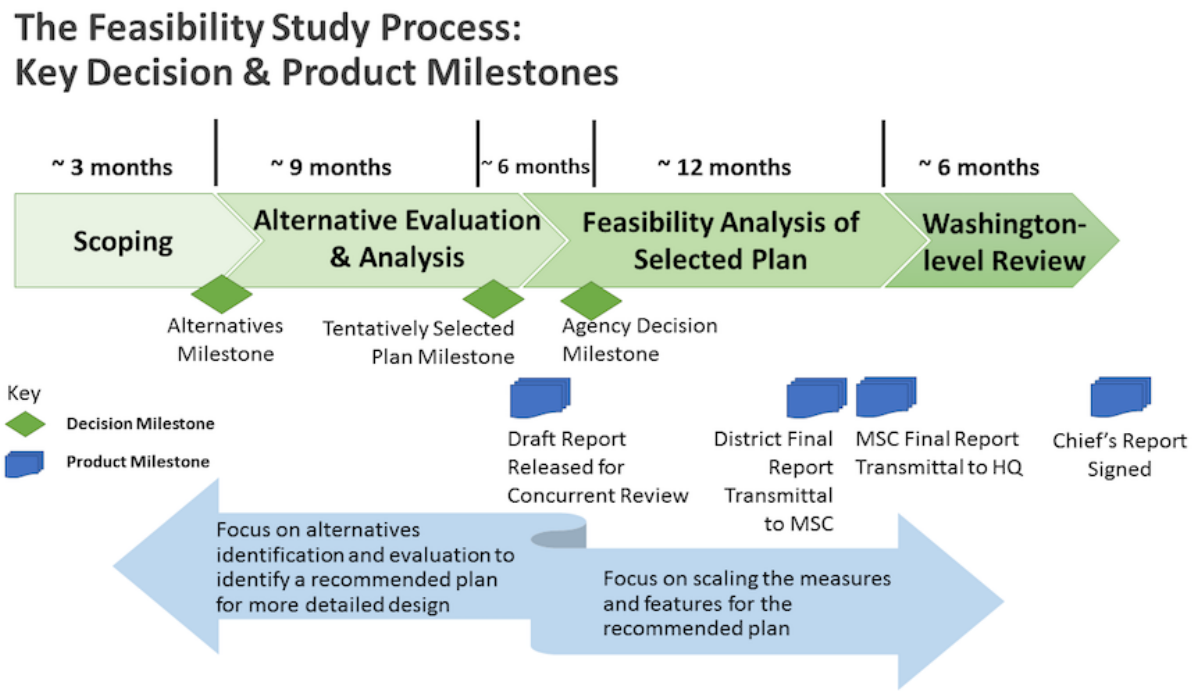

Figure B-1: SMART Planning Process

B.2 Problems, Opportunities, Objectives, and Constraints

B.2.1 Problems and Opportunities

B.2.1.1 Problems

B.2.1.1.1 Current and Future Allatoona Lake Users

Based on the limits of current water supply storage agreements, there is a shortage of M&I water supply available for withdrawal to current Allatoona Lake water users. As northern Georgia has continued to grow, so have its M&I water supply needs. Cartersville and CCMWA are the two users of Allatoona Lake that both have seen and are projecting increased population growth in their service areas over the next several decades.

Current water supply users have exceeded the yield found in their existing storage agreements at Allatoona Lake on multiple occasions over the last 15 years. To address that situation, USACE has received a request from the State of Georgia to evaluate additional use of storage that would provide an equivalent yield of 94 mgd.

The State of Georgia also requested that USACE adopt its proposed storage accounting methodology, including provision of credit for made inflows. Made inflows would include releases from Hickory Log Creek Reservoir into the Etowah River with subsequent water supply withdrawals at the current CCMWA intake in Allatoona Lake, commonly known as "flow through conveyance." An additional element of Georgia's proposed credit for made inflows would be credit for treated wastewater returns. Granting made inflow credits is not part of current USACE storage accounting practice.

B.2.1.1.2 Lack of Easements to Accommodate Flood Risk Management Operations at Logan Martin and Weiss Lakes

Current reservoir easements at Weiss and Logan Martin are below the required maximum surcharge elevations as described in the original WCMs. APC is responsible for obtaining sufficient easements to comply with the manuals and the Coosa Power Act as part of their FERC license. The flood easements were not obtained prior to completion of the projects. The top of the flood storage at Weiss Dam is at elevation 574 ft. Easements are currently purchased to elevation 572 ft. The top of the flood storage at Logan Martin is at elevation 477 ft. Easements are currently purchased to elevation 473.5 ft. On multiple occasions since the Weiss and Logan Martin projects were constructed, the absence of the necessary flowage easements at these projects has required APC to request temporary deviations, or variances, from USACE to conduct flood operations differently during flood events than as prescribed in the currently approved WCMs.

B.2.1.1.3 Water Quality at Weiss Dam

Water quality in Weiss Lake was identified as a concern by lake users during the 2018 NEPA scoping period for this project. APC has invested substantial resources in infrastructure to improve DO conditions downstream of Weiss Dam, but lake users expressed concerns about general water quality conditions in the lake upstream of the dam, mostly associated with sedimentation and nutrient concerns. USACE assessed baseline conditions and any potential impacts to water quality in Weiss Lake that might be associated the proposed storage reallocation at Allatoona Lake.

B.2.1.1.4 No signed Memorandum of Agreement for APC Projects

There is not a current signed MOA between USACE and APC addressing operation of APC projects in the basin to meet federally authorized purposes. USACE previously signed MOA with APC regarding project operations at the Weiss, H. Neely Henry, Logan Martin, and R. L. Harris projects in conjunction with completion of the original

WCMs for those projects. While the WCMs for the H. Neely Henry and R. L. Harris projects were updated in 2015, completion of a new MOA is being deferred until updates of the WCMs for the Weiss and Logan Martin projects are completed. The MOA provides that APC accepts the operation described in each WCM. APC is required to follow the WCM as compliance with their FERC license. USACE intends to negotiate and sign an MOA with APC after the completion of this FR/SEIS process.

B.2.1.2 Opportunities

USACE identified opportunities to improve recreation at Allatoona Lake, Weiss Lake and Logan Martin Lake. The public commented on recreation opportunities during the public scoping process as a key issue of concern with many lake users. Recreation is an important economic driver in the local communities and is a top concern for many stakeholders.

USACE identified opportunities to meet future water supply needs for Bartow County and Cobb County through a period from 2025 to 2050.

B.2.2 Objectives and Constraints

B.2.2.1 Federal Objective

Per ER 1105-2-100, The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

B.2.2.2 Study Objectives

USACE identified the following planning objectives for the ACR study:

- Objective 1: Reduce the risk of water supply shortages for Allatoona Lake users through year 2050.
- Objective 2: Maintain an acceptable level of flood risk at ACT River Basin projects.

B.2.2.3 Planning Constraints

The formulation of alternatives to address the study objective is limited by planning constraints. Constraints are statements of effects that the alternative plans should avoid. Constraints are designed to avoid undesirable changes between without and with-project future conditions.

Constraints could include resources, legal, or policy constraints. Constraints which are applicable to this study, are:

- Minimize effects on federally listed threatened and endangered species. Within the ACT River Basin, there are five species of fish, ten freshwater mussel species, and six snail species that are listed as well as several areas of critical habitat. During the impact analysis, the PDT will identify any key thresholds.
- Minimize impacts to cultural resources.
- Meet Congress' intent for flood control. The original Federal project was authorized on the Upper Coosa River for Flood Control, however Public Law 83-436 allowed a nonfederal entity to develop three reservoirs in place of the Federal project provided that it supported navigation and the intended amount of flood control.

- Must meet authorized project purposes for the ACT River Basin. Under the WSA, if the recommended plan constitutes a major operational change to a federally authorized project purpose or causes a serious effect it would require additional Congressional authorization. Therefore, the recommended plan must be within the existing Congressional authorization.
- Avoid adverse impacts to structural integrity of projects.
- Continue to maintain navigational support at APC projects.

B.3 Future Without Project Condition

The future without project condition provides the basis from which alternatives are formulated and impacts assessed. This section will discuss key assumptions relevant to operations at Lake Allatoona, Weiss Lake, and Logan Martin Lake. The figure below is a graphical representation of the focus area of the ACT basin where the proposed changes could occur:

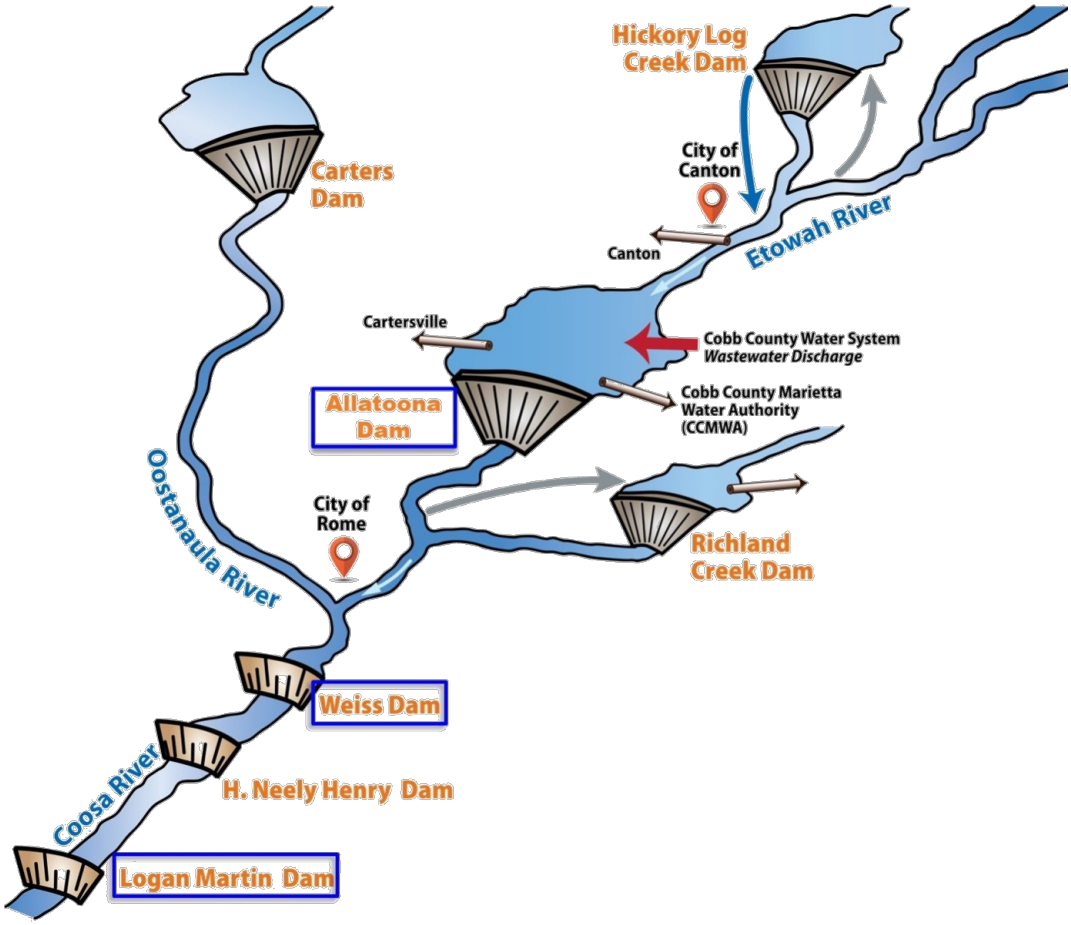

Figure B-2: Upper ACT Basin

B.3.1 Current and Future Water Supply Users

Allatoona Lake serves as a water source for two utilities: The City of Cartersville (Cartersville) and Cobb County Marietta Water Authority(CCMWA). Cartersville provides finished water for the city itself and Bartow County. CCMWA wholesales water to the following entities:

- Cobb County Water System
- Cherokee County Water and Sewage Authority
- Douglas County Water and Sewer Authority
- City of Marietta
- City of Austell

- Fulton County
- City of Powder Springs
- Paulding County
- City of Mountain Park
- City of Woodstock
- Lockheed Martin Corporation

B.3.1.1 Water Supply Demand Analysis Conducted to identify need

As part of the updated water supply storage request, the Metropolitan North Georgia Water Planning District (MNGWPD) provided updated water supply demand forecasts for entities that withdraw water from and return water to Allatoona Lake and the Etowah River between Allatoona dam and the Kingston gauge downstream of the reservoir. These projections are an update from the Metropolitan North Georgia Water Planning District Water Resource Management Plan (June 2017).The MNGWPD prepared county level forecasts for the 15 counties within the MNGWPD boundaries. The MNGWPD then isolated the portion of the demand that is assigned to Cobb County Marietta Water Authority and the City of Cartersville.

Total 2050 demand for CCMWA was projected to be 103 mgd. The MNGWPD projects a 2050 need for CCMWA from Lake Allatoona for 57 mgd. Currently, there is a storage contract for CCMWA at Lake Allatoona for 13,140 ac-ft that provides an effective yield of 24.9 mgd. This assumes that CCMWA will be able to withdraw water to meet the remaining need from the ACF basin which was part of the 2017 ACF WCM Update Record of Decision. This is currently under litigation. Paulding County currently purchases water from CCMWA. Richland Creek Reservoir is currently under construction and will serve as a source for Paulding County. Once Richland Creek Reservoir is fully operational Paulding County will not purchase water from Cobb County Marietta Water Authority. This was factored into the 2050 demand calculations.

Total 2050 demand for the City of Cartersville (Bartow County) ranged from 40.4 to 52.0 mgd. Based on discussions with these utilities 37 mgd of that need would be sourced from Lake Allatoona. There is an existing storage contract for 6,371 ac-ft that currently provides an effective yield of 12.2 mgd.

B.3.1.1.1 USACE review of Water Supply Demand Analysis

USACE conducted an independent review of the water supply demand analysis documentation.

Water demand forecasts were developed based on two different population projections, one from the Altlanta Regional Commission and one from Office of Planning and Budget. The population forecasts were developed through the year 2050.

Because the ARC and OPB projections were derived using different methodologies, the ARC and OPB forecasts are separate and independent projections of future population and employment for each county in the District. These independent projections were used to develop two different projection scenarios for water demand and wastewater flows to improve forecast reliability.

The ARC and OPB population and employment scenarios were then analyzed using the Demand Side Management Least Cost Planning Decision Support System (DSS) Model developed by Maddaus Water Management. The DSS Model thus provided two independent water demand forecasts for each of the 15 District counties from 2015 through 2050.

To address potential uncertainties in the demand forecasts, the District evaluated historic variability in four key water demand drivers: population growth rate; employment/population ratio; per capita residential water use; and per employee commercial water use. Probability distributions based on historical data were created for each demand driver and truncated to remove unrealistic extremes. Then, a Monte Carlo analysis was conducted to determine future water demand probabilities based on the observed historical variability in demand drivers.

Based on industry practice and methods used in planning efforts for other major metropolitan areas, the 65th percentile of the water demand forecast was used to calculate the uncertainty factor applied to each individual county. For each county, this resulted in an increase in water demands of approximately three percent at the start of the projections that grew to approximately 13 percent for the 2050 projections.

Based on the review of the documentation, the water supply demand analysis is valid for use in determining alternatives to meet the stated need in the 2018 Water Supply Storage Request.

B.4 Management Measures

Management measures are formulated to address problems and opportunities identified in section 2. They are also formulated to meet defined planning objectives and avoid planning constraints. The PDT identified measures to address both future water supply needs as well as the APC requests at Logan Martin and Weiss. The PDT identified the following measures and divided them into two groups: water supply measures and flood operations measures.

B.4.1 Initial Water Supply Measures

The PDT identified water supply measures from available data sources and information provided by the State of Georgia.

- **Conservation**: Conservation is often the first step in reducing consumption and overall demand for water supply. Water providers within the district have been implementing multiple conservation measures to reduce demand. Measures include conservation pricing, leak detection and repair, plumbing and toilet retrofit programs, education programs, multi-family sub-metering, and water recycling (e.g. car washes).

- **Groundwater**: Groundwater is an existing source for water in North Georgia. There is limited supply available in the area.

- **Desalination** and pumping to service areas: Desalination involves extracting ocean water (usually), desalinating it at a treatment facility, and then piping to a service area.

- **Other existing surface water sources**: Nearby surface water sources include Lake Lanier, Chattahoochee River, Etowah River, Hickory Log Creek Reservoir, Richland Creek Reservoir (currently under construction).

- **Reallocation from Allatoona Lake flood storage pool**: Reallocation would include an assignment of storage from the Flood Pool specifically to water supply project purpose. This involves raising the guide curve at Allatoona.

- **Reallocation from Allatoona Lake inactive storage**: Reallocation would include an assignment of storage from the Inactive Pool specifically to water supply project purpose. This involves lowering the bottom of the Conservation Pool at Allatoona

- **Reallocation from Allatoona Lake conservation storage**: Reallocation would include an assignment of storage from the Conservation Pool specifically to water supply project purpose.

- **Other new reservoir construction**: This would include identifying any new locations for a reservoir impoundment that could be constructed by the non-federal sponsor. USACE does not construct single purpose water supply reservoirs.

B.4.2 Initial Flood Operations Measures

The PDT received a request from APC which proposed changes at Weiss and Logan Martin Lakes. The following measures were included from the request:

- **Raise winter pool levels**: APC requested to raise the winter pool level at Weiss Lake from 558 ft to 561 ft (see Section 2.6.1. of the Main Report) and to raise the winter pool level at Logan Martin Lake from 460 ft to 462 ft (see Section 2.6.2 of the Main Report).
- **Lower the maximum surcharge (or top of flood pool) elevations**: APC requested to reduce the maximum surcharge elevation at Weiss Lake from 574 ft to 572 ft (see Section 2.6.1 of the Main Report) and to reduce the maximum surcharge elevation at Logan Martin Lake from 477 ft to 473.5 ft (see Section **2.6.2.** of the Main Report).
- **Modify induced surcharge operations**: APC requested to increase releases above those specified under current operations at Weiss and Morgan Martin dams during flood events to ensure that the proposed reduced maximum surcharge levels on the lakes are not exceeded. More detailed descriptions of the proposed maximum surcharge operations at Weiss Dam and Logan Martin Dam are presented in Section 2.6.1 of the Main Report and Section 2.6.2 of the Main Report, respectively.
- **Acquire additional property interests downstream of Logan Martin**: This measure would include APC purchase of easements downstream accommodate increased non-damaging releases from 50,000 cfs to 70,000 cfs
- **Acquire the reservoir flood easements up to the maximum surcharge elevation**: This measure is a requirement of the current WCMs.

B.4.3 Screening of Measures

As part of the planning process, the PDT screened the measures prior to combining them to formulate alternatives. Measures that met one or more of the study objectives were carried forward. Those measures that did not meet one or more of the study objectives were eliminated from further consideration. Based on the available information at the time of screening, the PDT carried forward all measures to use for formulating the initial array of alternatives.

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B.5 Alternatives

The PDT formulated alternatives based on the measures identified during the previous planning step as well as additional input received from stakeholders. Alternative formulation occurs in two phases. First, the PDT formulates an initial array of alternatives. The PDT then evaluates the initial array based on s set of screening criteria. The PDT then screens the initial array to identify the final array of alternatives that are carried forward for more detailed evaluation.

B.5.1 Initially Formulated Alternatives Array

The PDT formulated alternatives that focused on meeting the water supply objective or the flood risk objective as well as combing measures so that both objectives were addressed. The water supply alternatives absent reallocation were provided by the State of Georgia. The flood risk management measures are evaluated as one alternative. Based on discussion with APC these measures were dependent on each other and therefore should be considered as one whole component.

B.5.1.1 No Action Alternative

The No Action Alternative (NAA) represents a set of assumptions and conditions that would occur in the future absent any action by USACE. Assumptions and conditions will be identified at each of the three reservoirs where changes in the future are considered. System wide operations are those that were approved in the 2015 ACT WCM Update. Those manuals define the existing operations for the ACT basin and are included in each alternative unless otherwise specified.

B.5.1.1.1 Lake Allatoona:

B.5.1.1.1.1 Water Supply

Allatoona will continue to operate for existing water supply storage. The existing water supply contracts for CCMWA and Cartersville are as follows in Table B.5-1:

Table B.5-1: Existing Storage Contracts at Allatoona Lake

Entity	Original Storage Amount	Original Estimated Yield	Updated Storage Amount[1]	Updated Estimated Yield[2]
CCMWA	13,140 ac-ft	34 mgd	12,485 ac-ft	22.9 mgd
City of Cartersville	6,371 ac-ft	16.7 mgd	6,054 ac-ft	11.1 mgd

CCMWA has overdrawn their storage account several times over the last three decades. As the No Action condition is representing the baseline for impacts to be measure against, it is reasonably foreseeable that these storage accounts could be overdrawn again. The NAA uses the 2006 water demand withdraws as it was the year of greatest demand at Allatoona.

[1] The updated storage amount is based on an updated sedimentation survey from 2011. There is an estimated 5% reduction in storage due to sedimentation. (USACE,2011)
[2] Yield was updated based on new drought of record (2006-2008)(USACEc,2011)

Current storage allocation for Lake Allatoona is shown in Figure B-3 below:

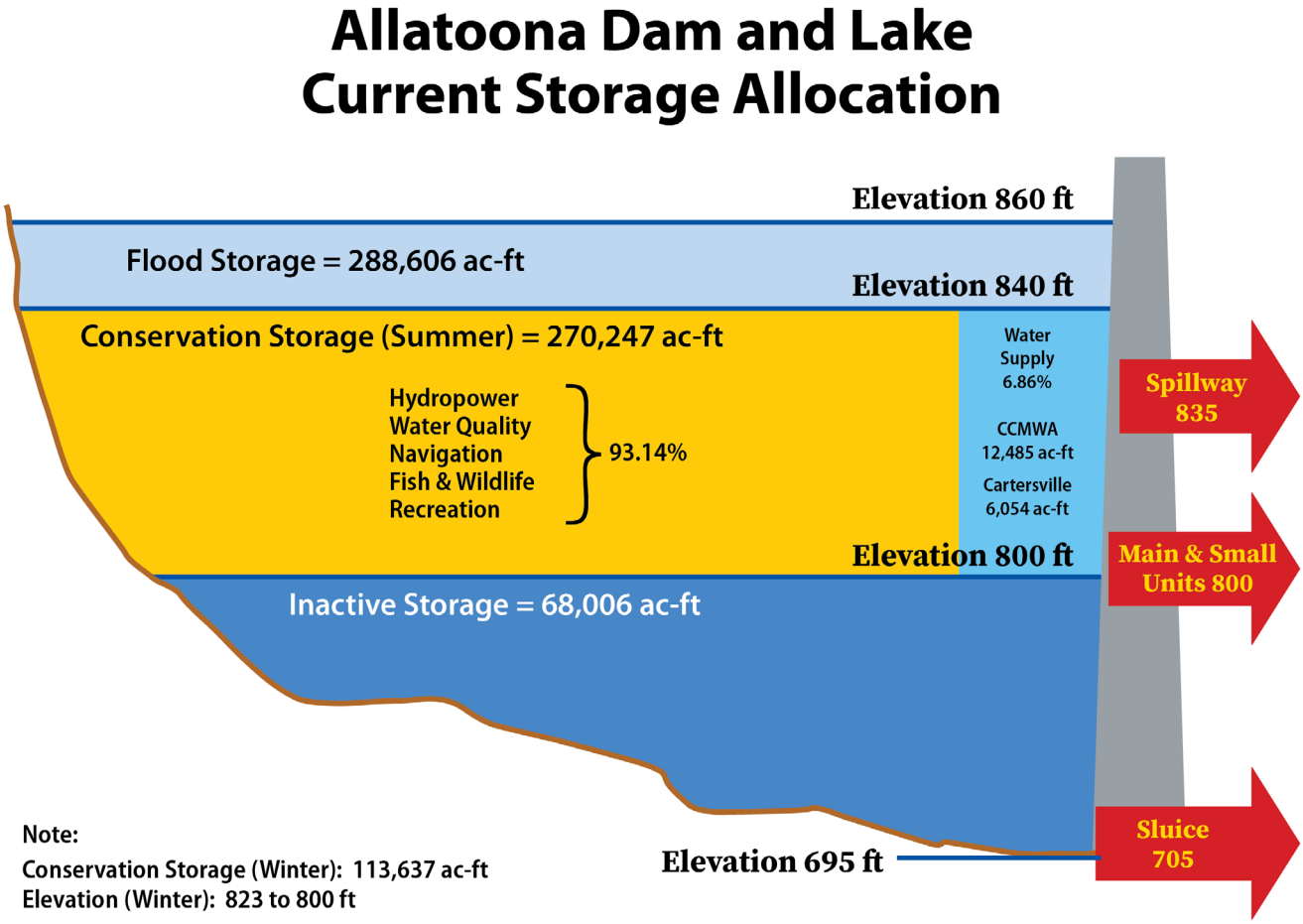

Figure B-3: Current Allatoona Storage Allocation

B.5.1.1.1.2 Water Supply Storage Accounting

Storage accounting is a systematic accounting record to track valid storage users when the lake is in the conservation pool. Below is a graphical representation of the variables that effect the storage accounting formula. This graphic represents the concept of storage accounting in general and is not specific to Allatoona Lake.

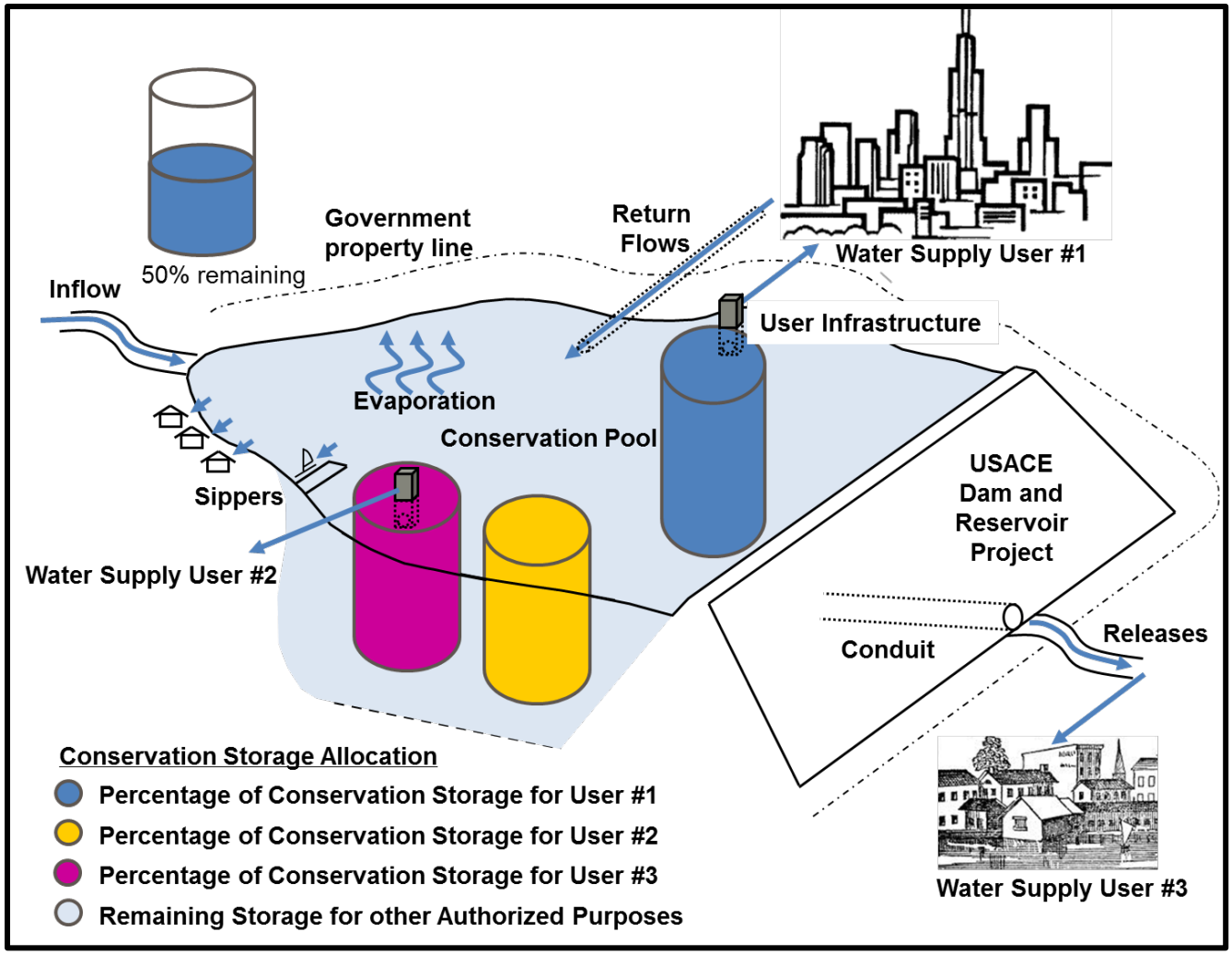

Figure B-4: Storage Accounting Concept

The NAA uses the current storage accounting practice that is standard for the South Atlantic Division Corps of Engineers (SAD).

SAD uses the following formula to calculate a user's available storage on any given day.

End Storage = beginning storage + user's share of inflow – user's share of loss – user's usage

Equation 1: Water Storage User's Available Storage

The current SAD USACE storage accounting methodology uses the following specific assumptions:

- A user's portion of project inflow is fixed.
- A user gets partial credit of made inflows which are prorated based on user portion of yield.
- At Allatoona specifically, all storage accounts are full at 840ft.

B.5.1.1.1.3 Flood Risk Management

Allatoona operates for flood risk management as one of its multiple project purposes. The NAA includes dedicated summer flood storage between 840' and 860' for a total of 288,606 ac-ft. Additional seasonal flood storage is available in the winter when the conservation pool is lowered to elevation 823'. For additional details, refer to the Allatoona WCM in Appendix A.

B.5.1.1.1.4 Other Project Purposes

Allatoona Lake's conservation storage, with summer storage of 270,247 ac-ft, where 93.14% is available to authorized project purposes including hydropower, water quality, navigation, fish and wildlife, and recreation. Detailed water management operations are described in the Allatoona WCM in Appendix A.

B.5.1.1.2 Weiss Lake

Weiss Lake is an APC reservoir that provides non-federal hydropower generation as well as recreation. USACE has federally authorized project purposes of navigation and flood risk management at Weiss Lake. As part of compliance with PL 83-436, USACE must approve flood control operational changes as part of any WCM update.

B.5.1.1.2.1 Flood Risk Management

Weiss Lake has dedicated flood storage of 397,759 ac-ft between elevations 564' and 574'. Refer to Figure B-5 for a graphic depiction of current storage allocation. Currently APC does not have the easements between elevation 572' and 574' as stated in the WCM. Additional flood storage is available in the winter as the conservation pool is drawn down beginning in September from 564' to 558'. At elevation 564' induced surcharge operations begin. Releases are based on the current Flood Control Regulation Schedule as defined in the currently approved Weiss Dam and Lake WCM.

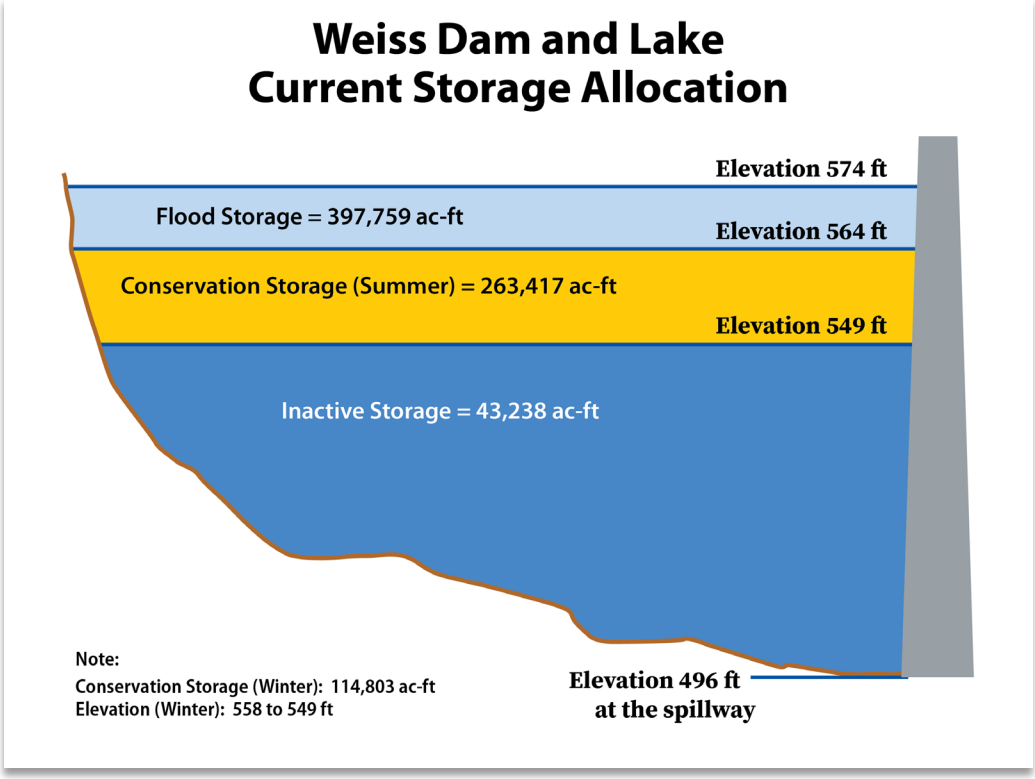

Figure B-5: Weiss Lake Storage Allocation

B.5.1.1.2.2 Other Project Purposes

The conservation (hydropower) pool has summer storage of 263,417 ac-ft and is between 549' and 564'. This storage is available to other project purposes including hydropower and recreation. Navigation flows are provided to support navigation downstream of Montgomery. Detailed water management operations can be found in the currently approved Weiss Dam and Lake WCP.

B.5.1.1.3 Logan Martin Dam and Lake

Logan Martin Lake is an APC reservoir that provides non-federal hydropower generation as well as recreation. USACE has federally authorized project purposes of navigation and flood risk management at Weiss Lake. As part of compliance with PL 83-436, USACE must approve flood control operational changes as part of any WCM update.

B.5.1.1.3.1 Flood Risk Management

Logan Martin Lake has dedicated flood storage of 245,673 ac-ft between elevations 465' and 477'. Refer to Figure B-6 for a graphic depiction of current storage allocation. Currently APC does not have the easements between elevation 473.5' and 477' as stated in the WCM. Additional flood storage is available in the winter as the conservation pool is drawn down beginning in October from 465' to 460'. At elevation 465' induced surcharge operations begin. Releases are based on the current Flood Control Regulation Schedule as defined in the currently approved Weiss Dam and Lake WCM.

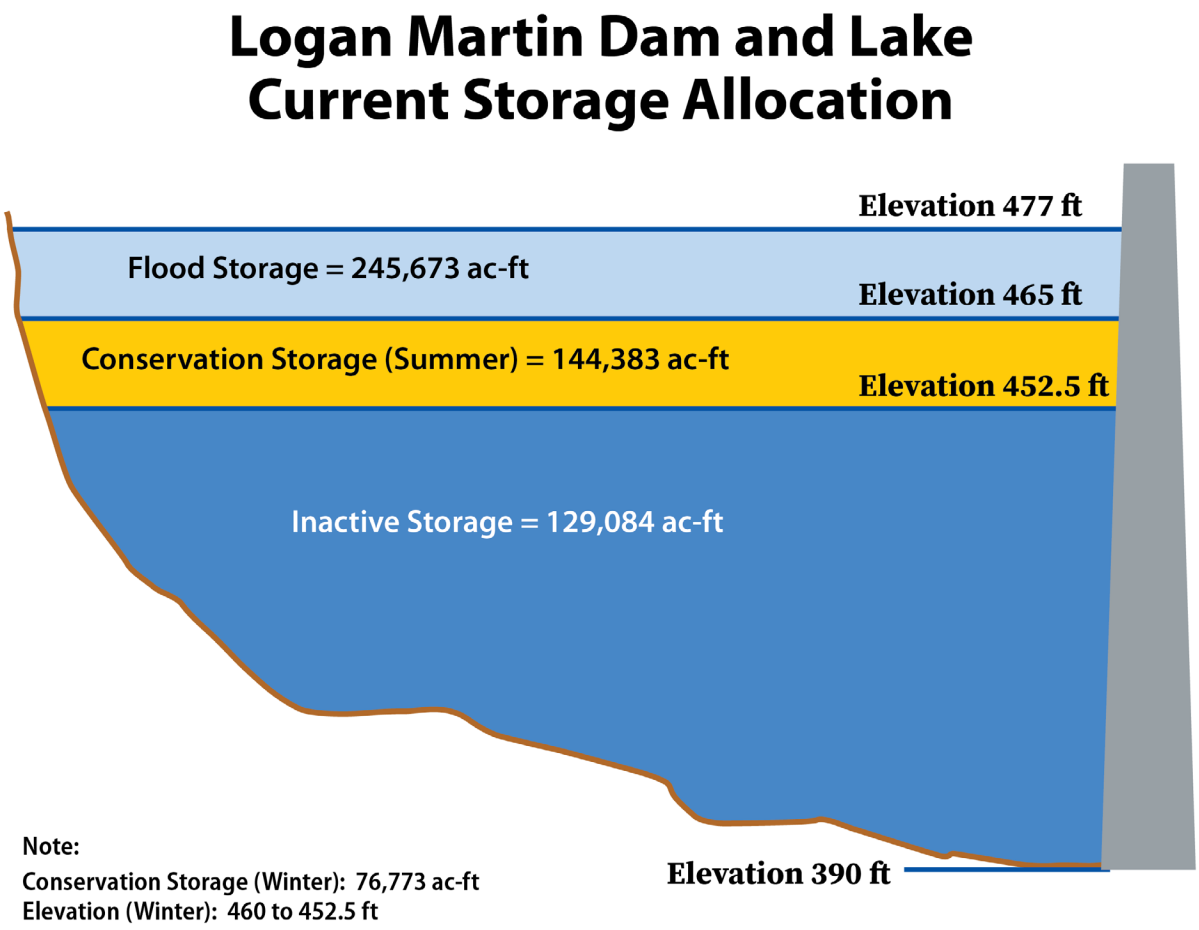

Figure B-6: Logan Martin Storage Allocation

B.5.1.1.3.2 Other Project Purposes

The conservation (hydropower) pool has summer storage of 144,383 ac-ft and is between 452.5' and 465'. This storage is available to other project purposes including hydropower and recreation. Navigation flows are provided to support navigation downstream of Montgomery. Detailed water management operations can be found in the currently approved Logan Martin Dam and Lake WCM.

Table B.5-2 Initial Array of Alternatives

Alternative / Alternative Component	NAA	FWOP	WS1	WS2	WS3	WS4	WS5	WS6	MFO1	WS2 MFO1	WS6 MFO1	WS1 MFO1	WS3 MFO1
Allatoona Lake													
Continue to operate for existing water supply storage contracts: Storage. 6.86% of conservation storage	X	X	X	X	X	X			X	X		X	X
Continue to operate for existing water supply storage contracts: Storage. 6.57% of conservation storage								X			X		
Reasonably foreseeable that water supply storage users could exceed their existing contracts as happened in the past	X												
Water supply storage users cannot exceed their available storage		X							X				
Reallocation of 14,524 ac-ft of conservation storage (5.37% of conservation storage)			X									X	
Reallocation of 32,812 ac-ft of conservation storage (12.14% of conservation storage)				X						X			
Reallocation of 15,041 ac-ft of conservation storage (5.34% of conservation storage)					X								X
Reallocation of 52,775 ac-ft of conservation storage (16.34% of conservation storage)						X							
Reallocation of 33,872 ac-ft of conservation storage (12.01% of conservation storage)								X			X		
Reallocation from inactive pool							X						
Conservation storage–270,247 ac-ft. (93.14% available to all other authorized purposes)	X	X							X				

Alternative / Alternative Component	NAA	FWOP	WS1	WS2	WS3	WS4	WS5	WS6	MFO1	WS2 MFO1	WS6 MFO1	WS1 MFO1	WS3 MFO1
Conservation storage–270,247 ac-ft. (87.77% available to all other authorized purposes)			X									X	
Conservation storage–270,247 ac-ft. (81% available to all other authorized purposes)				X						X			
Conservation storage–281,917 ac-ft (88.09% available to all other authorized purposes)					X								X
Conservation storage–281,917 ac-ft. (81.41% available to all other authorized purposes)								X			X		
Conservation storage–323,022 ac-ft. (77.92% available to all other authorized purposes)						X							
HEC-ResSim model uses 2006 water demands	X												
HEC-ResSim model uses 2050 water demands for Allatoona		X	X	X	X	X		X	X	X	X	X	X
SAD USACE storage accounting methodology. Detailed assumptions include: • A user's portion of inflow is fixed. • A user gets partial credit of made inflows that are prorated based on user portion of yield. • All storage accounts are full at 840 ft	X	X		X		X		X	X	X	X		
Georgia recommended storage accounting methodology. Detailed assumptions include: • A user's portion of inflow increases during the winter. • All storage accounts are full at 840 ft • User receives full credit for made inflows including: ▪ Hickory Log Creek releases ▪ Return flows to reservoir.			X		X							X	X
Dedicated summer flood storage of 288,606 ac-ft between 840 ft and 860 ft.	X	X	X	X					X	X		X	

Alternative / Alternative Component	NAA	FWOP	WS1	WS2	WS3	WS4	WS5	WS6	MFO1	WS2 MFO1	WS6 MFO1	WS1 MFO1	WS3 MFO1
Dedicated summer flood storage of 276,936 ac-ft between 841.5 ft and 860 ft					X			X			X		X
Dedicated summer flood storage of 235,831 ac-ft between 844.5 ft and 860 ft.						X							
Weiss Lake													
Dedicated flood control storage of 397,759 ac-ft between 564 ft and 574 ft	X	X	X	X	X	X	X	X					
Dedicated flood control storage of 302,000 ac-ft between 564 ft and 572 ft									X	X	X	X	X
Real estate easements purchased by APC up to 572 ft	X	X	X	X	X	X	X	X	X	X	X	X	X
Winter drawn down begins in Sept from 564 ft to 558 ft	X	X	X	X	X	X	X	X					
Winter drawdown begins in Oct from 564 ft to 561 ft									X	X	X	X	X
Induced surcharge operation begins at 564 ft (see Section 2.6)	X	X	X	X	X	X	X	X					
Modified induced surcharge operation begins at 564 ft (see Section 2.6)									X	X	X	X	X
Logan Martin Lake													
Dedicated flood control storage of 245,673 ac-ft between 465 ft and 477 ft	X	X	X	X	X	X	X	X					
Dedicated flood control storage of 160,100 ac-ft between 465 ft and 473.5 ft									X	X	X	X	X
Real estate easements purchased by APC up to 473.5 ft	X	X	X	X	X	X	X	X	X	X	X	X	X
Winter drawdown begins in Oct from 465 ft to 460 ft	X	X	X	X	X	X	X	X					

Alternative / Alternative Component	NAA	FWOP	WS1	WS2	WS3	WS4	WS5	WS6	MFO1	WS2 MFO1	WS6 MFO1	WS1 MFO1	WS3 MFO1
Winter drawdown begins in Oct from 465 ft to 462 ft									X	X	X	X	X
Induced surcharge operation begins at 465 ft (see Section 2.6)	X	X	X	X	X	X	X	X					
Modified induced surcharge operation begins at 465 ft (see Section 2.6)									X	X	X	X	X

B.5.1.2 Future Without-Project Alternative

The Future Without-Project Alternative represents a set of assumptions and conditions that would occur in the future absent any action by USACE. Assumptions and conditions will be identified at each of the three reservoirs where changes in the future are considered. System wide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in each alternative unless otherwise specified. Additional details are provided in Table B.5-2..

B.5.1.3 Water Supply 1

The Water Supply 1 (WS1) alternative represents a set of assumptions and conditions that would occur in the future including meeting the full need (94 mgd) identified in the 2018 Georgia water supply request from Allatoona Lake. This alternative includes a reallocation of conservation storage and incorporate the storage accounting methodology put forth by the State of Georgia. Systemwide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in the alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.4 Water Supply 2

The Water Supply 2 (WS2) alternative represents a set of assumptions and conditions that would occur in the future, including meeting the full need (94 mgd) identified in the 2018 Georgia water supply request from Allatoona Lake. This alternative includes a reallocation of conservation storage. It also incorporates the USACE storage accounting methodology. Systemwide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in this alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.5 Water Supply 3

The Water Supply 3 (WS3) alternative represents a set of assumptions and conditions that would occur in the future as defined in the 2018 Georgia water supply request. Reallocated storage would be met from a combination of the flood and conservation pools. It also incorporates the storage accounting methodology put forth by the State of Georgia Systemwide operations are those that were approved in the 2015 ACT River Basin WCM Update. Those manuals define the existing operations for the ACT River Basin and are included in this alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.6 Water Supply 4

The Water Supply 4 (WS4) alternative represents a set of assumptions and conditions that would occur in the future, including meeting the full need (94 mgd) identified in the 2018 Georgia water supply request from Allatoona Lake. The full need would be met out of the flood pool. It also incorporates the USACE storage accounting methodology. Systemwide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in the alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.7 Water Supply 5

The Water Supply 5 (WS5) alternative represents a set of assumptions and conditions that would occur in the future including meeting the full need (94 mgd) identified in the 2018 Georgia Water Supply Request from Allatoona

Lake. The full need would be met out of the inactive storage. System wide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in the alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.8 Water Supply 6

The Water Supply 6 (WS6) alternative represents a set of assumptions and conditions that would occur in the future including meeting the full need (94 mgd) identified in the 2018 Georgia Water Supply Request from Allatoona Lake. The full need would be met out of a combination of flood pool and conservation pool storage. It also incorporates the USACE storage accounting methodology. System wide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in the alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.9 The Modified Flood Operation (MFO) 1

The Modified Flood Operation 1 (MFO1) alternative represents a set of assumptions and conditions that would occur in the future, including satisfying the requested modifications to Weiss and Logan Martin project flood operations. Systemwide operations are those that were approved in the 2015 ACT River Basin WCM update. Those manuals define the existing operations for the ACT River Basin and are included in each alternative unless otherwise specified. Additional details are provided in Table B.5-2.

B.5.1.10 Water Supply 2 + Modified Flood Operation 1

The WS2+MFO1 alternative represents a set of assumptions and conditions that would occur in the future including satisfying the requested modifications to Weiss and Logan Martin projects flood operations as well as meeting the full need from the State of Georgia request out of Allatoona Lake. The full need would be met out of the conservation pool. It also incorporates the USACE storage accounting methodology. Additional details are provided in Table B.5-2.

B.5.1.11 Water Supply 6 + Modified Flood Operation 1

The WS6+MFO1 alternative represents a set of assumptions and conditions that would occur in the future including satisfying the requested modifications to Weiss and Logan Martin projects flood operations as well as meeting the full need from the State of Georgia request out of Allatoona Lake. The full need would be met out of a combination reallocation from the conservation and flood pools. It also incorporates the USACE storage accounting methodology. Additional details are provided in Table B.5-2.

B.5.1.12 Water Supply 1 + Modified Flood Operation 1

The WS1+MFO1 alternative represents a set of assumptions and conditions that would occur in the future including satisfying the requested modifications to Weiss and Logan Martin projects flood operations as well as meeting the full need from the State of Georgia request out of Allatoona Lake. The full need would be met out of the conservation pool. It also incorporates the storage accounting methodology put forth by the State of Georgia. Additional details are provided in Table B.5-2.

B.5.1.13 Water Supply 3 + Modified Flood Operation 1

The WS3+MFO1 alternative represents a set of assumptions and conditions that would occur in the future including satisfying the requested modifications to Weiss and Logan Martin projects flood operations as well as meeting the full need from the State of Georgia request out of Allatoona Lake. The full need would be met out of the conservation pool. It also incorporates the storage accounting methodology put forth by the State of Georgia. Additional details are provided in Table B.5-2.

B.5.2 Screening Criteria for Alternatives Array

The following criteria were identified to evaluate and screen the initial array of alternatives:

1. *Is it implementable by current law and by USACE policy and practice?* – This screening criteria was used to determine if an alternative would require additional authorization from Congress or a change in current USACE policy.
2. *Does it meet all authorized project purposes?* – USACE reservoirs within the ACT River Basin are operated for multiple project purposes in a balanced fashion. An action that would result in a major operational change would need additional authorization from Congress.
3. *Does it produce an increased risk to public life and safety?* – Any recommended alternative should not increase the current level of risk.
4. *Does it meet minimum flow requirements of the ACT basin?* – There are minimum releases required from Carter's Reregulation Dam and Allatoona Dam. These are detailed in the ACT River Basin Master Manual and project WCMs. A recommended alternative would need to meet these minimum flow requirements.
5. *Does it impact State Line Flow?* – The Georgia/Alabama state line flow trigger was used in formulating the drought management plan included in the 2015 ACT River Basin WCM update. The trigger is activated when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 low flow. 7Q10 is the lowest 7-day average flow (Q) that occurs (on average) once every 10 years. If this trigger is activated, drought operations would be initiated or expanded if one of the other triggers in the drought plan have already been met.

Table B.5-3 summarizes the screening process for the initial array of federal action alternatives using the planning objectives and the evaluation and screening criteria. Similarly, Table B.5-4summarizes the screening of the initial array of nonfederal alternatives.

Table B.5-3: Initial Array of Alternatives Screening

Initial Federal Alternatives	Evaluated in HEC-ResSim during Alternatives Milestone	Planning Objectives		Evaluation and Screening Criteria				
		Reduces Risk of Water Supply Shortage for Allatoona Users through year 2050	Maintains Acceptable level of Flood Risk	Implementable by current law, USACE policy and practice	Meets all authorized project purposes	Produces an increased risk to life and public safety	Meets ACT Basin minimum flow requirements	Impacts state line flow
NAA, includes overdrafts of storage accounts	Yes	No	Yes	Yes	Yes	No	Yes	11.60%
FWOP	Yes	No	Yes	Yes	Yes	No	Yes	11.40%
WS1	No	Yes	Yes	No	Yes	No	TBD	TBD
WS2	Yes	Yes	Yes	Yes	Yes	No	Yes	12.40%
WS3	No	Yes	TBD	No	TBD	TBD	TBD	TBD
WS4	Yes	Yes	No	Yes	No	Yes	Yes	11%
WS5	No	Yes	Yes	Yes	No	TBD	TBD	TBD
WS6	No	Yes	TBD	Yes	Yes	TBD	TBD	TBD
MFO1	No	No	TBD	Yes	TBD	TBD	TBD	TBD
WS2 and MFO1	No	Yes	TBD	Yes	TBD	TBD	TBD	TBD
WS6 and MFO1	No	Yes	TBD	Yes	TBD	TBD	TBD	TBD
WS1 and MFO1	No	Yes	TBD	No	TBD	TBD	TBD	TBD
WS3 and MFO1	No	Yes	TBD	No	TBD	TBD	TBD	TBD

Table B.5-4: Initial Array of Nonfederal Alternatives

Initial Nonfederal Water Supply Alternatives	Evaluated in HEC-ResSim during Alternatives Milestone	Planning Objectives		Evaluation and Screening Criteria					
		Reduces Risk of Water Supply Shortage for Allatoona Users through year 2050	Maintains Acceptable level of Flood Risk	Implementable by current law, USACE policy and practice	Meets all authorized project purposes	Produces an increased risk to life and public safety?	Meets ACT basin minimum flow requirements	Impacts State Line Flow?	Complete, Effective, Efficient, Acceptable
Conservation (CCMWA and Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Not Effective, Efficient, Acceptable
Construct a pipeline to convey water from Hickory Log Creek Reservoir to Wyckoff Water Treatment Plant (CCMWA)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Less Effective, Efficient, Acceptable
Pipe desalinated water from the Georgia coast (CCMWA and Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Effective, Not Efficient, Acceptable
Pipe water from the Tennessee River (CCMWA and Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Effective, Not Efficient, Not Acceptable
Drill new wells (CCMWA and Cartersville)	No	No	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Not Effective, Not Efficient, Acceptable

Initial Nonfederal Water Supply Alternatives	Evaluated in HEC-ResSim during Alternatives Milestone	Planning Objectives		Evaluation and Screening Criteria					
		Reduces Risk of Water Supply Shortage for Allatoona Users through year 2050	Maintains Acceptable level of Flood Risk	Implementable by current law, USACE policy and practice	Meets all authorized project purposes	Produces an increased risk to life and public safety?	Meets ACT basin minimum flow requirements	Impacts State Line Flow?	Complete, Effective, Efficient, Acceptable
Construct new reservoirs (CCMWA and Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Effective, Efficient, Acceptable
Purchase water from existing nonfederal reservoirs (CCMWA and Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Not Effective, Not Efficient, Acceptable
Withdraw more water from the Chattahoochee River (CCMWA)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Complete, Less Effective, Efficient, Not Acceptable
Withdraw water from the Etowah River below Allatoona Dam (Cartersville)	No	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Not Complete, Less Effective, Less Efficient, Not Acceptable

B.5.3 Alternatives Screened from Initial Array

B.5.3.1 Screened Federal Action Alternatives

Two alternatives were screened from the initial array of federal action alternatives: WS4 and WS5. Both alternatives were screened because they would fail to meet all authorized project purposes (Screening Criteria 2). The WS4 alternative would result in loss of approximately 173,990 ac-ft (39.1 percent) of winter flood storage and 52,775 ac-ft (18.3 percent) of summer flood storage. Additionally, multiple recreation facilities would need to be moved. USACE would not be able to provide an acceptable level of flood risk management at Allatoona Lake. Such a large reduction in flood storage at Allatoona Lake caused this alternative to be screened out. The WS5 alternative was also screened out because it would require changes to hydropower facilities at Allatoona Lake. The intakes for the hydropower turbines are within the reservoir's inactive storage and would require structural changes to accommodate a reallocation from the inactive storage.

B.5.3.2 Screened Non-federal Action Alternatives

All but two of the nonfederal action alternatives were screened from the initial array. The alternatives were screened either because it would not effectively meet the water supply objective and/or the overall cost of the alternative would be prohibitive. The purpose of the nonfederal alternative is to compute the next least costly/most likely alterative and to estimate the federal water supply benefit.

Alternative 14 (Conservation) was screened as The State of Georgia has already implemented an aggressive conservation strategy. Since the 2000's the per capita use has fall from 151 gpcd to around 100 gpcd in 2015. The MNGWPD also factors in future conservation implementation into the demand forecasting.

Alternative 16 (piping desalinated water from the coast) was screened as this option was very costly and least likely to be implemented. Similarly, Alternative 17 includes (piping water from the Tennessee River) this is also a very costly option and involves inter-basin transfer which is not widely supported.

Alternative 18 (Drill new wells) was screened due to the availability for new groundwater sources. There are minimal ground water well now and the yield would be approximately a few mgd. Alternative 18 was therefore not practicable or cost effective.

Alternative 20 (purchase water from existing nonfederal reservoirs) was screened as an alternative as local utilities that have access to surface water reservoirs are fully utilizing the water supply already. Richland Creek is under construction which will be used to meet the need for Paulding County who currently purchases from CCMWA.

Alternative 21 (withdraw more water from the Chattahoochee River (CCMWA)) was part of the ACF WSSA recommended plan. Approximately 40mgd would be available for withdraw. However this intake is only practical for Fulton County and would only occur potentially in an emergency situation as the cost of pumping to other users is high.

Alternative 22 (withdraw water from the Etowah Rover below Allatoona Dam (Cartersville only)) was screened as it would require a reallocation from Allatoona to provide enough flow and would also require an upgrade to the water intake and piping as it is currently only used in case of an emergency. This was not a cost effective alternative.

B.5.4 Combination Alternatives

B.5.5 Final Array of Alternatives

Table B.5-5 presents the final array of federal and nonfederal alternatives, including a summary of the major features of each alternative.

Table B.5-5: Final Array of Alternatives

#	Alternative	Meets GA 2050 Demands 94 mgd	Storage Accounting Method		Reallocation			APC Requested Changes	Screened or Carried Forward
			USACE	GA	Inactive Pool	Conservation Pool	Flood Pool		
0	No Action		✓						**Carried Forward**
1	Baseline-Capped								**Carried Forward**
2	FWOP		✓						**Carried Forward**
3	WS1	✓		✓		✓			**Carried Forward**
4	WS2	✓	✓			✓			**Carried Forward**
5	WS3	✓		✓		✓	✓		**Carried Forward**
6	WS4	✓	✓				✓		Screened
7	WS5				✓				Screened
8	WS6	✓	✓			✓	✓		**Carried Forward**
9	MFO1		✓					✓	**Carried Forward**
10	WS2 + MFO1	✓	✓			✓		✓	**Carried Forward**
11	WS6 MFO1	✓	✓			✓	✓	✓	**Carried Forward**
12	WS1 + MFO1	✓		✓		✓		✓	**Carried Forward**
13	WS3 + MFO1	✓		✓		✓	✓	✓	**Carried Forward**
	Nonfederal Water Supply Alternatives								
14	*Conservation*								Screened
15	*Construct a pipeline to convey water from Hickory Log Creek Reservoir to Wyckoff Water Treatment Plant (CCMWA)*	✓ (partial)							**Carried Forward**
16	*Pipe desalinated water from the Georgia coast*	✓							Screened
17	*Pipe water from the Tennessee River*	✓							Screened
18	*Drill new wells*								Screened

#	Alternative	Meets GA 2050 Demands 94 mgd	Storage Accounting Method		Reallocation			APC Requested Changes	Screened or Carried Forward
			USACE	GA	Inactive Pool	Conservation Pool	Flood Pool		
19	*Construct new reservoirs*	✓							**Carried Forward**
20	*Purchase water from existing nonfederal reservoirs*								Screened
21	*Withdraw more water from the Chattahoochee River (CCMWA)*	✓							Screened
22	*Withdraw water from the Etowah River below Allatoona Dam (Cartersville)*	✓							Screened

B.5.5.1 Alternatives Milestone Meeting

USACE conducted the Alternatives Milestone Meeting (AMM) on 14 December 2018. Attendees included members of the USACE Mobile District PDT, Major Subordinate Command (MSC) SAD members, and Headquarters USACE Office of Water Project Review and Regional Integration Team. The PDT hosted the meeting virtually via webinar.

The purpose of the AMM was to obtain concurrence on the final array of alternatives and the path forward to the Tentatively Selected Plan (TSP) Milestone. The PDT discussed the study purpose, completed activities, the request received from the State of Georgia, the request received from APC, current water supply storage and storage accounting methodologies, measures and preliminary alternatives, screening of the initial array of alternatives, the final array of alternatives, next steps to the TSP milestone, and key risks moving forward.

The SAD Planning Chief concurred with moving forward with the final array of alternatives and the process to evaluate, compare, and select alternatives.

B.6 Evaluation of Final Array of Alternatives

B.6.1 Evaluation, Comparison, and Screening Criteria developed in the TSP Decision Management Plan

The PDT developed a set of criteria to evaluate, compare and screen alternatives. The criteria utilized are as follows:

- Does the alternative comply with P.L. 83-436? The Coosa Power Act is discussed in Section 2.1 of the main report. Section 5 of the Coosa Power Act requires the Non-federal project to meet three criteria.
    - The project shall provide the maximum flood control that is economically feasible;
    - The flood control storage may not be less than the displaced valley storage; and
    - The flood control storage may not be less in quantity and effectiveness than the amount of flood control storage provided by the Howell Mill Shoals project. Howell Mill Shoals was the original federal project proposed for construction on the Coosa River. It was never constructed, and non-federal hydropower development was allowed in its place, subject to meeting this provision.
- Is it implementable under current law?
- Are there impacts to authorized project purposes?
- Is the alternative successful at meeting 1 or more project objectives?
- Does it increase overall flood risk in the basin?
- Does the alternative change the level of protection to life and safety? Is there an increase risk to dams and levees overtopping as a result in the changing flood operation?
- Does the alternative meet ACT basin minimum flow requirements?
- Does the alternative impact the State Line flow?
- What are the benefits forgone for the alternative?
- What are the revenues forgone for the alternative?
- What is the updated cost of storage for the alternative?

B.6.2 Modeling of Alternatives

The PDT utilized various types of modeling in order to evaluate the final array of alternatives against the criteria identified in section B.6.1. Models include HEC-ResSim, HEC-RAS, HEC-5Q and, HEC-FIA. A full description of the models used and reasons each model was utilized is discussed in Appendix E, Section E.3.1. Appendix C also includes modeling reports for HEC-ResSim, HEC-5Q, and HEC-RAS. Appendix D discusses the HEC-FIA modeling.

B.6.3 Evaluation of Criteria 1

Alternative 1, Alternative 2, Alternative 3, Alternative 4, Alternative 5, and Alternative 8 all comply with P.L. 83-436. These alternatives do not include a change to flood operations at Logan Martin and Weiss and therefore are compliant. The current WCMs direct flood operations that require inundation to elevation 574 ft at Weiss. APC only owns easements to elevation 572 ft at Weiss. If any of these alternatives are selected by the decision maker, it is reasonably foreseeable that flood operations would require use of the flood storage from elevation 572 ft to 574

ft. Therefore, APC might be required to purchase additional easements or real estate interests for this proposed operation to be legal and in compliance with P.L. 83-436. USACE will conduct additional analysis of impacts to private property both upstream and downstream of Weiss and Logan Martin dams. This analysis will provide the decision maker a comprehensive impact assessment of the effects for APC's current and proposed operations. Prior to implementation, it may be incumbent on APC to purchase any additional identified real interests as part of this proposed plan. This analysis and findings will be available for review in the Final FR/SEIS.

Alternative 9, Alternative 10, Alternative 11, Alternative 12, and Alternative 13 include changes to the flood operations at Weiss and Logan Martin. The PDT reviewed the documentation provided by APC and is satisfied that the change in flood operations still provides more flood storage than the displaced valley storage. The total revised flood storage between Weiss and Logan Martin is 586,700 ac-ft. This exceeds the proposed flood storage of Howells Mill Shoals of 451,500 ac-ft. APC has not yet provided documentation to support the requirement that this alternative is providing the maximum flood control that is economically feasible. USACE is awaiting additional information to ensure that all facets of Section 5 of P.L. 83-436 have been satisfied.

B.6.4 Evaluation of Criteria 2

All Federal Action Alternatives can be implemented under current law. However, it should be noted that Alternative 3, Alternative 5, Alternative 12, and Alternative 13 utilize a storage accounting methodology that is not part of the USACE SAD storage accounting methodology. National Rulemaking is ongoing regarding USACE storage accounting policy. Implementation of an alternative that utilizes the State of Georgia recommended storage accounting methodology would be contingent upon a final decision under this rule making.

B.6.5 Evaluation of Criteria 3

The PDT evaluated the potential effects on project purposes using outputs from the HEC-ResSim model as well as a range of other economic models. The comparison of the alternatives relative to selected metrics for hydropower, flood risk management, navigation, and recreation are presented in Table B.6-1. Additional details are presented in Appendix B and Appendix D.

B.6.6 Evaluation of Criteria 4

All alternatives maintain an acceptable level of flood risk within the ACT basin. Alternative 3, Alternative 4, Alternative 5, Alternative 8, Alternative 10, Alternative 11, Alternative 12, and Alternative 13 also fully meet Georgia's need for water supply from Lake Allatoona. Alternative 0, Alternative 1, and Alternative 2 do not fully reduce the risk of water supply shortage at Lake Allatoona.

B.6.7 Evaluation of Criteria 5

Alternative 0, Alternative 1, Alternative 2, Alternative 3, and Alternative 4 do not include modifications to flood operations at Allatoona Lake, Weiss Lake or Logan Martin Lake. Therefore, there are no changes to the level of flood impacts with these alternatives.

Table B.6-1. Selected Metrics for Authorized Project Purposes

Alternative No.	0	1	2	3	4	5	8	9	10	11	12	13
Hydropower system annual generation (GWh)	5,556.7	5,558.4	5,555.0	5,549.7	5,549.6	5,551.3	5,551.1	5,545.0	5,539.3	5,540.8	5,539.6	5,541.0
Hydropower system energy value ($M)	$136.04	$136.09	$136.01	$135.87	$135.86	$135.92	$135.91	$135.63	$135.49	$135.53	$135.49	$135.54
Hydropower system capacity (MW)	2,144.48	2,145.46	2,145.07	2,143.97	2,145.31	2,146.42	2,146.31	2,144.62	2,142.90	2,145.13	2,143.09	2,145.49
Hydropower Capacity Value ($M)	$265.80	$265.92	$265.87	$265.74	$265.90	$266.04	$266.03	$265.82	$265.61	$265.88	$265.63	$265.93
Flood Risk – 0.5% 1979 event at Rome, GA ($M)	$131.27	No Change	No Change	No Change	No Change	+3.6%;	+3.6%;	No Change	No Change	+3.6%;	No Change	+3.6%;
Flood risk – APC Apr 1979 event ($M)	$46.99	No Change	No Change	No Change	No Change	No Change	-5.4%;	-5.4%;	-5.4%;	-5.4%;	-5.4%;	-5.4%;
Flood risk – APC Feb 1990 event ($M)	$51.48	No Change	No Change	No Change	No Change	No Change	-135.8%	-135.8%	-135.8%	-135.8%	-135.8%	-135.8%
Flood Risk – APC Oct 1995 event ($M)	$15.70	No Change	No Change	No Change	No Change	No Change	+15.8%	+15.8%	+15.8%	+15.8%	+15.8%	+15.8%
Navigation – Percent of time a 7.5-ft channel would be available	85.9%	85.9%	85.9%	85.4%	85.9%	85.9%	86.1%	85.9%	85.0%	85.1%	85.0%	85.1%
Recreation - Allatoona ($M avg. annual)	$73.8	$73.8	$73.8	$73.8	$73.8	$74.5	$74.5	$73.8	$738	$74.5	$73.8	$74.5
Recreation - APC ($M avg. annual)	$32.0	$32.0	$32.0	$32.0	$32.0	$32.0	$32.0	$32.9	$32.9	$32.9	$32.9	$32.9

Alternative 5, Alternative 8, Alternative 11, and Alternative 13 include a 1-ft summer pool level increase at Allatoona and a 1.5-ft increase to the winter pool. This is equivalent to a 4 percent reduction in summer flood storage and 2.4 percent reduction in winter flood storage. The PDT evaluated flood impacts using the HEC-FIA Model. Details on the HEC-RAS and HEC-FIA modeling can be found in Appendix C, Attachment 4, and Appendix D, respectively.

From a total impact perspective, the modeled events/frequencies that impacted the largest number of structures was the Base and Proposed 1979 (0.2 percent) USACE scenario (500-year event). These scenarios produced impacts to 512 structures at base conditions, and 517 structures at proposed conditions along the Etowah, Oostanaula, and Coosa Rivers. Most impacts would occur in Rome, GA, within Floyd County. A summary of structure impacts is shown below in Table B.6-2. A summary of damages at Allatoona Lake are shown in Table B.6-3

Table B.6-2: Allatoona Flood Impacts - Structures

Impacts						
Base			Proposed			
Storm	Frequency	Structures Impacted	Storm	Frequency	Structures Impacted	Percent Change from Base
1961	0.002	418	1961	0.002	418	0.00%
1961	0.005	350	1961	0.005	350	0.00%
1961	0.01	315	1961	0.01	315	0.00%
1961	0.02	271	1961	0.02	271	0.00%
1961	0.05	87	1961	0.05	87	0.00%
1979	0.002	509	1979	0.002	514	0.97%
1979	0.005	362	1979	0.005	369	1.88%
1979	0.01	251	1979	0.01	251	0.00%
1979	0.02	184	1979	0.02	184	0.00%
1979	0.05	159	1979	0.05	159	0.00%
1990	0.002	328	1990	0.002	328	0.00%
1990	0.005	263	1990	0.005	263	0.00%
1990	0.01	203	1990	0.01	203	0.00%
1990	0.02	177	1990	0.02	177	0.00%
1990	0.05	158	1990	0.05	158	0.00%

Table B.6-3: Flood Impact Damages at Allatoona Lake

Damages						
Base			Proposed			
Storm	Frequency	Structure Damages	Storm	Frequency	Structure Damages	Percent Change from Base
0.04%	0.002	$180,208,187	1961	0.002	$180,280,028	0.04%
0.04%	0.005	$146,055,126	1961	0.005	$146,107,482	0.04%
0.00%	0.01	$133,697,579	1961	0.01	$133,697,426	0.00%
0.03%	0.02	$119,781,776	1961	0.02	$119,817,592	0.03%
0.55%	0.05	$14,675,209	1961	0.05	$14,756,926	0.55%
2.88%	0.002	$181,990,474	1979	0.002	$187,386,680	2.88%
3.62%	0.005	$131,256,139	1979	0.005	$136,189,406	3.62%
0.00%	0.01	$107,064,199	1979	0.01	$107,063,350	0.00%
-0.03%	0.02	$86,293,757	1979	0.02	$86,270,710	-0.03%
1.80%	0.05	$65,859,888	1979	0.05	$67,069,335	1.80%
0.01%	0.002	$132,436,363	1990	0.002	$132,451,203	0.01%
0.02%	0.005	$118,366,005	1990	0.005	$118,392,483	0.02%
0.03%	0.01	$104,614,830	1990	0.01	$104,641,536	0.03%
0.04%	0.02	$93,619,544	1990	0.02	$93,656,391	0.04%
0.33%	0.05	$74,559,305	1990	0.05	$74,807,521	0.33%

Alternative 9, Alternative 10, Alternative 11, and Alternative 12 and Alternative 13 include a proposed change to flood operations at Weiss Lake and Logan Martin Lake. At Weiss Lake and Dam the proposed changes include a 30 percent reduction in the flood storage during the winter months and a 24 percent reduction in flood storage during the summer months. At Logan Martin Dam and Lake the proposed changes include a 35 percent reduction in flood storage during the winter months as well as a 35 percent reduction in the summer months. To account for the reduction in flood storage, APC proposes to modify the current Flood Regulation Schedules for Weiss and Logan Martin Dams. A summary of impacts is shown below in Table B.6-4: APC Projects Flood Impacts - Structures and Table B.6-5.

Table B.6-4: APC Projects Flood Impacts - Structures

Impacts			
Storm	Existing	Proposed	Percent Change from Existing
	Structures Impacted		
Design	1,142	847	-34.83%
Back to Back	495	419	-18.14%

Impacts			
April 1979	796	757	-5.15%
February 1990	1,008	445	-126.52%
March 1990	457	424	-7.78%
May 2003	361	316	-14.24%
October 1995	393	383	-2.61%

Table B.6-5: APC Projects Flood Impacts: Damages

Damages			
Storm	Existing	Proposed	% Change from Existing
	Structure Damages		
Design	$60,355,624	$44,304,487	-36.23%
Back to Back	$28,283,180	$23,463,094	-20.54%
April 1979	$46,986,215	$44,567,294	-5.43%
February 1990	$51,480,801	$21,830,976	-135.82%
March 1990	$22,752,268	$21,529,299	-5.68%
May 2003	$19,382,372	$15,873,367	-22.11%
October 1995	$15,703,437	$18,653,614	15.82%

B.6.8 Evaluation of Criteria 6

Alternative 0, Alternative 1, Alternative 2, Alternative 3, and Alternative 4 do not include any changes to the flood pool and therefore do not change risks to over-topping of the Allatoona Dam or downstream levees at Rome, Georgia.

Alternative 5, Alternative 8, Alternative 11 and Alternative 13 do not increase the risk to life and public safety as a result of dam or levee overtopping. USACE reports that there are no resultant impacts to the routed Probable Maximum Flood maximum pool elevation and no significant downstream impacts to routed flood discharge. Additional details of the analysis are discussed in Appendix C, Attachment 4.

Alternative 9, Alternative 10, Alternative 11, Alternative 12, and Alternative 13 include a change to flood operations at both Weiss Lake and Logan Martin Lake. APC did not provide documentation of a dam safety analysis associated with the proposed changes to flood operations at either Weiss Lake or Logan Martin Lake. USACE recommends that an assessment covering the impacts to dam safety from the proposed changes should be required under the updated FERC License.

B.6.9 Evaluation of Criteria 7

All alternatives meet minimum releases required at USACE projects. Minimum releases are detailed in the project WCMs.

B.6.10 Evaluation of Criteria 8

USACE evaluated the percent of time the state line flow was triggered over the 73-year period of record. Table B.6-6 displays the results for each alternative. There are minimal differences between the alternatives which USACE concludes as minimal to no effect for an impact to drought operations.

Table B.6-6: Percent of Time State Line Flow Trigger

Alternative	Alternative Description	Percent of Time State Line Flow Trigger Would be Met
0	NAA	12.7%
1	BaseCap	12.4%
2	FWOP	12.4%
3	WS01	13.1%
4	WS02	13.2%
5	WS03	13.1%
8	WS06	13.1%
9	FWOP_MF	12.4%
10	WS02_MF	13.2%
11	WS06_MF	13.1%
12	WS01_MF	13.1%
13	WS03_MF	13.1%

B.6.11 Evaluation Criteria 9, 10, and 11

These criteria specific to determining the recommendation of water supply reallocation at Allatoona Lake are discussed in Section B.9. They are only evaluated for the TSP.

B.7 Comparison of the Final Array of Alternatives

B.7.1 System of Accounts

Table B.7-1. System of Accounts for Alternative Plans

Item	Alternative										
	1	2	3	4	5	8	9	10	11	12	13
A. PLAN DESCRIPTION (detailed description in section 4)											
A1. Water Supply at Allatoona Lake	Continue existing water supply storage agreements.	Continue existing water supply storage agreements. Next least cost water supply alternative implemented	Continue existing water supply storage agreements. Reallocate 14,524 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 32,812 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 15,041 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 33,872 ac-ft conservation storage	Continue existing water supply storage agreements. Next least cost water supply alternative implemented	Continue existing water supply storage agreements. Reallocate 32,812 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 33,872 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 14,524 ac-ft conservation storage	Continue existing water supply storage agreements. Reallocate 15,041 ac-ft conservation storage
A2. Flood Operations at Weiss and Logan Martin Dams	No change	No change	No change	No change	No change	No change	Revised APC flood operations at Weiss and Logan Martin	Revised APC flood operations at Weiss and Logan Martin	Revised APC flood operations at Weiss and Logan Martin	Revised APC flood operations at Weiss and Logan Martin	Revised APC flood operations at Weiss and Logan Martin
B. IMPACT ASSESSMENT											
B1. National Economic Development											
Water Supply	Shortage likely without non-federal alternative	Shortage likely without non-federal alternative	Full requested need met	Full requested need met	Full requested need met	Full requested need met	Shortage likely without non-federal alternative	Full requested need met	Full requested need met	Full requested need met	Full requested need met
Hydropower (000s)	$401,629	$401,498	$398,879	$401,197	$401,959	$401,940	$401,452	$401,091	$401,412	$401,122	$401,467
Flood Risk Management [a]	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7	For event-based values see 4.5.7
Recreation (000s)	$105,832	$105,832	$105,832	$105,832	$105,832	$106,529	$106,659	$106,659	$107,356	$106,659	$107,355
B2. Environmental Quality – Refer to Section 5.0 of Main Report											
B3. Regional Economic Development											
Impacts to employment	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Impacts to tax base	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Item	Alternative										
	1	2	3	4	5	8	9	10	11	12	13
B4. Other Social Effects – Refer to Section 5.0 of Main Report											
C. PLAN EVALUATION											
C1. Performance Relative to Authorized Project Purposes – Refer to Section 6.5											
C2. Planning Objectives – Refer to Section 6.6											
C3. P&G Criteria											
Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete	Not Complete
Effective	Not Effective	Not Effective	Partially Effective	Partially Effective	Partially Effective	Partially Effective	Partially Effective	Effective	Effective	Effective	Effective
Efficient	Efficient	Efficient	More Efficient than Alt 2	More Efficient than Alt 2	More Efficient than Alt 2	Most Efficient	More Efficient than Alt 2	More Efficient than Alt 2	Most Efficient	More Efficient than Alt 2	More Efficient than Alt 2
Acceptable	Not Acceptable	Not Acceptable	Partially Acceptable	Partially Acceptable	Partially Acceptable	Partially Acceptable	Partially Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
D. IMPLEMENTING RESPONSIBILITY	None	None	USACE/ State of Georgia	USACE/ State of Georgia	USACE/ State of Georgia	USACE/ State of Georgia	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC
E. STATE OR OTHER NON-FEDERAL COORDINATION	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC	USACE/ State of Georgia/ APC

B.7.2 Comparison to the No Action

B.7.2.1 Alternative 3

Alternative 3 has only a few select areas where there are differences from the No Action. Alternative 3 has slightly lower lake level conditions over the period of record. Dissolved oxygen levels are likely to be slightly adverse. This is due to increased lake withdraws over the period of record. Availability for M&I water supply is slightly beneficial compared to the no action as this alternative provides reallocation to meet the full need. Alternative 3 has slightly adverse hydropower impacts compared to the NAA. All other changes are negligible compared to the NAA.

B.7.2.2 Alternative 4

Alternative 4 has only a few select areas where there are differences from the NAA. Alternative 4 has slightly lower lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the NAA. Dissolved oxygen levels are likely to be slightly adverse. This is due to increased lake withdraws over the period of record. Availability for M&I water supply is slightly beneficial compared to the no action as this alternative provides reallocation to meet the full need. Alternative 4 has slightly adverse impacts to hydropower compared to the NAA. All other changes are negligible compared to the NAA.

B.7.2.3 Alternative 5

Alternative 5 has only a few select areas where there are differences from the NAA. Alternative 5 has slightly higher lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the NAA. Dissolved oxygen levels are likely to be slightly beneficial. Availability for M&I water supply is slightly beneficial compared to the no action as this alternative provides reallocation to meet the full need. Alternative 5 has slightly beneficial impacts to hydropower compared to the NAA. All other changes are negligible compared to the NAA.

B.7.2.4 Alternative 8

Alternative 8 has only a few select areas where there are differences from the NAA. Alternative 8 has slightly higher lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the NAA. Dissolved oxygen levels are likely to be slightly beneficial. Availability for M&I water supply is slightly beneficial compared to the no action as this alternative provides reallocation to meet the full need. Alternative 8 has slightly beneficial impacts to hydropower compared to the NAA. All other changes are negligible compared to the NAA.

B.7.2.5 Alternative 9

Alternative 9 has beneficial impacts compared to the NAA for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 9 also has slightly adverse impacts to hydropower compared to the NAA. Alternative 9 has slightly beneficial flood impacts compared to the NAA. Alternative 9 has slightly adverse impacts to M&I Water Supply as it does not meet any additional need over the NAA. Alternative 9 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the NAA.

B.7.2.6 Alternative 10

Alternative 10 has slightly adverse impacts compared to the NAA for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 10 also has slightly adverse impacts to hydropower compared to the NAA. Alternative 10 has slightly beneficial flood impacts compared to the NAA. Alternative 10 has slightly beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 10 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the NAA.

B.7.2.7 Alternative 11

Alternative 11 has slightly beneficial impacts compared to the NAA for lake level conditions and slightly adverse flow conditions above Weiss Lake. Alternative 11 also has slightly adverse impacts to hydropower compared to the NAA. Alternative 11 has slightly beneficial flood impacts compared to the NAA. Alternative 11 has slightly beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 11 has slight beneficial impacts to recreation at Allatoona due to a higher summer level and Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the NAA.

B.7.2.8 Alternative 12

Alternative 12 has slightly adverse impacts compared to the NAA for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 12 also has slightly adverse impacts to hydropower compared to the NAA. Alternative 12 has slightly beneficial flood impacts compared to the NAA. Alternative 12 has slightly beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 12 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the NAA.

B.7.2.9 Alternative 13

Alternative 13 has slightly beneficial impacts compared to the NAA for lake level conditions and slightly adverse flow conditions above Weiss Lake. Alternative 11 also has slightly adverse impacts to hydropower compared to the NAA. Alternative 13 has slightly beneficial flood impacts compared to the NAA. Alternative 13 has slightly beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 13 has slight beneficial impacts to recreation at Allatoona due to a higher summer level and Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the NAA.

B.7.3 Comparison to the Future Without Project Condition

B.7.3.1 Alternative 3

Alternative 3 has only a few select areas where there are differences from the FWOP. Alternative 3 has slightly lower lake level conditions over the period of record. DO levels are likely to be slightly adverse. This is due to increased lake withdraws over the period of record. Availability for M&I water supply is substantially beneficial compared to the FWOP as this alternative provides reallocation to meet the full need. Alternative 3 has slightly adverse hydropower impacts compared to the FWOP. Alternative 3 meets the full 2050 demand need. All other changes are negligible compared to the FWOP.

B.7.3.2 Alternative 4

Alternative 4 has only a few select areas where there are differences from the FWOP. Alternative 4 has slightly lower lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the FWOP. DO levels are likely to be slightly adverse. This is due to increased lake withdraws over the period of record. Availability for M&I water supply is substantially beneficial compared to the FWOP as this alternative provides reallocation to meet the full need. Alternative 4 has slightly adverse impacts to hydropower compared to the FWOP. Alternative 4 meets the full 2050 demand need. All other changes are negligible compared to the FWOP.

B.7.3.3 Alternative 5

Alternative 5 has only a few select areas where there are differences from the FWOP. Alternative 5 has slightly higher lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the FWOP. DO levels are likely to be slightly beneficial. Availability for M&I water supply is substantially beneficial compared to the FWOP as this alternative provides reallocation to meet the full need. Alternative 5 has slightly beneficial impacts to hydropower compared to the FWOP. Alternative 5 meets the full 2050 demand need. All other changes are negligible compared to the FWOP.

B.7.3.4 Alternative 8

Alternative 8 has only a few select areas where there are differences from the FWOP. Alternative 8 has slightly higher lake level conditions over the period of record. Flow conditions are also slightly adverse compared to the FWOP. DO levels are likely to be slightly beneficial. Availability for M&I water supply is substantially beneficial compared to the FWOP as this alternative provides reallocation to meet the full need. Alternative 8 has slightly beneficial impacts to hydropower compared to the FWOP. Alternative 8 meets the full 2050 demand need. All other changes are negligible compared to the FWOP.

B.7.3.5 Alternative 9

Alternative 9 has beneficial impacts compared to the FWOP for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 9 also has slightly adverse impacts to hydropower compared to the FWOP. Alternative 9 has slightly beneficial flood impacts compared to the FWOP. Alternative 9 has no impact to M&I Water Supply as it does not meet any additional need over the FWOP. Alternative 9 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the FWOP.

B.7.3.6 Alternative 10

Alternative 10 has slightly adverse impacts compared to the FWOP for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 10 also has slightly adverse impacts to hydropower compared to the FWOP. Alternative 10 has slightly beneficial flood impacts compared to the FWOP. Alternative 10 has substantially beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 10 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the FWOP.

B.7.3.7 Alternative 11

Alternative 11 has slightly beneficial impacts compared to the FWOP for lake level conditions and slightly adverse flow conditions above Weiss Lake. Alternative 11 also has slightly adverse impacts to hydropower compared to the FWOP. Alternative 11 has slightly beneficial flood impacts compared to the FWOP. Alternative 11 has substantially beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 11 has slight beneficial impacts to recreation at Allatoona due to a higher summer level and Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the FWOP.

B.7.3.8 Alternative 12

Alternative 12 has slightly adverse impacts compared to the FWOP for Allatoona lake level conditions and flow conditions above Weiss Lake. Alternative 12 also has slightly adverse impacts to hydropower compared to the FWOP. Alternative 12 has s beneficial flood impacts compared to the FWOP. Alternative 12 has substantially beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 12 has slight beneficial impacts to recreation at Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the FWOP.

B.7.3.9 Alternative 13

Alternative 13 has slightly beneficial impacts compared to the FWOP for lake level conditions and slightly adverse flow conditions above Weiss Lake. Alternative 11 also has slightly adverse impacts to hydropower compared to the FWOP. Alternative 13 has slightly beneficial flood impacts compared to the FWOP. Alternative 13 has substantially beneficial impacts to M&I Water Supply as it does provide for the full need in Georgia's request. Alternative 13 has slight beneficial impacts to recreation at Allatoona due to a higher summer level and Weiss and Logan Martin due to higher winter lake levels. All other changes are negligible compared to the FWOP.

B.8 Summary of Reasons why TSP was selected

The PDT reviewed all the modeled outputs and the results of the screening criteria in order to select the TSP from the final array of alternatives. The PDT has selected Alternative 11 as the TSP. This alternative fully meets both study objectives by reducing risk of water supply shortages with a reallocation of storage for water supply and including revised flood operations at the Weiss and Logan Martin projects. Alternative 11 has no significant impacts to any authorized project purposes.

There is a substantial beneficial impact to recreation. Annual recreation benefits increase by approximately $1.5 million. The reallocation from flood control storage would provide improved pool level conditions for year-round recreational use at Allatoona Lake, from October through February at Weiss Lake, and from November through mid-March at Logan Martin Lake. Recreation was a key issue for many of the stakeholders and discussed heavily during the scoping meetings.

Alternative 11 has no significant environmental effects compared to the NAA or other alternatives. Alternative 11 was the best alternative at achieving the objectives and providing for the least negative effects across the resource areas. Section 5.0 of the Main Report provides summary tables and detailed impacts for the environmental resources in the ACT basin for the TSP. Section 5.1 provides a full color coded summary of impacts. A full discussion of the TSP is detailed in Section 7.0 of the Main Report.

B.8.1 Additional analysis required for Allatoona Water Supply Reallocation only.

ER 1105-2-100 requires the USACE to evaluate the potential costs and benefits of nonfederal water supply alternatives to determine the "Next least costly/most likely alternative" absent reallocation from a USACE reservoir. Sections B.9 and B.10. The Test for Financial Feasibility discussed in section B.10 is used to determine whether or not USACE will recommend a reallocation from a USACE reservoir.

B.9 Derivation of User Cost

The TSP includes a reallocation from storage at Allatoona Lake for water supply to meet a future need of an estimated 94 mgd for the CCMWA and the City of Cartersville, GA. USACE guidance requires four different methods to be used to determine the cost of water supply storage to the user, which is discussed in Section B.9.2. . In addition to determining user cost, USACE must ensure that reallocation of federal storage to water supply is the most economical alternative compared to other sources of water (including the Next Least Costly Alternative), which is discussed in Section B.10.1. Reallocated storage to water supply can be repaid over a period not to exceed 30 years. Details of annual storage costs are discussed in Section B.9.2.5.

B.9.1 Methodology

USACE's Engineer Regulation (ER) 1105-2-100 specifies the four pricing methods used to calculate the value of storage considered for reallocation (i.e., the price to be charged for the capital investment for the reallocated storage). The four methods include: benefits foregone, revenues foregone, replacement cost, and updated cost of storage. The value placed on the storage is the highest of the four methods.

- Benefits Foregone. Benefits foregone are generally estimated using the standard National Economic Development (NED) evaluation criteria in compliance with ER-1105-2-100. The benefits forgone are evaluated over a 50-year period of analysis.
- Revenues Foregone. Hydropower revenues foregone are defined as the reduction in revenues accruing to the Treasury as a result of reallocating storage from hydropower to water supply. The revenues are based on the existing repayment agreement between the power marketing agency and the USACE. Revenues forgone from other project purposes are the reduction in revenues accruing to the U.S. Treasury based on existing repayment agreements.
- Replacement Cost. Notwithstanding unforeseen circumstances, replacement costs are equal to benefits foregone. In the event that reallocated storage is being taken from the flood control pool, the USACE will estimate the replacement cost of equivalent protection if necessary.
- Updated Cost of Storage. The updated cost of reallocated storage is estimated by updating the cost of the joint use features from the midpoint of construction to the fiscal year in which the reallocation of storage is approved. The updated cost of the joint use features is then multiplied by the proportion of useable storage that is to be reallocated to estimate the value of the reallocated storage.

B.9.2 The Value of Storage

B.9.2.1 Benefits Forgone

Benefits forgone are calculated for the ACT Federal project in accordance with guidance in the ER 1105-2-100. There are no benefits forgone calculated for navigation. While there is channel availability on the ACT System, no NED benefits were evaluated due to the lack of consistent commodity movements over the last decade. Therefore, there are no benefits forgone to the navigation project purpose.

Benefits forgone are calculated for both the hydropower project purpose, flood risk management and for recreation. A full description of the methodology for NED hydropower impacts is contained in Attachment 2 of Appendix D to the main report and the recreation benefit analysis in contained in Attachment 1 of Appendix D. Benefits forgone are summarized in Table B.9-1 in average annual dollars based on the 2019 price levels, a 2.875 percent interest rate and a period of analysis of 50 years. It should be noted that impacts to project purposes discussed in Section 5 of the EIS are a comparison of the NAA to the Proposed Action Alternative. The benefits forgone analysis the comparison between the Without Project Condition (Alt2) and Alternative 8. The purpose of comparing to Alternative 8 is to isolate the costs attributable to water supply storage allocation.

Table B.9-1: Benefits Forgone

Alternative	Total Benefits (Federal System)	Benefits Forgone compared to baseline (Without Project Future Condition)
FWOP	$218,773,749	
Hydropower (from water supply)	$138,664,206	
FRM	$6,325,243	
Recreation	$73,784,300	
Reallocation	$219,588,166	$760,975
Hydropower (from water supply)	$138,695,392	$31,186
FRM (Flood Damages Reduced)	$6,411,774	($86,530)
Recreation	$74,481,000	$696,700

Note: FRM is in FY 2020 price level with a discount rate of 2.75%.

B.9.2.2 Revenues Forgone

Revenues forgone are calculated for the ACT Federal system in accordance with guidance in the ER 1105-2-100. There are no revenues foregone for flood risk management, navigation, or recreation project purposes. A detailed discussion of the hydropower revenues forgone calculations and methodology is found in Appendix D. Revenues forgone are based on the capacity and energy rates as reported by Southeastern Power Administration, October 2018 (FY 2019) price levels, and average annual generation over a period of analysis of 50 years. Revenues forgone are $38,220 for the 33,872 ac-ft reallocation alternative (Alt 8 in the EIS). Alt 8 is used for this comparison to isolate the changes solely due to changes in water supply storage at Allatoona Lake.

Table B.9-2: Revenues Forgone

Alternative	Total Revenue (Federal System)	Revenue Foregone compared to baseline (Without Project Future Condition)
FWOP	$65,245,635	
Reallocation	$65,207,415	($38,220)

B.9.2.3 Replacement Cost

No replacement cost was calculated for flood risk management as no serious effects were identified. The replacement cost of power is equivalent to the hydropower benefits forgone. There are positive hydropower benefits due to the reallocation to water supply storage and therefore there is no replacement cost to hydropower.

B.9.2.4 Updated Cost of Storage

The cost allocated to the user under this pricing method updates the joint–use portion of the first costs of reservoir construction to present day price levels and then assigns a percentage of the costs based on the "Use of Facilities" (UOF) cost allocation procedure. Costs are updated from "as built" costs in 1953 (the mid-point of construction) to 1967 prices by use of the Engineering News Record (ENR) Construction Cost Index, and then from 1967 to current prices by use of the USACE's Civil Works Construction Cost Index System (CWCCIS). Land values are updated by the weighted average update of all other project features. Costs are indexed from the midpoint of the physical construction period to the beginning of the FY in which the contract for the reallocated storage is expected to be approved (FY2019). Joint-use costs shown in Table 16 exclude infrastructure costs allocated to specific project purposes such as recreation facilities, hydropower turbines, etc.

Construction is considered as having been initiated at the start of the month when lands for the project were first acquired or on the date when the first construction contract was awarded whichever was earlier. Construction is considered as having been completed at the end of the government FY in which final deliberate impoundment of the reservoir pool was initiated.

The USACE policy on pricing storage reallocated from one authorized project purpose to another is based on the UOF methodology. UOF methodology allocates joint-use costs (costs that cannot be specifically allocated to a specific project purpose) based on overall percentage of storage reallocated. For example, if 15 percent of the usable storage is reallocated, then the reallocated storage is apportioned 15 percent of the joint-use costs. The cost of reallocated storage changes each government FY. This is due to the fact that the Federal discount rate changes on an annual basis as well as varying annual OMRR&R costs. Section 932 of the 1986 WRDA requires recalculation of the interest rate at 5-year intervals if the storage is paid annually over a 30-year period.

B.9.2.5 Cost of Reallocated Storage

The updated cost of storage is the highest of the four comparable costs; therefore, the updated costs of storage will be used to determine the user cost. Table B.9-3 displays the results of the four pricing methods for comparison. The percent of usable storage is calculated in Table B.9-5. The updated joint use costs are shown in Table B.9-4. The storage cost calculations for the 33,872 ac-ft is shown in Table B.9-6. The cost calculations are based on the updated cost of storage of $362,442,000 and a 5-year average OM costs of $929,188, and RR&R costs of $311,363. The updated cost of storage over a 50-year period of analysis is $870,000. Additional annual costs for modifications to recreation features due to the reallocation are $592,000.

Table B.9-3: Costs of Storage

Storage Option	Benefits Foregone compared to baseline (Without Project Future Condition)	Revenue Foregone	Replacement Cost	Updated Cost of Storage
Without Project Condition	$0	$0	$0	$0
Reallocation of 33,872 ac-ft (60 mgd)	$760,975	($38,220)	$31,186	$870,000

Table B.9-4: Updated Joint Use Costs

Category	Actual Joint use as of Mid-point of construction 1939	1939 ENR Index Ratio	1967 ENR Index	ENR ratio	1967 CWCCIS Index Base 100	Updated Joint-Use as of 1967	Mar 2019 CWCCIS Index	Update Factor	FY 2020 Joint Costs
Lands and Damages	$2,010,000	236	1074	4.55	100	$9,147,000	918	9.18	83,975,000
Relocations	$315,200	236	1074	4.55	100	$1,434,000	938.88	9.39	13,464,000
Power Plant	$965,000	236	1074	4.55	100	$4,392,000	831.24	8.31	36,508,000
Dam	$4,714,700	236	1074	4.55	100	$21,456,000	919.97	9.20	197,389,000
Roads, Railroads, & Bridges	$40,300	236	1074	4.55	100	$183,000	938.88	9.39	1,718,000
Channels & Canals	$671,800	236	1074	4.55	100	$3,057,000	961.34	9.61	29,388,000
Total									362,442,000
Specific Conduit Costs to Water Supply	Intakes already present								

Table B.9-5: Lake Storage

Feature	Elevation (feet, NGCD)		Usable Storage (acre-feet)	Percent of	
				Usable Storage (%)	Conservation Storage (%)
Flood Control	841	860	281,936	49.55	
Conservation	800	841	281,917	50.45	100.00
Water Supply			52,411	9.38	18.59
State of Georgia – Reallocation of 33,872 ac-ft			33,872	6.06	12.01
Existing storage -CCMWA			12,485	2.23	4.43
Existing storage -City of Cartersville			6,054	1.08	2.15
Total Usable Storage			558,853	100.00	

Table B.9-6: Costs to User

Total Usable Storage for Allatoona Lake (STot)		558,853 ac-ft
Storage Recommendation (SRec)		33,872 ac-ft
Percent of Total Conservation Storage P = SRec/ STot		6.06%
Total Updated Cost of Storage for Allatoona Lake (CTot)		$ 362,442,000
Cost of Storage Recommendation (CRec) CRec= P x CTot		$ 21,968,000
Annual Cost of Storage Recommendation (ARec)		$ 1,103,000
ARec=((CRec)*(i))/(1-((1+i)^-N))	CRec = $ i = 2.875% discount rate +.125% N = 30 years	
Operation and Maintenance for Allatoona Lake (O&MTot)		$ 929,188
Allatoona Lake Annual Operation and Maintenance Estimate (O&MRec) O&MRec = P x O&MTot		$ 56,000
Allatoona Lake Annual Replacement, Repair and Rehabilitation (RR&R) Estimate (RR&RRec)		$ 311,363
RR&RRec = P x R,R,&RTot		$ 18,872
Total Annual Cost =ARec + O&MRec + RR&RRec (Average Annual $)		$ 1,177,872
Additional costs due to modifications to recreation features		$ 802,000

B.9.3 Credit to the Power Marketing Agency

Project costs originally allocated to hydropower are being repaid through power revenues which are based on rates designed by the Federal power marketing agency (PMA) to recover allocated costs plus interest within 50 years of the date of commercial power operation. If a portion of the storage is reallocated from hydropower to water supply, the PMA's repayment obligation must be reduced in proportion to the lost energy and marketable capacity.

Planning Guidance Notebook, Appendix E-57d(3) of ER 1105-2-100 (22 April 2002) states that;

"If hydropower revenues are being reduced as a result of the reallocation, the power marketing agency will be credited for the amount of revenues to the Treasury foregone as a result of the reallocation assuming uniform annual repayment."

Paragraph d(2)(b) states that;

"Revenues foregone to hydropower are the reduction in revenues accruing to the Treasury as a result of the reduction in hydropower outputs based on the Baseline rates charged by the power marketing agency. Revenues foregone from other project purposes are the reduction in revenues accruing to the Treasury based on any Baseline repayment agreements."

ER 1105-2-100 also allows the marketing agency credit for any additional costs above the lost revenue to recover costs of purchased power to meet the obligations of the current power sales contract(s) relating to the marketing of power from the hydro project(s) where storage is being reallocated. The continuation of Appendix E-57d(3), provides the following guidance:

"In instances where Baseline contracts between the power marketing agency and their customer would result in a cost to the Federal Government to acquire replacement power to fulfill the obligations of contracts, an additional credit to the power marketing agency can be made for such costs incurred during the remaining period of the contracts."

In both cases the credit in each year will be based on the revenue actually lost or the replacement costs actually incurred (and documented) by the power marketing agency.

Estimate of credit to the PMA will be the same as revenue foregone which is based on the change energy between an Alternative and a Base Case multiplied by the SEPA Composite Revenue Rate.

Additional credit will be based on revenue actually lost or replacement costs actually incurred.

B.10 Test of Financial Feasibility

To test the financial feasibility of the reallocation, the annual cost of the reallocated storage is compared to the annual cost of the most likely, least costly alternative water supply source that would provide an equivalent quality and quantity of water if storage reallocation at Allatoona Lake were not an option for the water supply customers. The following sections evaluate the alternative source for the State of Georgia and identify the most likely, least costly water supply source if storage reallocation at Allatoona Lake were not an option.

B.10.1 Least Costly Water Supply Alternatives to Meet Future Regional Demands

The forecasts for regional water demands for current and future Allatoona Lake users and an inventory of existing and potential sources of water supply are detailed in Attachment 2 of this Appendix. These demands and existing and potential sources of water supply were comprehensively discussed in the 2017 Water Supply and Water Conservation Management Plan. The State of Georgia has identified Allatoona Lake water as a critical source of water supply to meet forecast needs through 2050 because of existing withdrawal and distribution infrastructure, including pipelines and water treatment facilities. Current water treatment facilities will provide enough capacity for the 2050 needs at Allatoona Lake. The State of Georgia has identified Allatoona Lake as the preferred source to meet a portion of future needs.

The State of Georgia will require water from Allatoona Lake currently and beyond the immediate need. The State of Georgia is also planning for additional water supply sources in the future to accommodate additional needs of its users. Other sources are not expected to be realized in the near term because of the large financial resources required (hundreds of millions of dollars) and the need to consider social and environmental impacts. Two such conceptual alternatives being considered that could be implemented in the absence of reallocation are described below.

Hickory Log Creek Pipeline Alternative – This includes the cost of construction of a new water intake on the Etowah River downstream of the Hickory Log Creek reservoir and the existing Canon Intake, and a pipeline, that can accommodate up to 70 mgd, with connection the Wyckoff Water Treatment Plant. This includes boring under I-75 as well as crossings over Little River Embayment on Allatona Lake and Lake Acworth. (Hazen and Sawyer, Inc, 2018) Additional details can be found in Attachment 2 of Appendix B.

New reservoir development including additional piping construction. Two potential sites were identified for reservoir construction. Stamp Creek in Bartow County and Sharp Mountain Reservoir in Cherokee County. No safe yield was estimated for Stamp Creek reservoir. Sharp Mountain reservoir had an estimated safe yield of 30-36 mgd.

The PDT estimated potential costs based on information provided in Attachment 2 of Appendix B as well as cost information used in the ACF Water Supply Storage Assessment. Estimated costs are presented in Table B.10-1:Costs for Nonfederal Alternatives.

Table B.10-1:Costs for Nonfederal Alternatives

Alternative	First Cost	Annualized Cost over 50 years
Hickory Log Creek Pipeline Alternative	$224,000,000	$8,500,000
New Reservoir Construction	$594,000,000	$22,541,000

B.10.2 Most Likely Water Supply Alternatives to Meet Future Regional Demands

While the Hickory Log Creek Pipeline Alternative is a lower cost per mgd, it does not address the water supply need for the City of Cartersville. The new reservoir construction alternative does provide the ability to meet needs of both users. This alternative was used as the "most likely/ least cost alternative" to meet future demand absent federal reallocation.

The proposed reservoir construction would be the most likely and least costly water supply alternative to (the existing source) Allatoona Lake storage reallocation. The proposed alternative can supply up to 60-70 mgd with two reservoir construction and would have an estimated average annual cost of about $22,541,000. The Allatoona Lake storage reallocation for the State of Georgia, with an average annual cost of $870,000 and an estimated yield of about 60 mgd, passes the test of financial feasibility without further analysis. The benefit-to-cost ratio is approximately 25.9:1. The economic value of "$870,000" represents the FY 2020 updated cost of storage annualized over a 50-year period at a discount rate of 2.875 percent and does not represent the annual water storage agreement payments amortized over 30 years.

Attachment 1. State of Georgia's Updated Allatoona Lake Water Supply Request (March 30, 2018)

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GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Richard E. Dunn, Director

EPD Director's Office
2 Martin Luther King, Jr. Drive
Suite 1456, East Tower
Atlanta, Georgia 30334
404-656-4713

March 30, 2018

Colonel James DeLapp
District Commander
Mobile District, U.S. Army Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36628

Re: State of Georgia's Updated Allatoona Lake Water Supply Request

Dear Colonel DeLapp,

On January 10, 2018, the United States District Court for the Northern District of Georgia issued an order (the "Order") requiring the United States Army Corps of Engineers to act by March 1, 2021, on water supply requests submitted by the State of Georgia and the Cobb County-Marietta Water Authority ("Cobb-Marietta"). The State submitted its request on January 24, 2013, in a letter from Governor Nathan Deal to the Honorable Jo-Ellen Darcy (the "2013 Request"). Cobb-Marietta submitted its original request on November 16, 1981 and more recently updated that request on October 22, 2012. *See* Letter from G. Page to Colonel S. J. Roemhildt (Oct. 22, 2012). As part of the Order, the State and Cobb-Marietta agreed that the Corps could fulfill its duty to answer both pending requests by responding to and addressing the issues raised by the State's 2013 Request, as updated. This letter and the two attached memoranda provide that update.

The first memorandum is from the Metropolitan North Georgia Water Planning District (the "Metro District") and outlines the Metro District's anticipated water supply demands from and returns to Allatoona Lake through the year 2050. To provide the updated information required under the Order, the Metro District worked with Cobb-Marietta, the City of Cartersville, and Bartow County (which the City of Cartersville supplies) to update both projected demands from and returns to Allatoona Lake using the best available data and the parties' most reliable current projections.

The second memorandum is from Dr. Wei Zeng, Chief of Georgia Environmental Protection Division's Hydrology Unit, and provides a technical evaluation and analysis of the effects of this updated request. Dr. Zeng's memorandum demonstrates that updated request will not seriously affect project purposes or flows downstream of Allatoona Lake.

Based on those memoranda, the State requests that the Corps take the following actions to reallocate storage in and revise its storage accounting methodology for Allatoona Lake:

Storage Reallocation and Contract

The State requests that the Corps enter into a storage contract providing storage capacity in Allatoona Lake sufficient to enable Georgia users to sustain annual average withdrawals from Allatoona Lake in the amount of 94 million gallons per day ("mgd") through 2050 (instead of 123.9 to 147.9 mgd through 2040 as contained in the 2013 Request). If the Corps determines not to grant the entire storage capacity needed to support the stated demand, the State requests that the Corps specify how much storage it can reallocate and provide a detailed explanation of its reasoning.

Storage Accounting

The State recognizes that the storage capacity needed to support average annual withdrawals of 94 mgd will depend upon the assumptions the Corps makes about the relationship between storage capacity and yield. These include assumptions about the total natural inflow to Allatoona Lake; the extent to which natural inflows are augmented by "made inflows"; the manner in which "made inflows" will be allocated to users; the rule that is used to determine when storage space allocated to water supply users is full; and the rule that will be used to determine each user's share of conservation storage for purposes of allocating natural inflows to the project. As explained in detail below, this request separates those assumptions into two categories: made inflows and other storage accounting issues.

The Corps' current assumptions regarding both categories are reflected in the storage accounting system that the Corps currently employs at Allatoona Lake. The State disagrees with the Corps' assumptions and requests that the Corps resolve all storage accounting issues consistent with the below requests.

Made Inflows

The State's 2013 Request sought changes to the Corps' storage accounting system and included a specific request to credit certain "made inflows," consisting of releases from the Hickory Log Creek Reservoir and return flows to Allatoona Lake.

Since the 2013 Request was submitted, the Georgia Department of Natural Resources promulgated rules clarifying the Georgia Environmental Protection Division's authority and procedures for allocating made inflows to particular users. *See* Ga. Comp. Rules & Regs. 391-3-6-.07(2)(o), (16)(a). And, pursuant to that authority, the State of Georgia has allocated certain made inflows to Cobb-Marietta. This allocation is reflected in Georgia Environmental Protection Division Permit No. 008-1491-05 (Modified Nov. 7, 2014) ("Cobb-Marietta's Permit"). The State, therefore, requests that the Corps honor Cobb-Marietta's Permit (and any subsequent renewal thereof), which grants Cobb-Marietta the exclusive right to impound water released from Hickory Log Creek Reservoir and certain return flows in Cobb-Marietta's existing storage space in Allatoona Lake, subject to available space in Cobb-Marietta's storage. In addition, the State requests that the Corps credit made inflows in accordance with any future allocations by the Georgia Environmental Protection Division ("EPD"). If the Corps does not honor Cobb-Marietta's Permit and EPD's authority to allocate made inflows, please provide a detailed and reasoned explanation because the State does not believe the Corps retains discretion to override EPD's express water allocation decisions.

Other Storage Accounting Issues

In addition to made inflows, there are other outstanding storage accounting issues at Allatoona Lake that are the subject of ongoing litigation between Cobb-Marietta and the Corps. *See Cobb County-Marietta Water Authority v. U.S. Army Corps of Engineers*, Civil Action No. 1:17-cv-400-RWS (N.D. Ga.) (the "Storage Accounting Litigation"). For example, under the Corps' current storage accounting methodology, the Corps at times calculates Cobb-Marietta's storage as empty, even when the reservoir is above the rule curve and conservation storage in the project is completely full as defined by the top of the variable rule curve. The State requests that the Corps determine that water supply storage accounts in Allatoona Lake must be full whenever conservation storage, as defined by the project's rule curve, is full.

Likewise, the Corps' current accounting improperly allocates natural inflows (all inflows that are not made inflows) using a fixed percentage of conservation storage, despite the fact that Cobb-Marietta's *pro rata* share of conservation storage increases in the winter when the volume of conservation storage is reduced. The State requests that the Corps determine that natural inflows should be allocated to users in proportion to the percentage of conservation storage held by a user at the time the inflow occurs, as defined by the top-of-conservation rule curve.

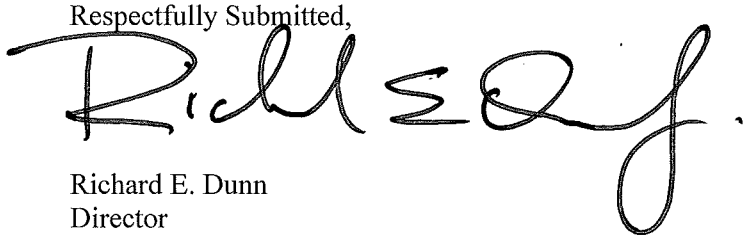
Structure of the Reallocation Study

The Corps will be responding to this request against the backdrop of the pending Storage Accounting Litigation and while promulgating a national rule addressing some, but not all, of the storage accounting issues. *See* 2016 Notice of Proposed Rulemaking, U.S. Army Corps of Engineers, *Use of U.S. Army Corps of Engineers Reservoir Projects for Domestic, Municipal & Industrial Water Supply*, 81 Fed. Reg. 91556 (Dec. 16, 2016) (the "Water Supply Rule"). While the Corps has previously taken the position that any change to the assumptions embedded in its current storage accounting methodology at Allatoona Lake would have to await a "national policy review," the State believes the Order requires the Corps to address the disputed storage accounting questions in response to this request.

In responding to the 2013 Request, it is unclear whether the Corps intends to fully reconsider its storage accounting policies and procedures at Allatoona Lake or whether the Corps will merely apply those existing policies and procedures. Accordingly, the State requests that the reallocation study be structured, not only to study the impact of the requested reallocation, but also to ensure that the reallocation study and supporting NEPA documentation bracket the possible outcomes of the Water Supply Rule and the Storage Accounting Litigation. This will ensure the reallocation study process will move forward without potential delays caused by external developments related to storage accounting.

If you require additional information from Georgia, please let me know.

Respectfully Submitted,



Richard E. Dunn
Director
Georgia Environmental Protection Division
On behalf of the State of Georgia

Metropolitan North Georgia Water Planning District

MEMORANDUM

Date: March 30, 2018

To: Rick Dunn, Director, Georgia Environmental Protection Division

From: Katherine Zitsch, Director

Re: Projected Future Water Supply Demands and Returns for the Allatoona Lake System

---

As requested, this Memorandum provides updated projections for water supply demands and returns for jurisdictions within the Metropolitan North Georgia Water Planning District (the "Metro Water District" or "District") that withdraw water from, and return water to, Allatoona Lake and the Etowah River between Allatoona dam and the Kingston gage downstream of the reservoir. The information provided is based on information developed as part of the District's 2017 update to its Water Resources Management Plan for the 15-county metropolitan Atlanta area, and new information developed since the District Plan was finalized and adopted. I understand this information will be provided to the U.S. Army Corps of Engineers to be used to support a reallocation study for Allatoona Lake to be undertaken in response to a court decision in Georgia v. U.S. Army Corps of Engineers, Civil Action No. 1:14-cv-3593 (N.D. Ga.).

This memorandum proceeds in four parts: (1) it briefly introduces the Metro Water District and the recent update to its water management plan for the Atlanta metropolitan area; (2) it projects future water supply needs for water providers that withdraw water from Allatoona Lake; (3) it describes an expected change in water supply source for one District jurisdiction downstream of Allatoona Lake (Paulding County); and (4) it projects treated wastewater return flows for those water providers that withdraw water from Allatoona Lake.

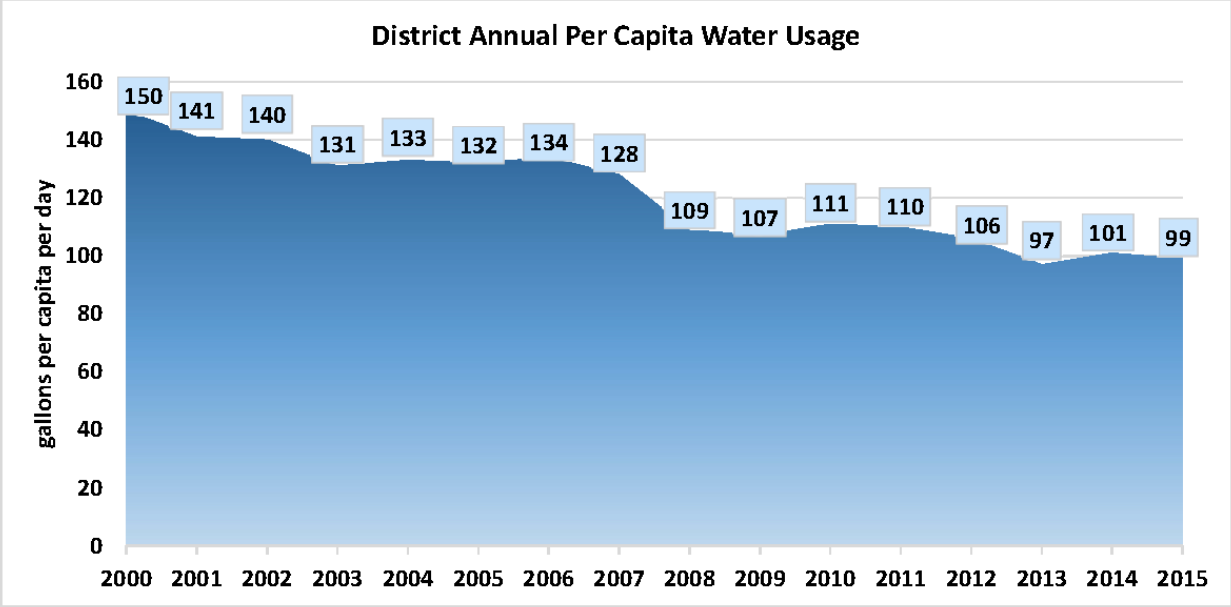
I. Background on the Metro Water District and the 2017 District Plan

The State of Georgia established the Metro Water District in 2001. By statute, the District is charged with developing comprehensive regional and watershed-specific water resource management plans to be implemented by local governments in the 15-county metropolitan Atlanta area.

A. The District's Water Conservation and Efficiency Successes

The District issued its first water resource management plans in 2003. At that time, the District issued three separate plans: Water Supply and Water Conservation, Wastewater Management and Watershed Management. These plans include a range of water conservation and efficiency requirements, which must be implemented by each jurisdiction within the District. The District updated these plans in 2009 to include additional water conservation and efficiency requirements, with additional conservation and efficiency measures added by amendment in 2010.

Collectively, the water conservation and efficiency measures required under the District's plans—combined with investments by District jurisdictions in water conservation and efficiency, leak detection and decreasing water loss, and indirect potable reuse—have dramatically reduced water demands within the District. Per capita water withdrawals in the District declined by more than 30% between 2000 and 2015, falling from 150 gallons per capita day (gpcd) in 2000 to 99 gpcd in 2015. (Figure 1) Total water supply withdrawals have likewise decreased by 10% over the same period, despite the fact that the District's population has grown by more than 1 million people, or 20%. (Figure 2) As a result of these successes, District jurisdictions are now projected to use approximately 25% less water in 2050 than they were when the District's plans were updated in 2009.



Note: The US Census Bureau revised population estimates for 2000 through 2009 after the decennial census was conducted in 2010. Per Capita numbers for 2000 - 2009 have been updated from prior published values to reflect the new population estimates.

Figure 1. Metro Water District per capita water use trend (2000-2015)
Reproduced from District Plan Figure 3-2

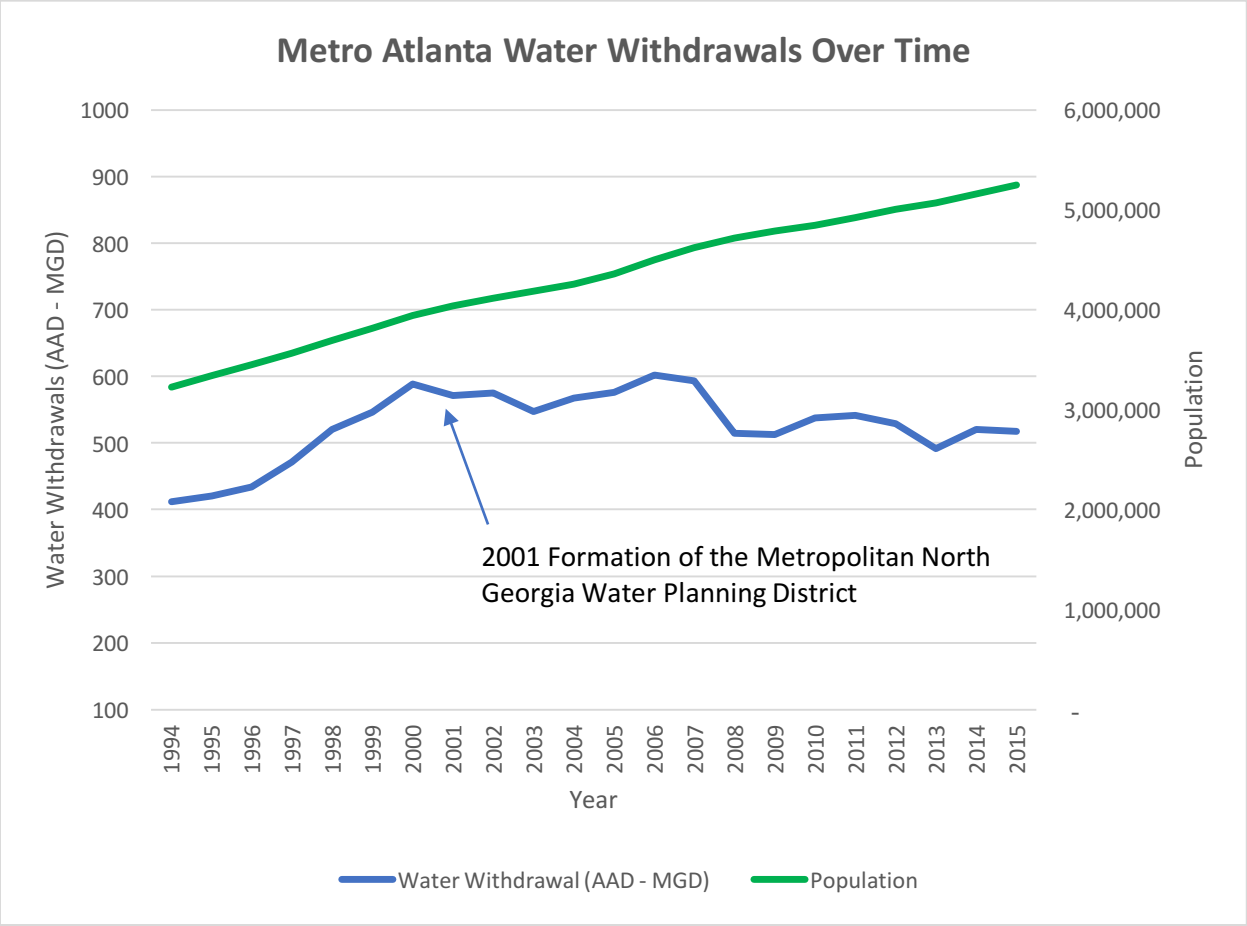


Figure 2. Total Water Withdrawals in the Metro Water District Compared to Population

These successes are a testament to the District's member jurisdictions and reflect their commitment to water conservation and efficiency.

B. The District's 2017 Plan and Its Updated Demand Projections

The District's most recent plan was adopted in 2017 (the "District Plan").[1] The District Plan combines the three separate plan documents into one comprehensive plan to highlight the interrelationships between approaches to water, wastewater and watershed/stormwater management.

In connection with this work, the Metro Water District prepared water demand projections and wastewater return projections for the current planning period extending through the year 2050. These projections address water needs for residential, commercial, industrial and institutional uses supplied by municipal systems across the Metro Water District. The Metro Water District projections do not include thermoelectric uses or industrial uses not supplied by municipal systems. Neither of these exist as withdrawals from Allatoona Lake.

[1] Metropolitan North Georgia Water Planning District, Water Resource Management Plan (June 2017), available at http://northgeorgiawater.org/plans-manuals.

II. Water Supply Demand Projections for Allatoona Lake

As requested, we have isolated and projected year 2050 water demands to be met from Allatoona Lake. These incorporate the water demand projections developed by the District for the 2017 District Plan. As described below, they also reflect new information developed since the projections used in the District Plan were derived. As such, they represent the best and most reliable projection of the range of future water supply demands from Allatoona Lake and wastewater returns for these jurisdictions.

A. County-Level Projections from the District Plan

The 2017 District Plan includes water demand projections out to the year 2050 for each of the 15 counties in the District. The methods used to develop these projections are described in Chapter 4 of the District Plan. In general, base water demands were calculated for each county to create a representative base year, which reflect the effects of the Metro Water District's award-winning conservation programs and existing state codes and standards.

The base water demands for each county were then paired with corresponding county-level population and employment forecasts developed by the Atlanta Regional Commission ("ARC") and the University of Georgia's Vinson Institute for the State of Georgia's Office of Planning and Budget ("OPB"). The ARC and OPB population and employment forecasts for each county used in the District Plan are included as Table 1 and Table 2, respectively.

Because the ARC and OPB projections were derived using different methodologies, the ARC and OPB forecasts are separate and independent projections of future population and employment for each county in the District. These independent projections were used to develop two different projection scenarios for water demand and wastewater flows to improve forecast reliability.

The ARC and OPB population and employment scenarios were then analyzed using the Demand Side Management Least Cost Planning Decision Support System (DSS) Model developed by Maddaus Water Management. The DSS Model thus provided two independent water demand forecasts for each of the 15 District counties from 2015 through 2050.

To address potential uncertainties in the demand forecasts, the District evaluated historic variability in four key water demand drivers: population growth rate; employment/population ratio; per capita residential water use; and per employee commercial water use. Probability distributions based on historical data were created for each demand driver and truncated to remove unrealistic extremes. Then, a Monte Carlo analysis was conducted to determine future water demand probabilities based on the observed historical variability in demand drivers.

Based on industry practice and methods used in planning efforts for other major metropolitan areas, the 65th percentile of the water demand forecast was used to calculate the uncertainty factor applied to each individual county. For each county, this resulted in an increase in water demands of approximately three percent at the start of the projections that grew to approximately 13 percent for the 2050 projections. The final county-level projections for each scenario are included below in Table 3.

Table 1. ARC and OPB Population Projections
Reproduced from District Plan Table 4-1

County	ARC Population Projections (Scenario 1)				OPB Population Projections (Scenario 2)			
	2020	2030	2040	2050	2020	2030	2040	2050
Bartow	130,924	160,133	178,780	189,569	108,763	118,274	125,461	131,085
Cherokee	270,994	336,152	394,907	437,370	265,020	331,015	406,740	494,713
Clayton	283,792	304,371	327,266	350,555	282,488	302,823	315,351	321,509
Cobb	726,369	799,383	893,279	969,932	781,311	863,236	930,414	984,089
Coweta	165,321	204,744	235,587	256,038	152,575	182,430	213,856	247,779
DeKalb	725,746	789,454	870,176	945,468	756,138	800,302	824,638	835,063
Douglas	148,812	175,224	201,144	220,545	155,959	185,446	215,834	247,930
Fayette	109,427	124,558	140,809	148,739	114,379	122,584	127,011	129,033
Forsyth	255,412	356,079	431,478	468,230	245,429	334,694	450,066	597,255
Fulton	1,050,286	1,143,594	1,235,645	1,310,110	1,104,788	1,278,928	1,453,507	1,631,265
Gwinnett	927,056	1,073,102	1,239,115	1,392,162	985,396	1,176,845	1,375,267	1,581,299
Hall	234,487	287,486	330,425	362,697	210,468	244,958	280,791	318,828
Henry	256,188	311,014	353,232	379,989	241,568	289,270	339,799	395,121
Paulding	169,951	213,806	259,524	297,884	170,901	209,745	253,980	304,621
Rockdale	96,909	113,320	129,993	145,344	95,285	106,944	116,872	126,086
Total	**5,551,674**	**6,392,420**	**7,221,360**	**7,874,632**	**5,670,468**	**6,547,495**	**7,429,586**	**8,345,677**

Table 2. ARC and OPB Employment Projections
Reproduced from District Plan, Table 4-2.

County	ARC Employment Projections (Scenario 1)				OPB-based Employment Projections (Scenario 2)			
	2020	2030	2040	2050	2020	2030	2040	2050
Bartow	62,524	69,819	76,352	82,193	56,867	60,238	64,315	67,420
Cherokee	95,421	108,787	123,123	128,021	93,318	107,124	126,812	144,806
Clayton	187,706	201,227	216,228	231,625	186,843	200,204	208,356	212,433
Cobb	526,073	581,725	641,877	699,093	565,865	628,192	668,561	709,297
Coweta	64,037	71,972	79,668	86,453	59,100	64,128	72,319	83,664
DeKalb	524,712	573,647	625,031	679,851	546,685	581,529	592,322	600,463
Douglas	71,786	81,812	91,924	100,510	75,234	86,585	98,637	112,990
Fayette	84,908	93,954	102,838	111,192	88,750	92,465	92,761	96,461
Forsyth	85,801	100,872	115,834	134,805	82,447	94,814	120,824	171,952
Fulton	1,098,358	1,182,107	1,268,878	1,360,794	1,155,354	1,321,998	1,492,600	1,694,373
Gwinnett	488,390	549,702	611,597	671,565	519,125	602,845	678,798	762,803
Hall	118,756	133,564	147,120	160,535	106,591	113,806	125,021	141,118
Henry	96,029	107,685	118,775	127,670	90,549	100,156	114,258	132,754
Paulding	54,898	63,544	72,732	80,089	55,205	62,337	71,178	81,900
Rockdale	54,289	61,027	67,890	74,363	53,379	57,593	61,037	64,510
Total	**3,613,688**	**3,981,444**	**4,359,867**	**4,728,759**	**3,735,312**	**4,174,014**	**4,587,799**	**5,076,944**

Table 3. Projected County-Level Water Demands
Reproduced from District Plan, Table 4-7.

County	Baseline Water Demand (AAD-MGD)	2025 Water Demand (AAD-MGD)		2050 Water Demand (AAD-MGD)	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
Bartow	27.5	36.4	31.4	52.0	40.4
Cherokee	19.9	25.0	24.4	35.2	39.5
Clayton	25.0	28.9	29.1	37.6	33.6
Cobb	71.3	77.1	80.6	98.1	96.0
Coweta	13.7	17.4	16.0	23.7	23.5
DeKalb	73.0	77.5	78.7	95.4	83.2
Douglas	12.8	14.9	15.2	20.0	21.7
Fayette	11.8	12.9	12.8	16.7	14.0
Forsyth	22.7	31.5	29.5	47.9	59.6
Fulton	142.7	155.3	166.4	186.4	227.4
Gwinnett	84.4	96.2	101.2	132.1	145.2
Hall	20.2	25.0	22.7	33.9	31.0
Henry	23.7	29.6	28.1	39.4	41.5
Paulding	12.8	15.6	15.5	23.0	24.0
Rockdale	13.2	15.4	14.8	21.1	18.3
District Total	**574.5**	**658.6**	**666.5**	**862.5**	**899.0**

B. Allatoona Lake Demands

Two entities withdraw water from Allatoona Lake: the Cobb County-Marietta Water Authority ("Cobb-Marietta") and the City of Cartersville, Georgia. As shown below in Table 4, total projected year 2050 water demands for these entities to be met from Allatoona Lake is 94 million gallons per day (mgd). This includes 57 mgd for Cobb-Marietta and 37 mgd for the City of Cartersville, which in turn serves Bartow County and the City of Emerson. Additional information regarding the projected demands for each user is provided below.

Table 4. Total Projected Water Demands to be Supplied from Allatoona Lake

Water Provider	Average Annual Day – Million Gallons per Day (AAD-MGD)
Cobb County-Marietta Water Authority	57
City of Cartersville / Bartow County	37
Total Demand	**94**

1. Cobb-Marietta

Cobb-Marietta is an authority created by the State of Georgia in 1951. It currently provides finished water to 11 wholesale customers in the metropolitan Atlanta area, including the Cobb County Water

System, Cherokee County Water and Sewage Authority, Douglasville/Douglas County Water and Sewer Authority, City of Marietta, City of Austell, City of Powder Springs, City of Smyrna, Paulding County, City of Mountain Park, City of Woodstock, and Lockheed Martin Corporation.

Cobb-Marietta withdraws water from two sources, both of which involve the U.S. Army Corps of Engineers. First, it withdraws water from Allatoona Lake under a Water Supply Act storage contract executed in 1963. This contract grants Cobb-Marietta the right to use 13,140 acre-feet of storage in the reservoir to store and withdraw water allocated to it by the State of Georgia. Second, Cobb-Marietta operates a water supply intake on the Chattahoochee River below Buford Dam and Lake Lanier, which the Corps operates to ensure that sufficient water is available in the Chattahoochee River for Cobb-Marietta and other metro Atlanta utilities to withdraw.

In the State of Georgia's water supply request for Lake Lanier and the Chattahoochee River System, the District projected year 2050 water demands from the Chattahoochee River for Cobb-Marietta ranging from 37 mgd to 61 mgd.[2] This was based on a total projected demand 103 mgd, with varying assumptions regarding the amount of water that would be withdrawn from Allatoona Lake (42 mgd to 66 mgd). This was intended to reflect ongoing uncertainty and litigation regarding the supply available to Cobb-Marietta from its existing storage space in Allatoona Lake.

In March 2017, the Corps' adopted a new Master Water Control Manual for the Apalachicola-Chattahoochee-Flint ("ACF") reservoir system. The ACF Manual states that the Corps will operate Lake Lanier to provide up to 379 mgd for Cobb-Marietta and other users withdrawing water from the Chattahoochee River below the reservoir. This includes the higher projected demand of 61 mgd for Cobb-Marietta, corresponding to approximately 42 mgd for supplies from Allatoona Lake.[3]

Based on current information and recent experience in the drought of 2016, the District projects that Cobb-Marietta needs 57 mgd AAD from Allatoona Lake in the year 2050 (Table 4), reflecting Cobb-Marietta's existing treatment plant capacity in the ACT basin. Supplying up to 57 mgd AAD of Cobb-Marietta's demand from Allatoona Lake will allow Cobb-Marietta to utilize existing constructed water treatment plant capacity in the ACT (57 mgd (AAD) and 72 mgd (peak day)). It will also provide Cobb-Marietta with needed operational flexibility. Among other things, this would allow Cobb-Marietta to respond to operational needs and system maintenance requirements and to manage overall demands between sources. This would enhance Cobb-Marietta's and the Corps' ability to adjust system operations to account for differing hydrologic conditions and differences in available supply in the ACF and ACT basins.

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[2] Memorandum from Katherine Zitsch, Director, Metropolitan North Georgia Water Planning District, to Jud Turner, Director, Georgia Environmental Protection Division, Projected Future Water Supply Demands for the Chattahoochee River and Lake Lanier System (Dec. 2, 2015).

[3] The ACF Manual is the subject of ongoing litigation, where the State of Alabama and others have challenged the Corps' ability to accommodate water supply withdrawals downstream of Lake Lanier at the level described above. The supply available to Cobb-Marietta from the Chattahoochee River thus remains uncertain.

The needed amount of 57 mgd is predicated on levels of supply provided in the ACF Manual. Additional supply from Allatoona Lake would be required if the supply available to Cobb-Marietta from the Chattahoochee River were constrained as a result of ongoing legal or other challenges.

2. Cartersville

The City of Cartersville withdraws water from Allatoona Lake pursuant to Water Supply Act storage contracts, which give Cartersville the right to use 6,371 acre-feet of storage in the reservoir to store and withdraw water allocated to it by the State of Georgia. Major finished water customers for the City of Cartersville include Bartow County (and its customers) and Anheuser Busch. Allatoona Lake is currently the sole source of supply for the City of Cartersville and, through Cartersville, it is the primary source of supply for Bartow County.[4]

The 2017 District Plan projects year 2050 water demands for Bartow County, including the City of Cartersville, ranging from 40.4 mgd to 52.0 mgd from all water supply sources. Based on discussions with these jurisdictions, the requested water supply for the year 2050 from Allatoona Lake is 37 mgd.

C. Change in Water Source for Paulding County

Paulding County is currently supplied by Cobb-Marietta. In the baseline year of 2006, Cobb-Marietta supplied 10.57 mgd of water to Paulding County. Paulding County is in the process of constructing its own water supply reservoir, Richland Creek Reservoir, a pump-storage reservoir located on a tributary of the Etowah River. Paulding County is also currently constructing the reservoir's associated pump station on the Etowah River downstream of Allatoona Lake. Once completed, the Richland Creek Reservoir is expected to replace Cobb-Marietta as the County's primary water supply source.

III. Projected Returns of Treated Wastewater

A. Cobb-Marietta

Cobb-Marietta's largest wholesale customer, the Cobb County Water System, returns highly treated wastewater to Allatoona Lake from two water reclamation facilities: the Noonday Creek Water Reclamation Facility ("WRF") and Northwest Cobb WRF (the "Allatoona Lake WRFs"). These return flows have been allocated to Cobb-Marietta by the State of Georgia, which has granted Cobb-Marietta the exclusive right to impound and withdraw these return flows to Allatoona Lake.[5]

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[4] The City of Cartersville currently has two intakes – one for withdrawal directly from Allatoona Lake and one for withdrawal from the Etowah River immediately downstream of the reservoir. The City is not currently operating their river withdrawal intake, but instead is withdrawing all water from Allatoona Lake. For the purposes of the water supply request, it is assumed that the City will continue to withdraw only from Allatoona Lake throughout the 2050 planning horizon.

[5] Georgia Environmental Protection Division, Permit to Withdraw, Divert or Impound Surface Water issued to Cobb-Marietta by Georgia EPD, Permit No. 008-1491-05 (Nov. 7, 2014).

Existing permitted capacities for the Noonday Creek WRF and Northwest WRF are 16 mgd (AAD) and 9.6 mgd (AAD), respectively. As in the memorandum accompanying the ACF water supply request, the District projects that these facilities will be operated at their capacities and that year 2050 returns from the Allatoona Lake WRFs will be 25.6 mgd.[6] (Table 5)

Table 5. Projected Return Flows to Allatoona Lake
Reproduced from Zitsch ACF Memorandum Table A-9

	AAD-MGD
Projected Sewered Flow	92.4
Allatoona Lake discharges	
Noonday WRF	16
Northwest Cobb WRF	9.6
Total Allatoona Lake discharges	**25.6**
Total Chattahoochee River discharges downstream of Peachtree Creek	**66.8**

Note: Allatoona Lake discharges assumed at currently permitted discharge amounts (25.6 AADF = 32 max month / 1.25)

Operation of the Allatoona Lake WRFs to maximize return flows to Allatoona Lake, as described above, would likely impose additional treatment and operational costs, owing to the need to redistribute sewered flows across treatment plants and sub-basin divides. Willingness to operate in this manner thus may depend on the adoption of appropriate policies that credit returns from the Allatoona Lake WRFs in accordance with the State of Georgia's permit issued to Cobb-Marietta.

B. Bartow County / City of Cartersville

No jurisdiction in Bartow County presently returns reclaimed water to Allatoona Lake. Instead, these return flows to the ACT Basin enter the system below Allatoona Lake, either to the Etowah River (Cartersville WPCP and Bartow Southeast WPCP) or to tributaries of the Etowah River (Emerson Henry Jordan WWTP, Bartow Two Run WPCP, Adairsville South WPCP, and Adairsville North WPCP). The District projects that total return flows from these facilities in the year 2050 will be 23.7 mgd. Of these returns, approximately 20.3 mgd originate from water to be withdrawn from Allatoona Lake for the City of Cartersville. These returns may be created by the City of Cartersville or by an entity purchasing water from the City of Cartersville. In either case, they are projected to occur into the Kingston reach.[7]

[6] Memorandum from Katherine Zitsch, Director, Metropolitan North Georgia Water Planning District, to Jud Turner, Director, Georgia Environmental Protection Division, dated Jan. 25, 2016, Table A-9.

[7] The District understands that some or all of the water returned by the City of Cartersville to the Etowah River may instead be returned to Allatoona Lake if the Corps makes appropriate policy changes and the State of Georgia allocates those flows to the City. If that were to occur, the City would be returning the flows in order to enhance the yield of the City's water supply storage in the reservoir.

Memorandum

To: Richard Dunn, Director, Georgia EPD

From: Wei Zeng, Hydrology Unit, Georgia EPD

Date: March 30, 2018

Subject: Technical Analysis of Georgia's updated Water Supply Request in Allatoona Lake in the Coosa River Basin

Introduction

In January 2013, the State of Georgia submitted to the Army Corps of Engineers (Corps) a Water Supply Request asking the Corps to allocate storage, for water supply purpose, from Allatoona Lake in the Alabama-Coosa-Tallapoosa (ACT) River Basin. The 2013 Request included a technical memorandum analyzing the effects of the Request.

As a result of a court order issued by the U.S. District Court of the Northern District of Georgia, the Corps is now taking action to respond to the 2013 Request and requests made by the Cobb County-Marietta Water Authority (CCMWA) as updated pursuant to the court's order (Updated Request). In a memorandum to EPD dated March 30, 2018, the Metropolitan North Georgia Water Planning District (Metro Water District) provided updated information on projected future water supply demands and returns for the Allatoona Lake system. This updated information predicts that less water will be needed to meet 2050 water supply needs than anticipated in the 2013 Request. It is therefore necessary for the technical analysis to be updated to reflect these changes. The purpose of this memorandum is to summarize this updated analysis.

ACT Water Control Manual

In October 2014, the Corps released its ACT Basin Water Control Manual Final Environmental Impact Statement (FEIS) detailing its intended operations of the ACT Basin and the impacts of such operations. On May 4, 2015, the Corps issued a Record of Decision adopting the ACT Water Control Manual.

The new ACT Basin Water Control Manual contains a Master Manual governing the overall water control operations in the ACT Basin, and individual project manuals for each Corps water control facility in the ACT Basin, including the two federal reservoirs in the Georgia portion of the Basin. These two reservoirs are Allatoona and Carters.

The new Allatoona Manual contains a revised rule curve (or top of conservation pool) with a phased drawdown in the fall, a set of new action zones, a revised peaking power generation guidance, a minimum release reflecting the service unit's release and leakage, and a description of Allatoona's role in the newly developed basin-wide drought contingency operation plan.

This analysis incorporates the Corps' operations as described in the 2015 ACT Water Control Manual.

ACT HEC-ResSim Model

ResSim stands for Reservoir System Simulation software developed by the Corps' Institute of Water Resources, Hydrologic Engineering Center (HEC). ResSim is used to model reservoir operations at one or multiple reservoirs with multiple operational goals and constraints. The model is the Corps' state-of-the-art tool for analyzing complicated reservoir or reservoir system operations. As HEC states, "HEC-ResSim is a decision support tool that meets the needs of modelers performing reservoir project studies as well as meeting the needs of reservoir regulators during real-time events." HEC also states, "HEC-ResSim is now the standard for USACE reservoir operation modeling."

The ACT ResSim model was initially developed by the Corps' Mobile District and HEC and applies the ResSim model to the specifics of the ACT Basin. This model contains physical characteristics of federal and private (Alabama Power) reservoirs in the ACT Basin, including Allatoona and Carters. The model also contains operations and constraints as described in the 2015 ACT Water Control Manual.

The model makes use of 73 years (1939-2011) of hydrology, in the form of daily unimpaired incremental inflows to the model's numerous nodes representing the ACT Basin's various reaches. The model simulates the Corps' operations as described by the 2015 ACT Water Control Manual. Water demands, in the form of water withdrawals from the reaches and discharges of treated wastewater to the reaches, whether recorded or projected, can be incorporated in the model to assess their impacts.

We used the ACT HEC-ResSim model to assess the impact of Georgia's Updated Request to the Corps. We analyzed four water demand scenarios, as described below, and analyzed the impact of Georgia's Updated Request on the Corps' authorized purposes at the federal reservoirs inside Georgia, as well as resulting flows at the Georgia/Alabama state line.

Water Demand Scenarios

As described in more detail below, to analyze the impact of water demands as specified in the Updated Request, we considered two baseline scenarios reflecting recorded water use data in

2006 and 2011 and two impact scenarios reflecting changes in water demand under the Updated Request. The impact scenarios are designated as Scenario E-2006 and Scenario E-2011. Scenarios A-D were presented in my technical memorandum supporting the 2013 Request.

Georgia EPD, through its permitting process, regulates all municipal and industrial water withdrawal activities from surface water sources with a flow rate greater than 0.1 million gallons per day (mgd). This regulation applies across the state, including the Georgia portion of the ACT Basin. EPD also regulates, through delegated authority under the Clean Water Act, discharges of treated wastewater, including flow rates at which such treated wastewater is returned to receiving water bodies. Such delegated regulation is administered through National Pollutant Discharge Elimination System (NPDES) permitting. Finally, under the Georgia Water Quality Control Act and its implementing regulations, EPD regulates and authorizes the impoundment and withdrawal of certain "made inflows" in the State of Georgia. All withdrawing and discharging facilities permitted by EPD, and any entity to which EPD has allocated made inflows, have the responsibility of reporting their water use activities to the State on a regular basis. Such reporting is usually done on a monthly basis.

EPD's Hydrology Unit, through coordination with other programs and district offices, maintains a consumptive water use database (CUD) that captures monthly water use activity across the State, including the Georgia portion of the ACT Basin. This database contains monthly withdrawal and discharge rates of municipal and industrial facilities going back approximately twenty years. The CUD also contains consumptive water use by thermoelectric power generating facilities with cooling tower operations. This portion of the data dates back to the early 2000s.

EPD estimates agricultural water use by applying irrigated acreage and estimated application rates. State-wide irrigated acreage has been mapped by EPD and its contractors by analyzing satellite imagery. Irrigation application rates have been estimated by prior studies by the "National Environmentally Sound Production Agriculture Laboratory" (NESPAL) authored by Dr. James Hook and others. The volume of water applied for agricultural irrigation is estimated by multiplying irrigated acreage with monthly application rates.

It is worth noting that among all of the following water use scenarios, operation of the entire ACT Basin remains identical and consistent with the 2015 ACT Water Control Manual.

1. Baseline-2006

We chose 2006 as one of the two Baseline scenarios because the Corps used 2006 as its baseline year in the FEIS and because 2006 is a recent drought year in Georgia. The Corps stated in its FEIS that it chose 2006 because this was a year with the highest consumptive water

use from the ACT Basin and the year with "the greatest stress on the system from water withdrawals." In this water use scenario, recorded 2006 surface water withdrawals by all permitted municipal and industrial facilities have been compiled at monthly time steps. These withdrawals have been grouped into different river reaches, representing different portions of the river basin, and aggregated to represent reach totals. Consumptive water uses by thermoelectric facilities have been incorporated into such reach-aggregated withdrawals. For planning purposes, agricultural water use is considered to be 100% consumptive, with no return flows. Therefore, estimated agricultural withdrawals have been incorporated into the reach withdrawal aggregation.

Similarly, recorded 2006 discharges of treated wastewater by permitted municipal and industrial facilities have been compiled at monthly time steps. These include all of the facilities whose discharge data are reported and compiled into a federal database, or its mirror image database maintained by Georgia EPD – GAPDES. These data are also grouped by their locations into river reaches and aggregated to represent total reach return flows.

In general, these reach aggregated withdrawals and returns result in reach-wise consumptive water use rates, i.e. their differences. The consumptive water use rates are inputs to the ACT HEC-ResSim model. In two reaches (Allatoona and Kingston), the Corps singled out certain individual facilities' withdrawals or returns in the model. For example, CCMWA and the City of Cartersville's withdrawals in the Allatoona Reach, Cobb County's Noonday Creek and Northwest Cobb discharging facilities in the Allatoona Reach, and the City of Cartersville's discharging facility in the Kingston Reach have been separated from reach consumptive use aggregations. For consistency, we followed the Corps' approach and included these facilities' individual withdrawals or discharges.

2. Baseline-2011

We chose 2011 as the second Baseline scenario because it represents a recent drought year in Georgia and was used in our original technical analysis of the 2013 Water Supply Request. The Baseline-2011 scenario is very similar to Baseline-2006 scenario, with recorded withdrawals and discharges in 2011 forming the basis of reach-wise consumptive water use calculations. For consistency with the Baseline-2006 scenario and the Corps' modeling approach, we maintained the same reach configuration in Allatoona and Kingston reaches as in Baseline-2006, i.e. separation of individual facilities (or groups of facilities) from reach aggregations.

3. Scenario E-2006

Scenario E-2006 isolates the impact of just the requested changes sought by this Updated Request while holding all other water use activities in the Basin unchanged from Baseline-2006 conditions.

This scenario is based on Baseline-2006, with changes to certain withdrawals and discharges directly associated with this Updated Request. CCMWA's recorded 2006 water withdrawal (47.2 mgd) has been replaced with its projected 2050 withdrawal (57 mgd). The City of Cartersville's recorded 2006 water withdrawal (13.9 mgd) has been replaced with its projected 2050 withdrawal (37 mgd).

Cobb County's recorded 2006 discharge (17.2 mgd – with discharges from Noonday Creek WRF and Northwest Cobb WRF combined) has been replaced with its projected 2050 discharge (25.6 mgd). The City of Cartersville's recorded 2006 discharge (8.9 mgd) has been replaced with its projected 2050 discharge (20.3 mgd).

There is one additional change made to Scenario E-2006. Under Baseline-2006, approximately 10.6 mgd was supplied to Paulding County by CCMWA. As the memo from the Metro Water District explains, Paulding County is currently constructing the Richland Creek Reservoir (a pump-storage project with an intake on the Etowah River below Allatoona Lake). This reservoir is projected to replace CCMWA as Paulding County's water supply source. As a result, the projected 2050 CCMWA withdrawal from Allatoona Lake does not contain any amount for Paulding County and the Paulding County's existing need (10.6 mgd) is placed in the Kingston Reach, which is immediately downstream of Allatoona Lake. This approach is consistent with the stated objective of keeping all other water use conditions the same as in Baseline-2006.

4. Scenario E-2011

Scenario E-2011 also isolates the impact of the requested changes contained in the Updated Request, except that this scenario reflects conditions from Baseline-2011 instead of Baseline-2006.

In this scenario, CCMWA's recorded 2011 water withdrawal (38.2 mgd) has been replaced with its projected 2050 withdrawal (57 mgd). The City of Cartersville's recorded 2011 water withdrawal (11.3 mgd) has been replaced with its projected 2050 withdrawal (37 mgd).

Cobb County's recorded 2011 discharge (14.5 mgd – with discharges from Noonday Creek WRF and Northwest Cobb WRF combined) has been replaced with its projected 2050 discharge (25.6 mgd). The City of Cartersville's recorded 2011 discharge (6.8 mgd) has been replaced with its projected 2050 discharge (20.3 mgd).

Just like in Scenario E-2006, for Scenario E-2011, the existing 10.6 mgd of Paulding County's water supply is placed in the Kingston Reach.

Results and Analysis

The modeling results are presented as follows: Scenario E-2006 is compared to Baseline-2006 in the first set of comparisons; Scenario E-2011 is compared to Baseline-2011 in the second set of comparisons. The potential impact of the Updated Request is described with regard to:

(1) Reservoir Elevations
    a. Average elevations in Allatoona Lake;
    b. Ninety percent exceedance elevations in Allatoona Lake;
    c. Minimum elevations in Allatoona Lake;
    d. Elevation duration curves in Allatoona Lake;
(2) Daily average power generation in the federal reservoirs of Allatoona and Carters;
(3) Percentage of time when there is some level of recreational impact; and
(4) State line flow duration curve.

Appendix A is a set of slides summarizing model results and comparisons among the various scenarios. The discussion below references those specific slides.

Reservoir Elevations

Modeling results on Allatoona elevation are evaluated and presented in four ways. The first is a look at simulated daily average elevation from January 1 to December 31. The period of simulation has 73 years of daily elevation output. The 73 January 1 values are averaged to represent the first day of the year. The same averaging process is repeated for the other three hundred and sixty-four days.

Simulation results show very little difference among the scenarios. When looking at the average daily elevation at Allatoona of Baseline-2006 and Scenario E-2006 (Slide 8), very little difference can be detected in the months of January through July and December. For example, when comparing to the 2006 baseline, on May 1, average Allatoona elevation under Scenario E-2006 would be 0.07 feet lower than under Baseline-2006. Modeling results for the Baseline-2011 and Scenario E-2011 comparisons are similar (Slide 17). For example, when compared to the 2011 baseline, on May 1, average Allatoona elevation would be 0.10 feet lower in Scenario E-2011 than under Baseline-2011. All scenarios point to effective refill of Allatoona.

Some small differences can be seen among the scenarios in the months August through November. For example, on October 1, average Allatoona elevation under Scenario E-2006 would be 0.30 feet lower than under Baseline-2006. In the second set of comparisons, Allatoona elevation on October 1 under Scenario E-2011 would be 0.41 feet lower than under Baseline-2011.

Second, Slides 9 and 18 show the daily elevations for Allatoona Lake for each scenario that would be exceeded 90 percent of the time over the modeled period of record, which is representative of extremely low basin inflow (or drought) conditions in the basin. As can be seen, projected elevations mostly differ only by inches between the Baseline scenarios and their corresponding isolated impact scenarios. For example, the average difference between Baseline 2006 and Scenario E-2006 is 0.32 feet. While the differences between the two scenarios in October and November are somewhat more pronounced than the rest of the year, the average difference between the two scenarios in these two months is only 0.86 feet. Similarly, the average difference between Baseline 2011 and Scenario E-2011 is 0.42 feet, with an average difference for October and November of 1.10 feet. Overall, the lowest projected 90-percent exceedance elevation for either impact scenario is 822.4, while the minimum simulated elevation under any scenario is 818.5. This approximates the lowest actual elevation recorded by the Corps, which was 818.9 feet in December 2007.

The third way of evaluating and presenting simulated elevations compares the minimum daily values. Similar to the process used in obtaining the daily average, the minimum values of each of the three hundred and sixty-five days in a year from the 73-syear record have been obtained and plotted in Slide 10 (Baseline-2006 and Scenario E-2006) and Slide 19 (Baseline-2011 and Scenario E-2011).

The largest difference between a Baseline and its corresponding Water Supply scenarios takes place in the month of December. For example, the minimum Allatoona elevation on December 15 under Scenario E-2006 is 1.64 feet lower than under Baseline-2006 (Slide 10). The differences in the second set of comparisons are slightly larger, mostly because water demand conditions in 2011 were less than in 2006. For example, Allatoona elevation on December 15 under Scenario E-2011 would be 3.02 feet lower than under Baseline-2011 (Slide 19). Note again that the lowest actual elevation recorded by the Corps was 818.9 feet in December 2007.

The fourth way of evaluating simulated elevations is to look at the elevation exceedance curves. An exceedance curve (also referred to as a duration curve) represents a statistical summary of a time-varying quantity (e.g. daily reservoir elevation or daily stream flow over a long period of time). A point on an exceedance curve indicates the percentage of time (x-coordinate) when a quantity (y-coordinate) has been exceeded over the entire period of record. For example, in Slide 11, we can roughly see (from any one of the scenarios) that simulated Allatoona elevation would be higher than 834 feet for about 50 percent of the time. We can also see that an elevation of 830 feet is exceeded more than 70 percent of the time. The exceedance curves in this analysis are in one percentage point increments.

Slide 11 presents a comparison of exceedance curves for Baseline-2006 and Scenario E-2006. For the most part, both scenarios are very similar, with the exception of the lowest point (or

100 percent exceeded) where there is a 1.71 feet difference between Baseline-2006 and Scenario E-2006. For all of the other percentage points, the differences between the Scenario E-2006 and Baseline-2006 are only inches. For example, the largest difference (aside from the lowest point) between Baseline-2006 and Scenario E-2006 is 0.27 feet (or 3.2 inches) around 59 and 60 percent exceedance level.

Slide 20 compares exceedance curves for Baseline-2011 and Scenario E-2011. For the most part, both scenarios are again very similar, with the exception of the lowest point (or 100 percent exceeded) where there is a 2.90 feet difference between Baseline-2011 and Scenario E-2011. For all of the other percentage points, the differences between Scenario E-2011 and Baseline-2011 are only inches. For example, the largest difference (aside from the lowest point) between Baseline-2011 and Scenario E-2011 is 0.39 feet (or 4.7 inches) at 64 percent exceedance level.

Hydropower Generation

Results of power generation are summarized in Slide 12 (for Baseline-2006 and Scenario E-2006) and Slide 21 (for Baseline-2011 and Scenario E-2011). The amount of power generation can be expressed as daily average or annual average values.

In comparison to Baseline-2006, where a daily average amount of power generation at Allatoona Lake is 312 MWH, average daily simulated hydropower generation under Scenario E-2006 is projected to decrease by less than 9 MWH, or less than 2.8%, to approximately 303 MWH. System generation at both federal reservoirs in Georgia is projected to decrease by only 0.4% from Baseline-2006. (See Slide 12 for comparisons.)

In comparison to Baseline-2011, where a daily average amount of power generation at Allatoona Lake is 315 MWH, average daily simulated hydropower generation under Scenario E-2011 is projected to decrease by 11.8 MWH, or 3.7%, to approximately 304 MWH. System generation at both federal reservoirs in Georgia is projected to decrease by less than 0.6% from Baseline-2011. (See Slide 21 for comparisons.)

Recreational Impact

The 2015 Water Control Manual defines the primary recreational season as May through September and Allatoona's peak recreational season as Memorial Day to Labor Day. For purposes of this analysis, we used the period between May 20 and September 10 as the window for recreational impact assessment.

The Corps has defined three levels of recreational impact. They are Initial Impact Level (837 feet), Recreation Impact Level (835 feet), and Water Access Impact Level (828 feet), as discussed in the FEIS.

Our analysis tallies the average number of days when simulated Allatoona elevation falls below any one of the three recreation impact levels and presents a comparison of the percentage of time when the level is breached. Slide 13 shows a comparison between Baseline-2006 and Scenario E-2006. Under Baseline-2006, the Lake elevation would be below the Initial Impact Level 33.0% of the time, below the Recreation Impact Level, 17.1% of the time, and below the Water Access Impact Level 0.6% of the time. In comparison, Scenario E-2006 would increase Initial Impact Level by 2.3%, Recreation Impact Level by 2.0%, and Water Access Impact Level by 0.3%.

Slide 22 shows a comparison between Baseline-2011 and Scenario E-2011. Under Baseline-2011, the Lake elevation would be below the Initial Impact Level 31.8% of the time, below the Recreation Impact Level 16.0% of the time, and below the Water Access Impact Level 0.3%. In comparison, Scenario E-2011 would increase Initial impact Level by 3.2%, Recreation Impact Level by 2.9%, and Water Access Impact Level by 0.5%.

State Line Flow

The effect of the Updated Request on stream flow, isolated for water supply differences in Allatoona, can be assessed at the Coosa River near the Georgia/Alabama state line. Similar to how exceedance curves have been used to portray lake elevations, exceedance curves (duration curves) are also used to show statistical features of stream flow.

Slide 14 contains state line flow duration curves for Baseline-2006 (blue) and Scenario E-2006 (green). The two curves are very hard to distinguish simply because they are nearly identical. Slide 15 is a zoomed-in view of Slide 14, where only the lowest 50% of the entire flow spectrum is shown. Between Scenario E-2006 and Baseline-2006, where the only difference is the Updated Request, there is mostly a difference of approximately 20 to 40 cfs.

Slide 23 contains state line flow duration curves for Baseline-2011 (blue) and Scenario E-2011 (green). The two curves are very hard to distinguish simply because they are nearly identical. Slide 24 is a zoomed-in view of Slide 23, where only the lowest 50% of the entire flow spectrum is shown. Between Scenario E-2011 and Baseline-2011, where the only difference is the Updated Request, there is mostly a difference of approximately 30 to 50 cfs.

For a perspective of the magnitude of such changes, the long-term average flow at the state line as observed by USGS is 6,441 cfs.

Appendix A
Evaluations of Updated ACT Water Supply Requests

Georgia EPD

Hydrology Unit

March 30, 2018

Updated ACT Water Supply Request Model Scenarios

- Baseline-2006: Existing Conditions
  - 2006 recorded M&I water use through out the Georgia portion of the basin, including on Allatoona
  - Total withdrawal on Allatoona 61.1 mgd
  - Cobb County return to Allatoona 17.2 mgd
  - Estimated 2006 agricultural water use through the Georgia portion of the basin
  - Otherwise HEC-ResSim model representing May 2015 ACT Water Control Manual

Updated ACT Water Supply Request Model Scenarios

- Baseline-2011: Existing Conditions
  - 2011 recorded M&I water use through out the Georgia portion of the basin, including on Allatoona
  - Total withdrawal on Allatoona 49.6 mgd
  - Cobb County return to Allatoona 14.5 mgd
  - Estimated 2011 agricultural water use through the Georgia portion of the basin
  - Otherwise HEC-ResSim model representing May 2015 ACT Water Control Manual

Updated ACT Water Supply Request Model Scenarios

- Scenario E-2006: Isolating Water Supply Impacts
  - Total withdrawal on Allatoona 94 mgd (57 mgd from CCMWA and 37 mgd from City of Cartersville)
  - Total Cobb County return 25.6 mgd
  - City of Cartersville return 20.3 mgd downstream of Allatoona Dam
  - Paulding County existing 10.6 mgd demand placed downstream of Allatoona Dam
  - Model otherwise same as Baseline-2006 with May 2015 Water Control Manual operation

Updated ACT Water Supply Request Model Scenarios

- Scenario E-2011: Isolating Water Supply Impacts
  - Total withdrawal on Allatoona 94 mgd (57 mgd from CCMWA and 37 mgd from City of Cartersville)
  - Total Cobb County return 25.6 mgd
  - City of Cartersville return 20.3 mgd downstream of Allatoona Dam
  - Paulding County existing 10.6 mgd demand placed downstream of Allatoona Dam
  - Model otherwise same as Baseline-2011 with May 2015 Water Control Manual operation

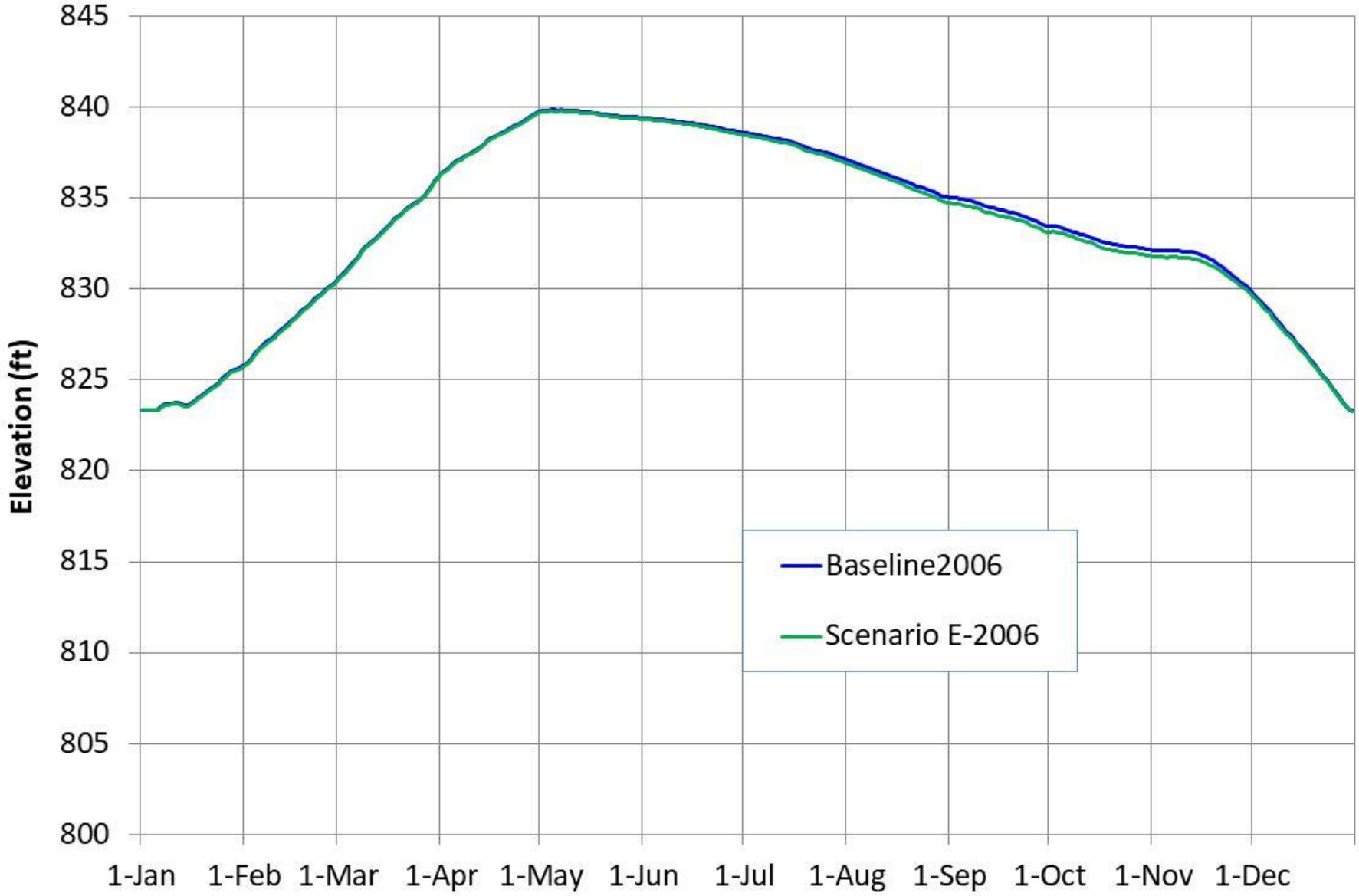
Evaluating Modeling Results

- Allatoona average daily elevation
- Allatoona minimum daily elevation
- Allatoona elevation exceedance curve
- Power generation in Corps projects in GA
- Recreational impacts
- State line flow exceedance curve

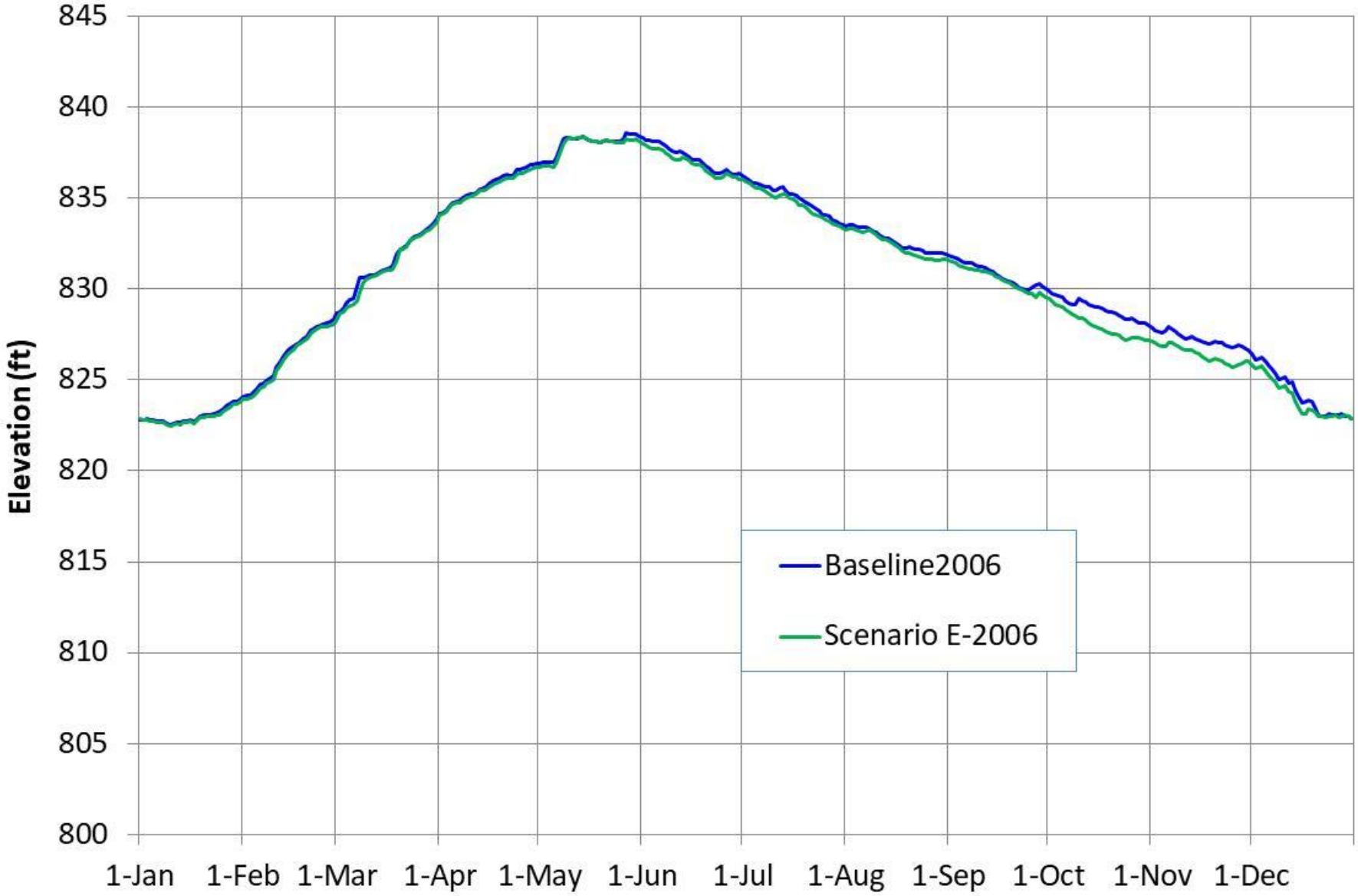
Modeling Results

- Baseline-2006 vs. Scenario E-2006

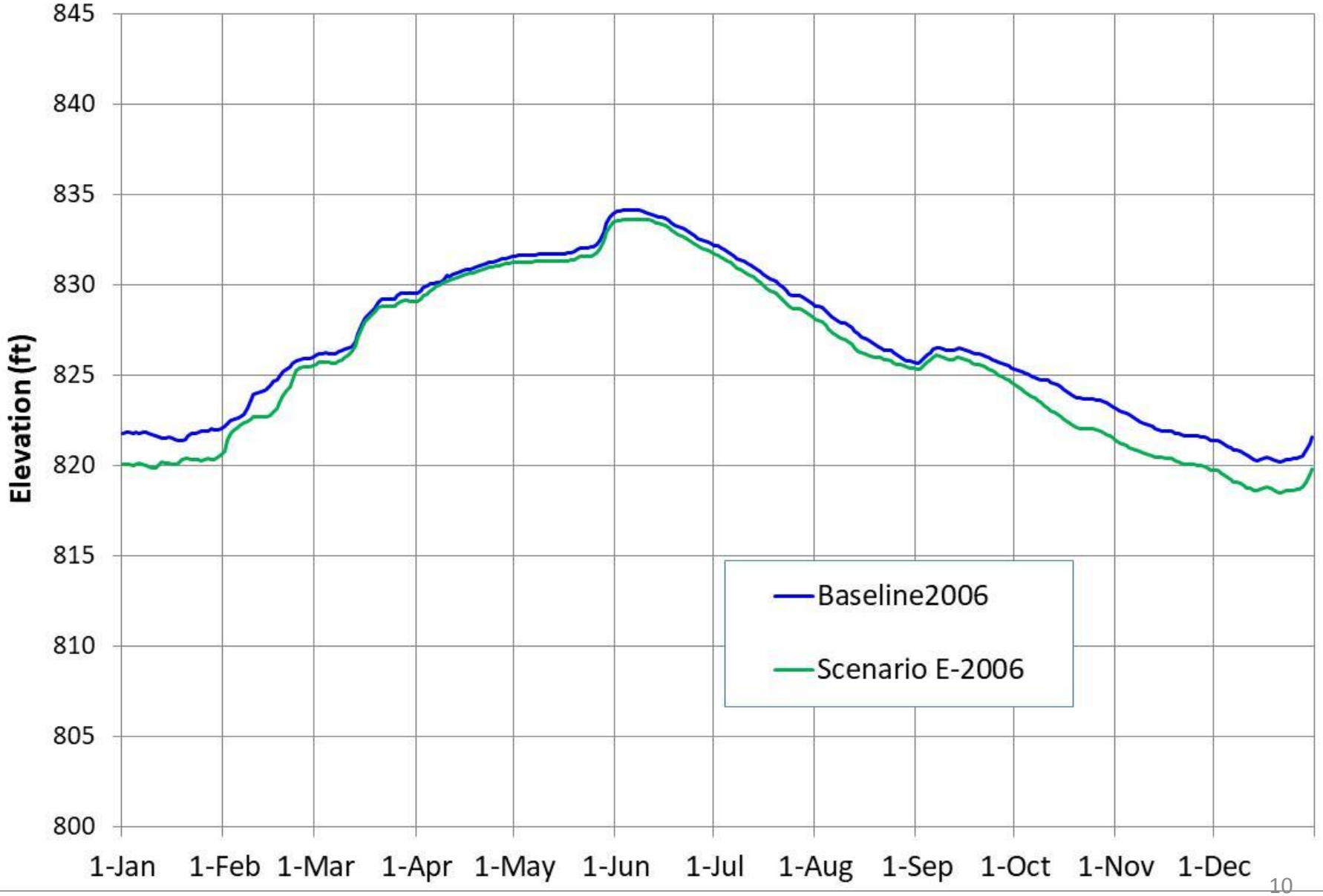
Simulated Average Daily Elevation at Allatoona



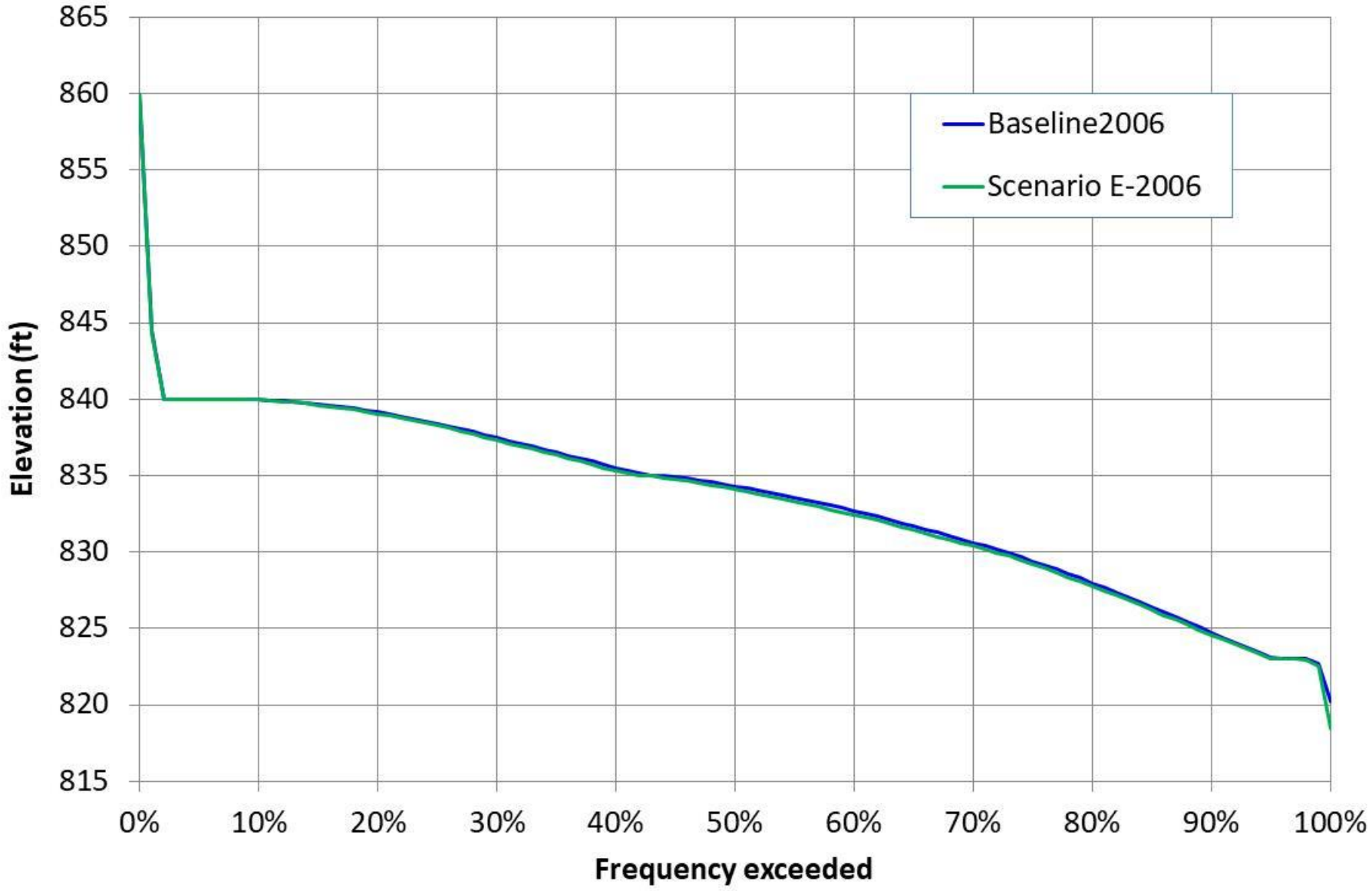
Simulated 90% Exceedance of Daily Elevation at Allatoona



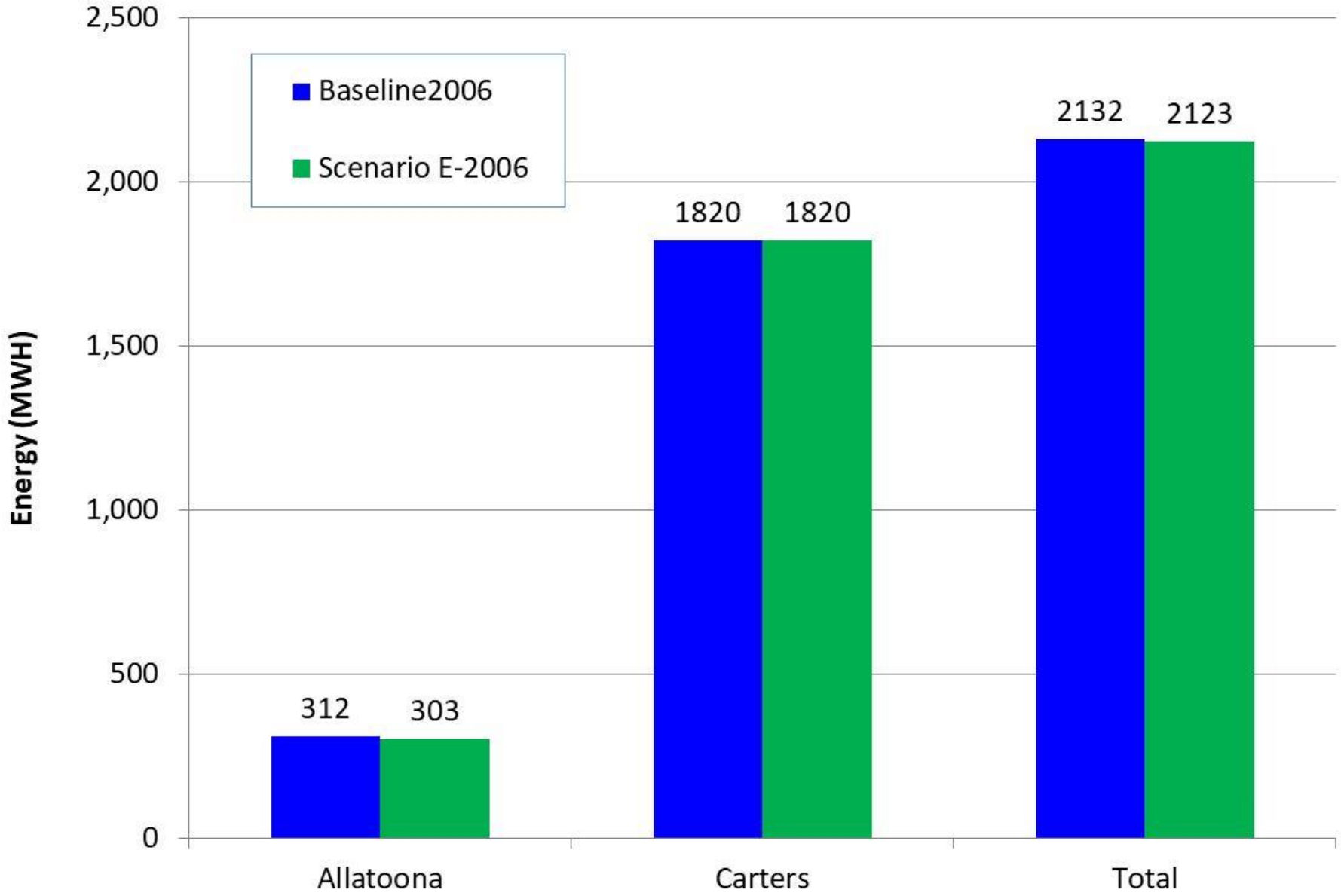
Simulated Minimum Daily Elevation at Allatoona

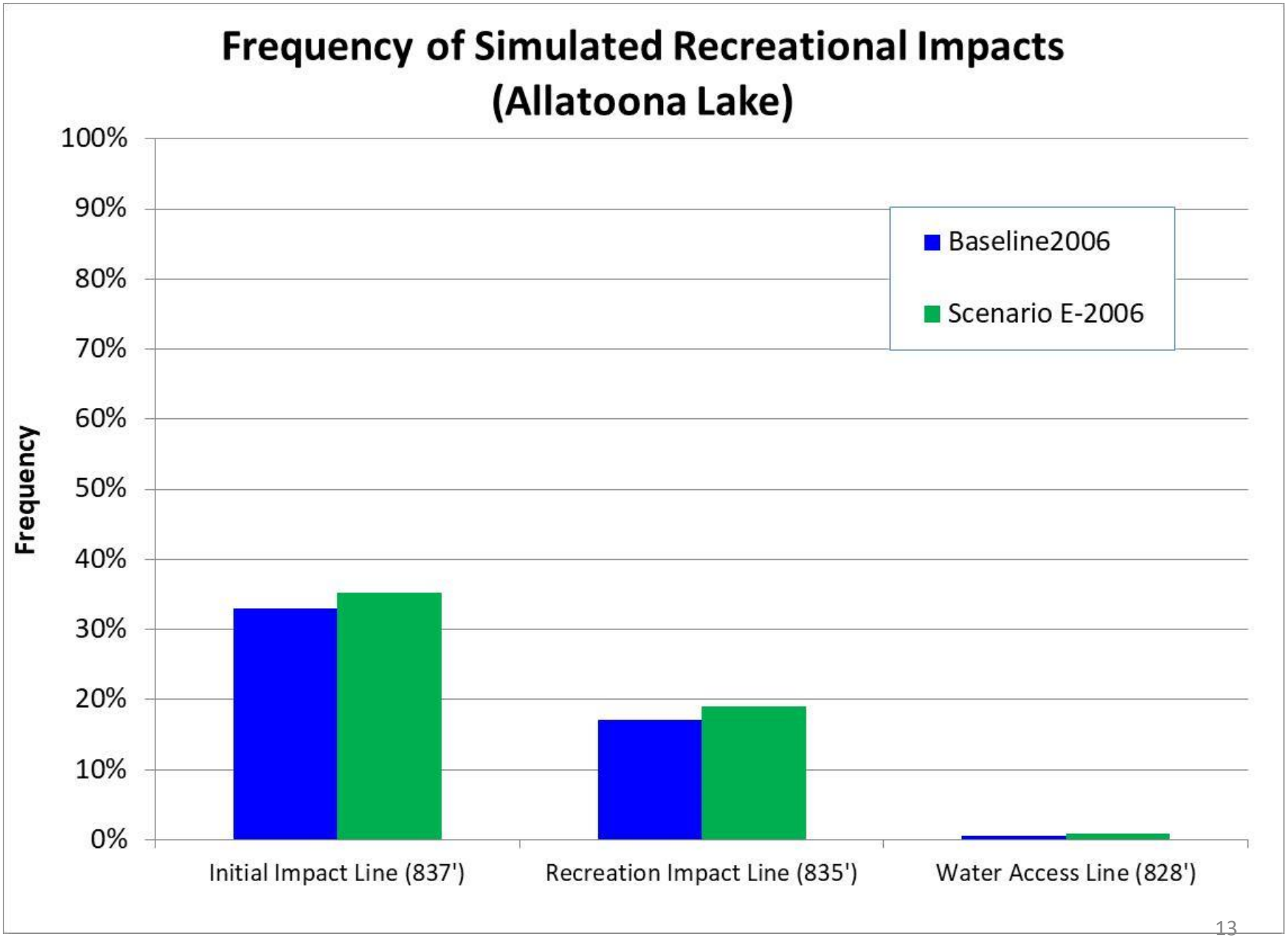


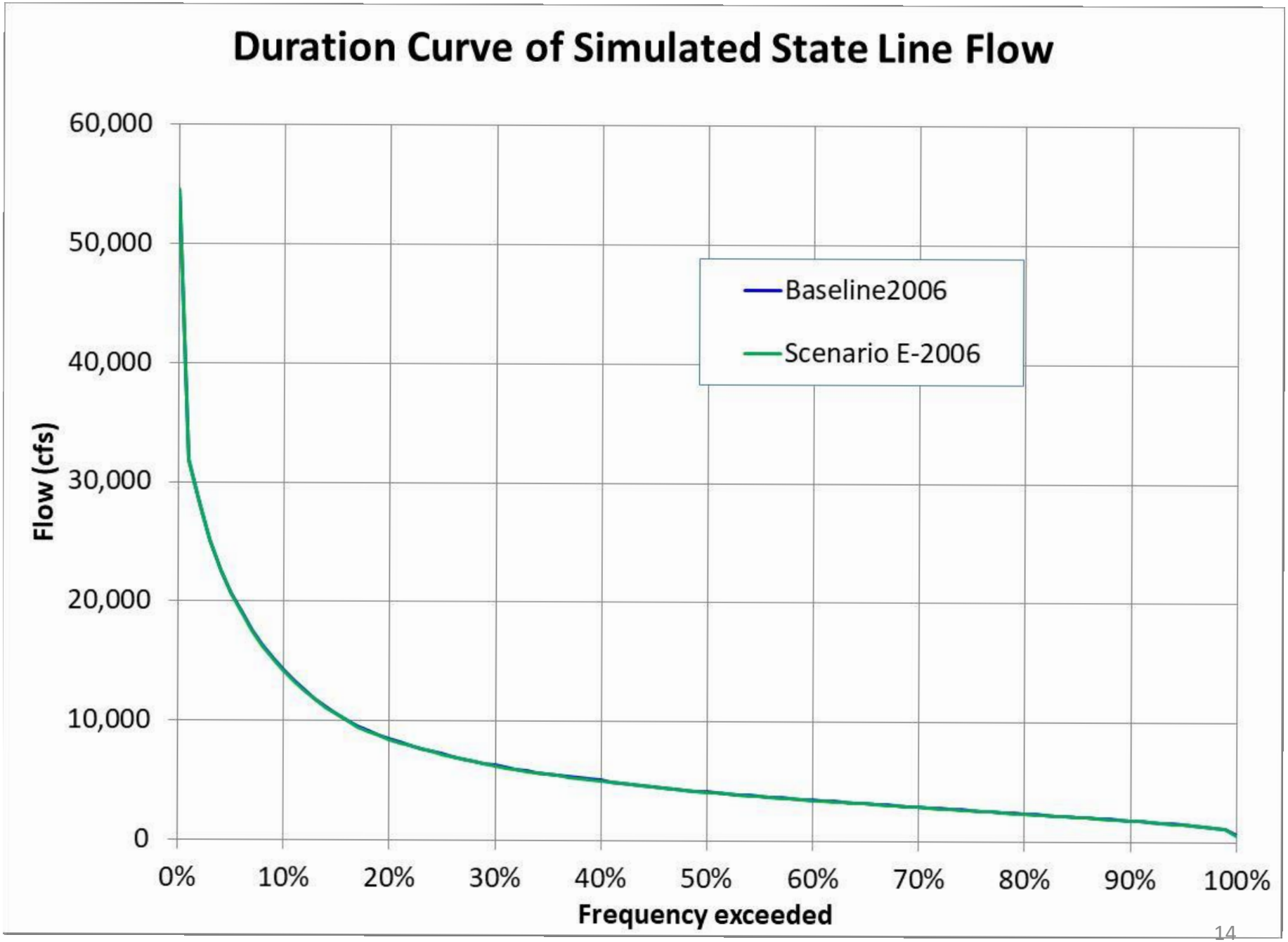
Duration Curve of Allatoona Elevation (1939-2011)



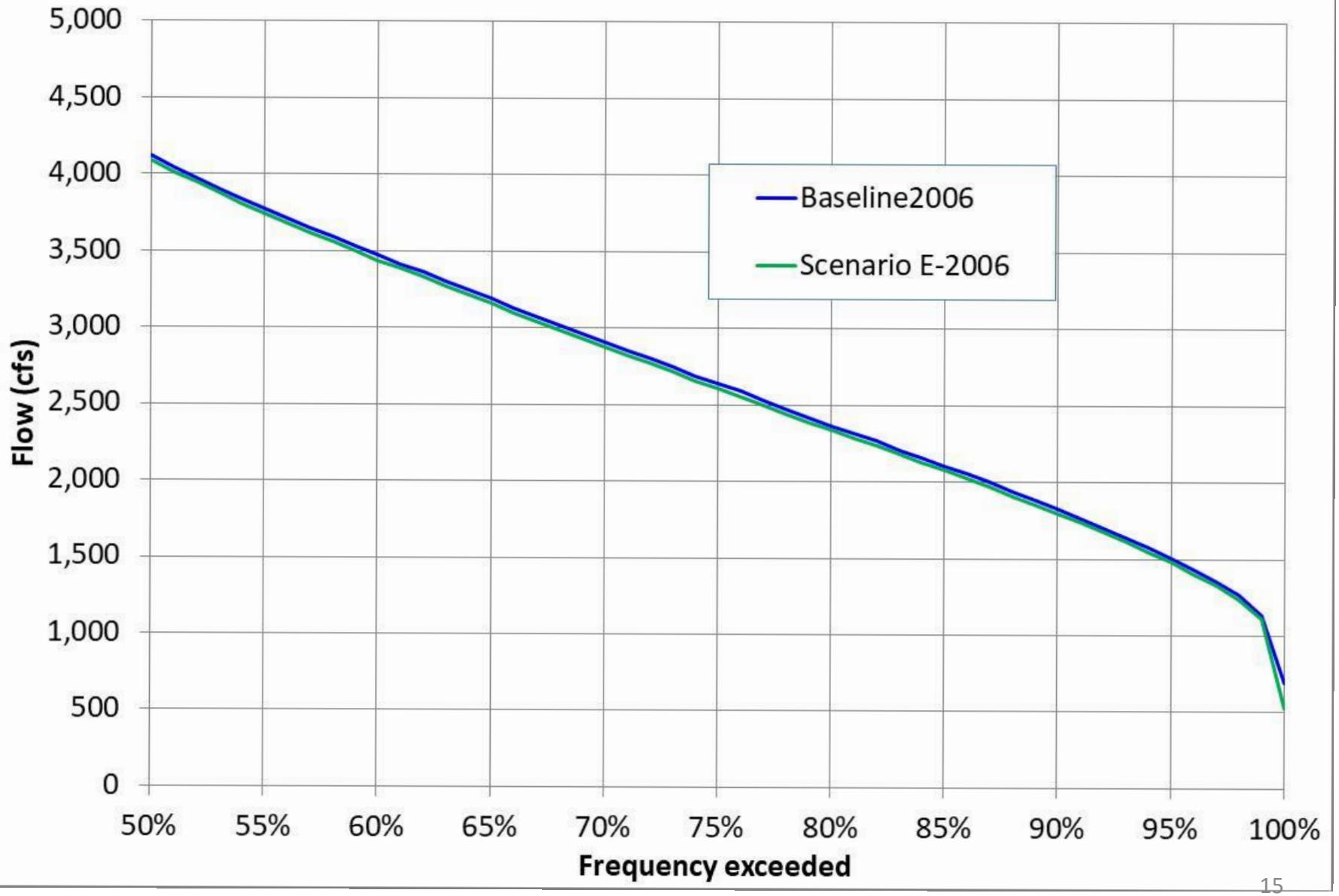
Simulated Power Generation at Federal Reservoirs in GA




Frequency of Simulated Recreational Impacts (Allatoona Lake)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Frequency
Baseline2006
Scenario E-2006
Initial Impact Line (837')
Recreation Impact Line (835')
Water Access Line (828')

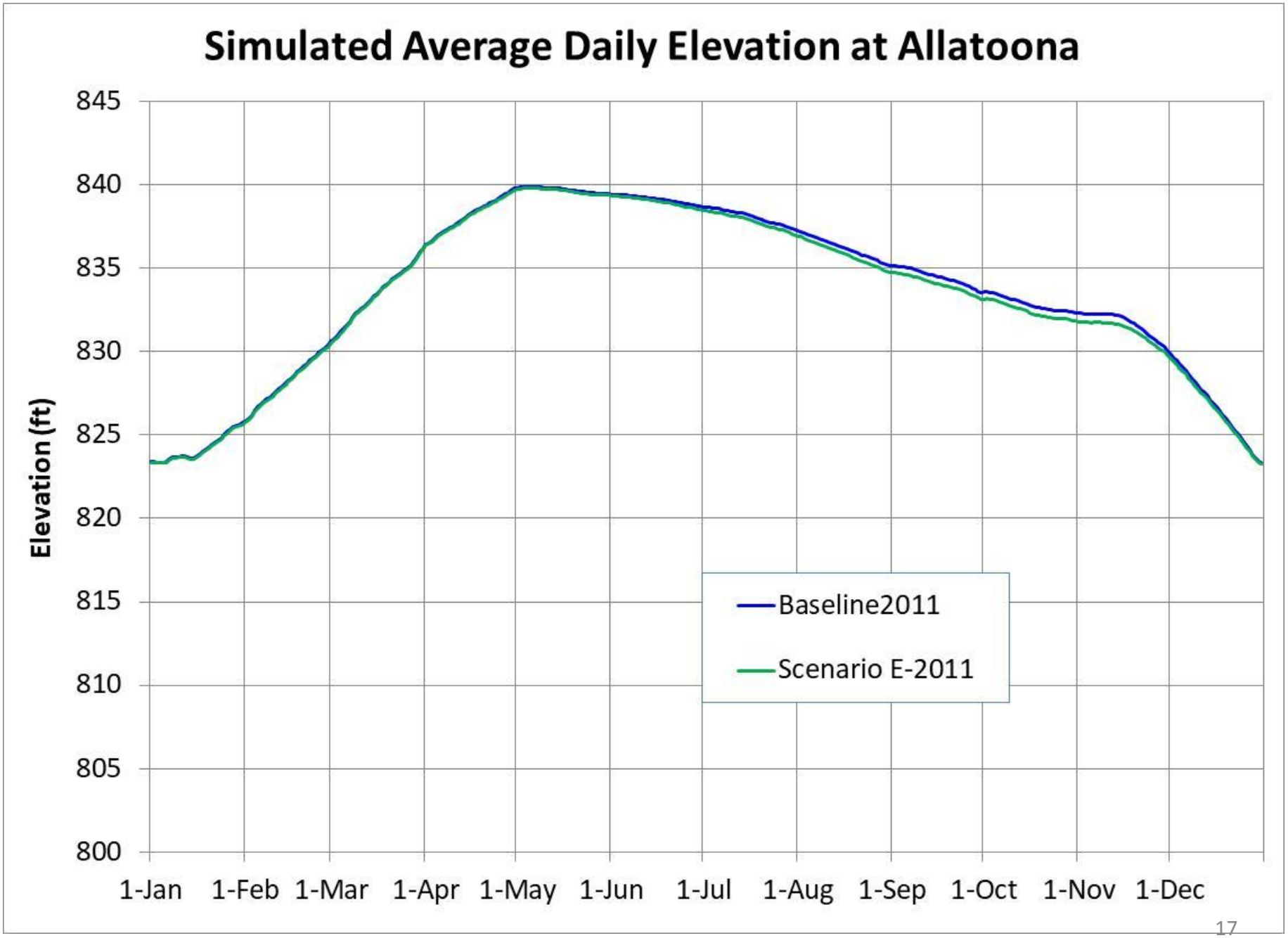

Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline2006
Scenario E-2006
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded

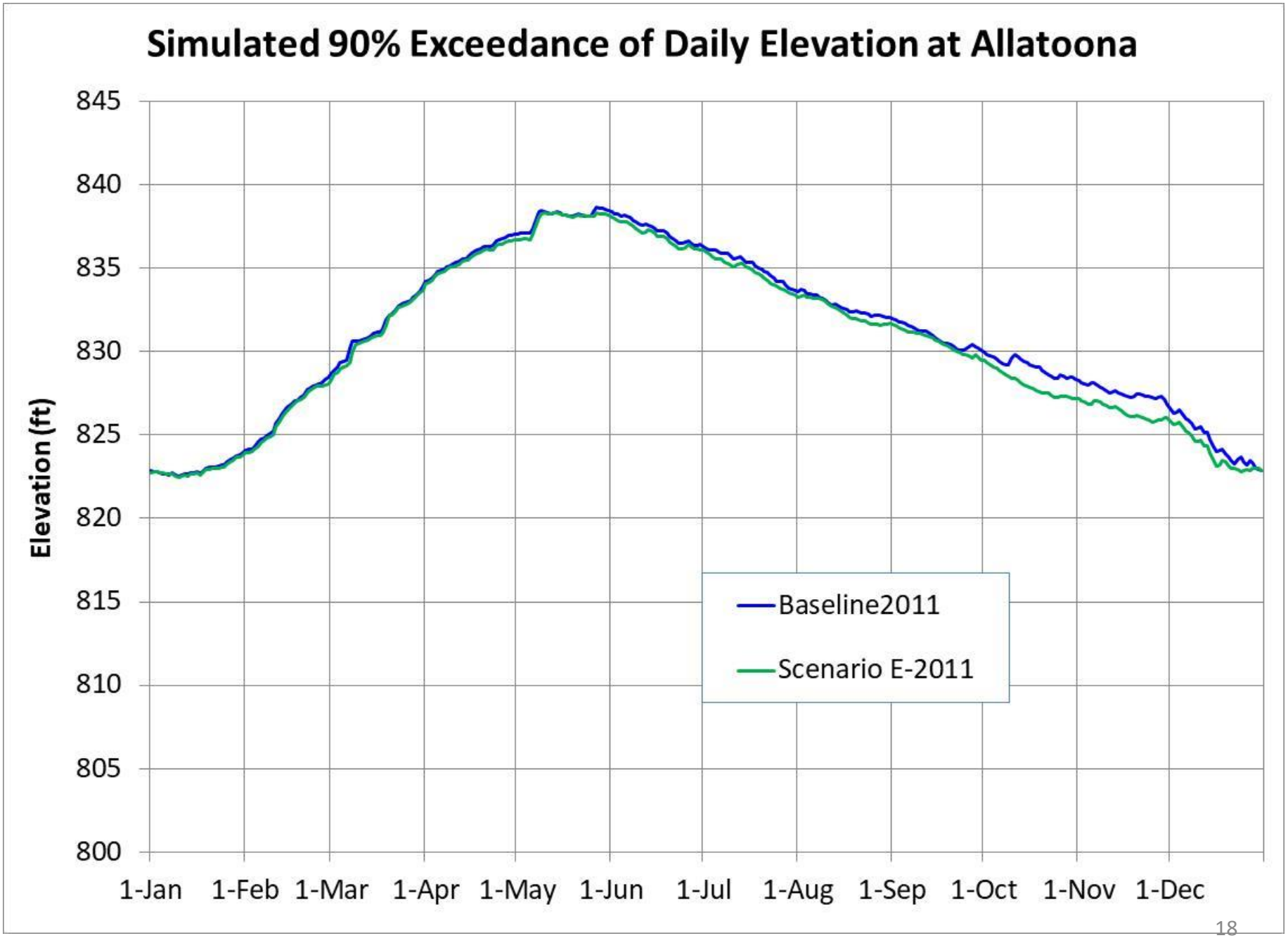
Duration Curve of Simulated State Line Flow

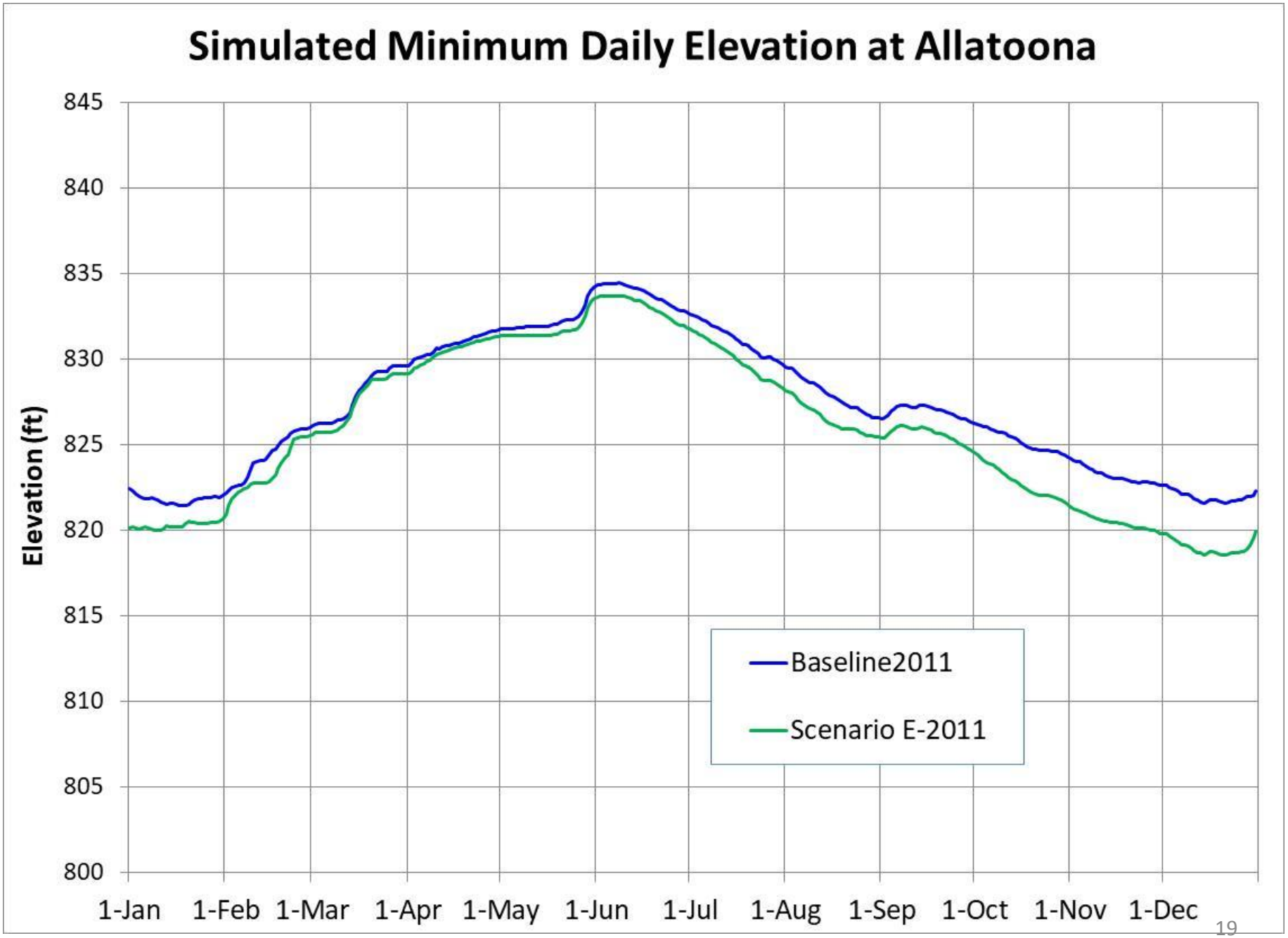


Modeling Results

- Baseline-2011 vs. Scenario E-2011


Simulated Average Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline2011
Scenario E-2011


Simulated 90% Exceedance of Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline2011
Scenario E-2011


Simulated Minimum Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
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805
800
1-Jan
1-Feb
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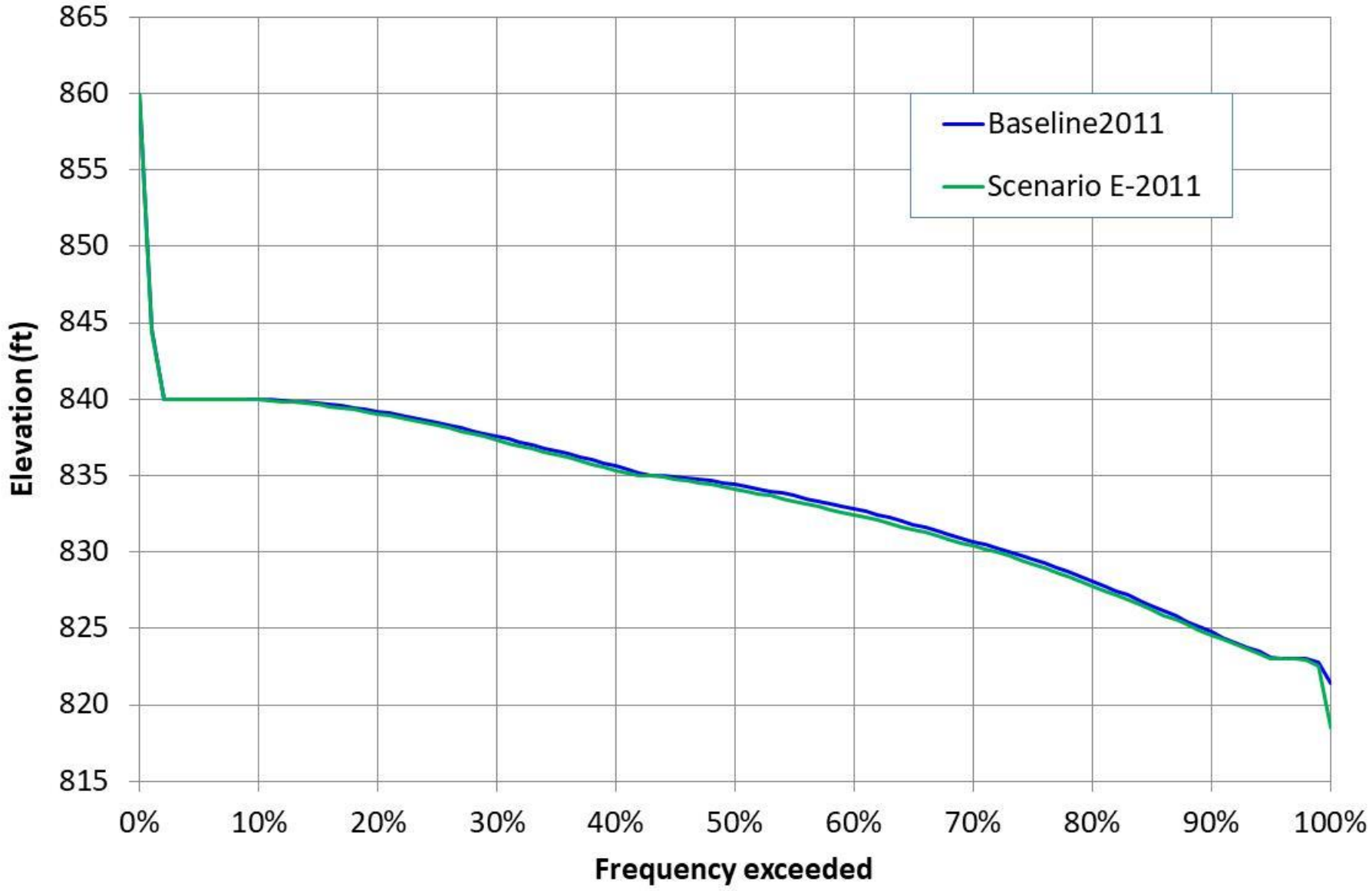
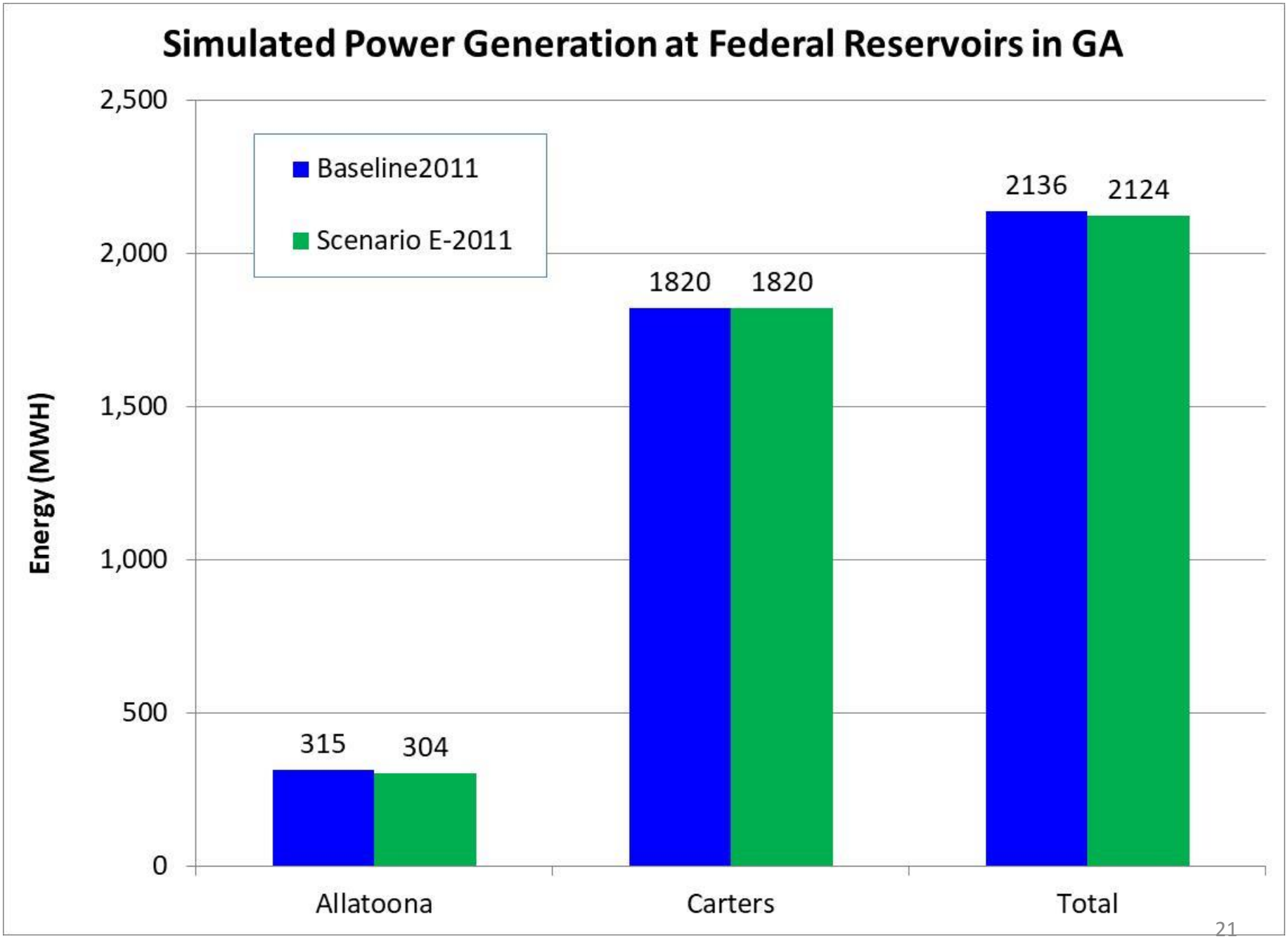
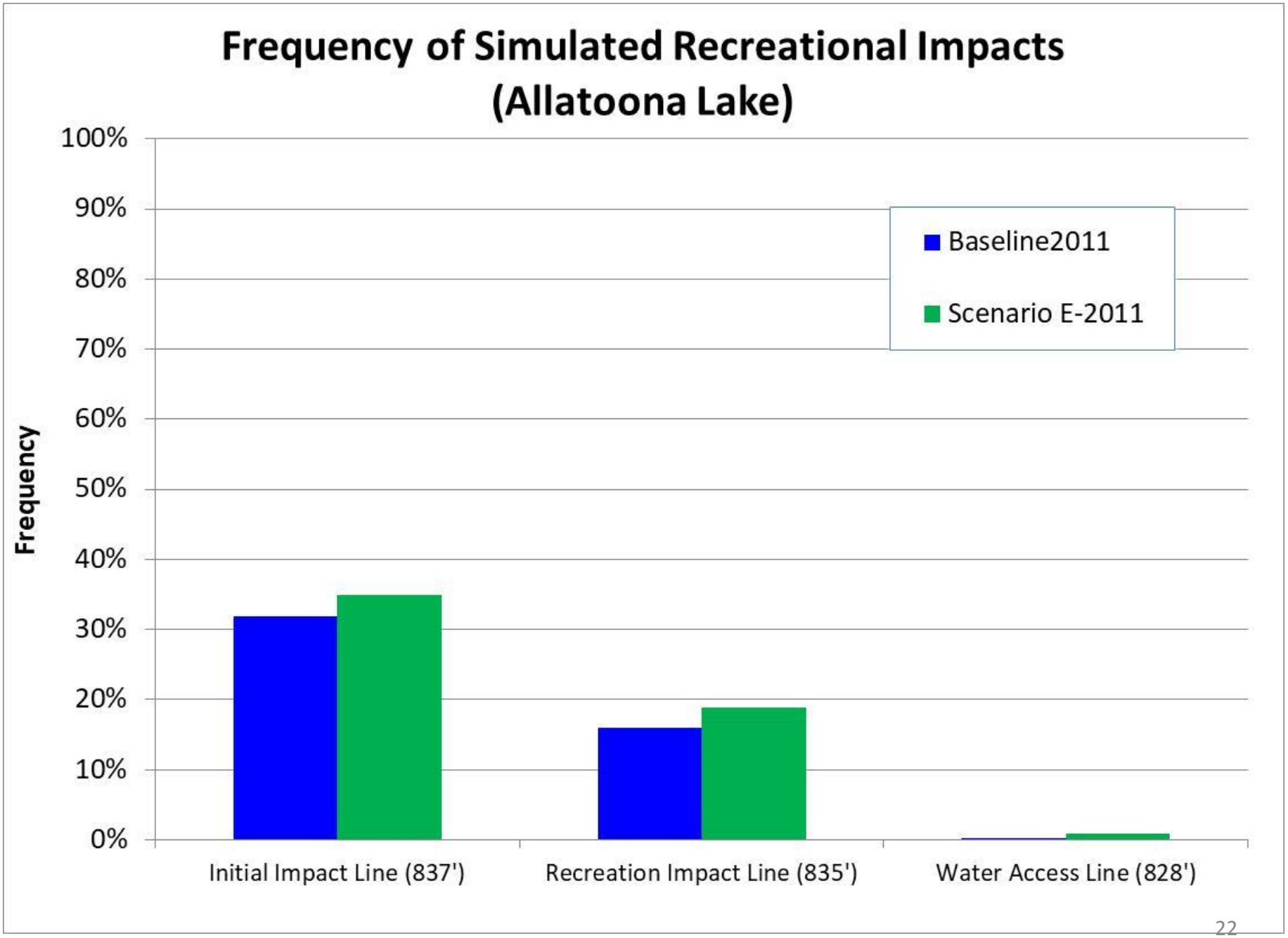
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline2011
Scenario E-2011

Duration Curve of Allatoona Elevation (1939-2011)




Simulated Power Generation at Federal Reservoirs in GA
Energy (MWH)
2,500
2,000
1,500
1,000
500
0
Baseline2011
Scenario E-2011
315
304
1820
1820
2136
2124
Allatoona
Carters
Total


Frequency of Simulated Recreational Impacts (Allatoona Lake)
100%
90%
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20%
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Frequency
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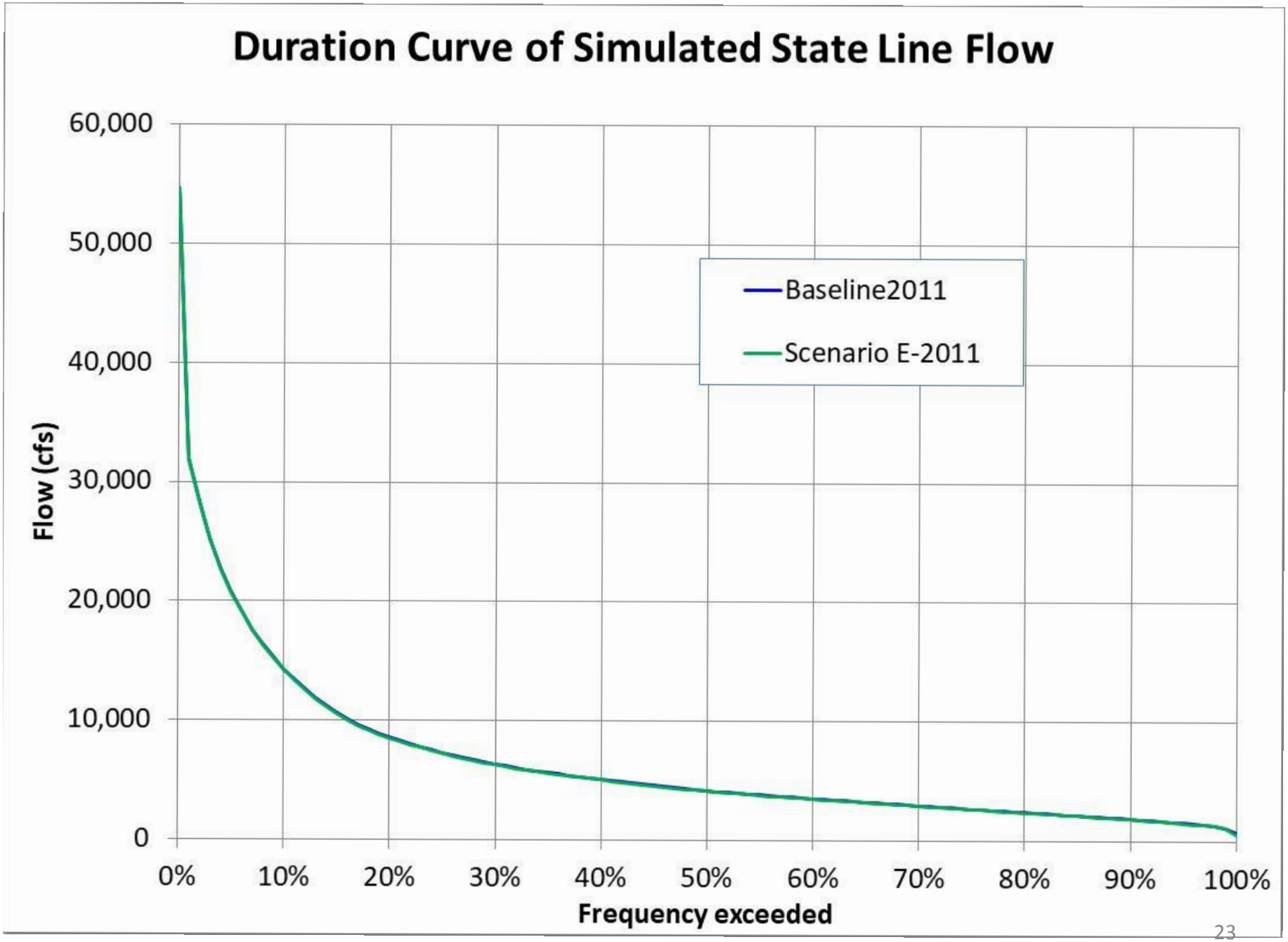
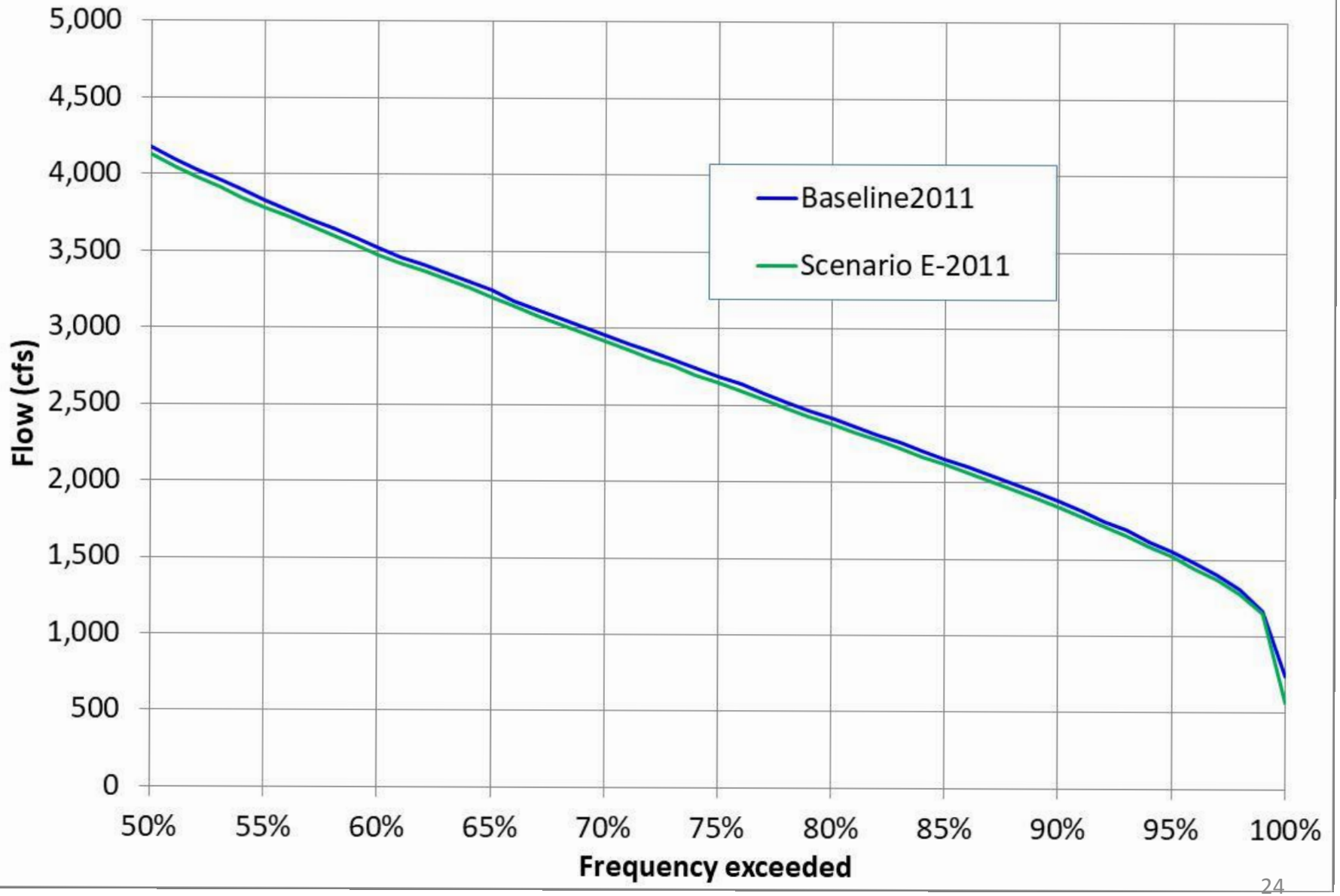

Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline2011
Scenario E-2011
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded

Duration Curve of Simulated State Line Flow



Attachment 2. Allatoona Lake Reallocation - Evaluation of Potential Alternatives (Hazen Report)

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September 1, 2018

VIA ELECTRONIC AND U.S. MAIL

Ms. Kristina Mullins
Chief of Staff
U.S. Army Corps of Engineers
Mobile District
Mobile, AL 36628–0001

Dear Ms. Mullins:

On behalf of the Georgia Parties, attached please find an Alternatives Analysis, which provides additional information relevant to the U.S. Army Corps of Engineers' evaluation of the water supply requests at Allatoona Lake. This Alternatives Analysis is submitted in accordance with the Court's Order entered in *Georgia v. U.S. Army Corps of Engineers*, No. 1:14-cv-3593 (N.D. Ga.). A hard copy, along with a drive containing cited reference materials, will follow by U.S. Mail.

The attached analysis considers a wide range of potential alternatives to meet the water supply needs for Cobb County-Marietta Water Authority and the City of Cartersville (which serves Bartow County) included in the State of Georgia's updated water supply request. Based on an analysis of the feasibility, economic costs, and environmental impacts of each, it concludes that correcting the Corps' storage accounting rules at Allatoona Lake, in combination with a reallocation of storage to meet the water supply needs of the City of Cartersville, is the most reasonable and cost-effective alternative with the least environmental impacts.

Please do not hesitate to contact me if you have any questions or need additional information.

Sincerely yours,

s/ John L. Fortuna

cc: Michael Creswell, Esq.
Lewis Jones, Esq.
John Allen, Esq.
Shelly Ellerhorst, Esq.
Glenn Page, PE
Katherine Zitsch, PE

Hazen

Allatoona Lake Reallocation - Evaluation of Potential Alternatives

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Table of Contents

Hazen

1. Project Overview

This Technical Memorandum summarizes potential alternatives to the request that the U.S. Army Corps of Engineers (USACE) enter into a storage contract providing storage capacity in Allatoona Lake sufficient to sustain annual average withdrawals by Georgia water providers in the amount of 94 million gallons per day ("MGD"). The request for this water supply storage and associated background information are covered in detail in the March 30, 2018 letter from Richard E. Dunn of the Georgia Environmental Protection Division (EPD) to Colonel James DeLapp of the USACE (updated water supply request). This memorandum identifies and evaluates potential alternatives to the updated water supply request, provides pertinent background information and documentation for alternatives, and summarizes the costs and potential impacts associated with the alternatives. The evaluations will focus on water availability, engineering feasibility, economic cost, and environmental impacts.

The summary of alternatives and the high-level evaluation of potential engineering, cost and environment issues is based on existing information provided in other reports and documents. A more thorough assessment of costs would require more detailed engineering study for each alternative to define pipeline diameters and lengths, pumping requirements, and project footprints to assess the areas of impact that would require mitigation. The same level of engineering detail was not available for each alternative to provide the same level of certainty in the cost estimates. In the analysis below, the best available data were used. The available cost information was escalated to 2018 dollars. In each case the source of data and the elements included in the cost estimate have been identified. Overall, the evaluation of the recommended alternatives in this memorandum is provided to support a general comparison of potential alternatives for the NEPA process. Local governments would need further engineering to determine if any of these projects are viable. Consistent with the principals of risk-informed decision making, the level of detailed provided in this document is sufficient to compare alternatives to the proposed reallocation of Allatoona Lake.

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2. Alternatives Evaluation

This memorandum clarifies the proposed no action and action alternatives and evaluates how these alternatives can fill the gap between water supply and water demand if Georgia's updated water supply request is not granted.

2.1 No Action Alternatives (CCMWA and Cartersville)

There are two different "baselines" that should be considered to define the current level of supply—one (the "Current Use Baseline") representing the current level of use, and the other (the "USACE Accounting Baseline") representing the amounts available under the existing storage contracts and the USACE's current storage accounting rules at Allatoona Lake, which CCMWA and the State of Georgia dispute.

2.1.1 Current Use Baseline

The Current Use Baseline is based on the withdrawals from Allatoona Lake in 2006, which is the baseline year used in the ACT Basin Water Control Manual Final Environmental Impact Statement (FEIS). The gap between 2050 supplies and 2050 demands under this scenario is shown in Table 2-2 below, as provided by HydroLogics, Inc.[1]

Table 2-1: Water Supply Needs — Current Use Baseline

Water Provider	2006 Level of Use	Projected 2050 Demand	Gap in Meeting Need
Cobb County-Marietta Water Authority	47.3	57	9.7
City of Cartersville (including Bartow County as its wholesale customer)	13.9	37	23.1
Total	61.2	94	32.8

2.1.2 USACE Accounting Baseline

The USACE uses "storage accounting" to determine how much water is available to be withdrawn from each storage account in Allatoona Lake. CCMWA has challenged the USACE's storage accounting on multiple grounds in a suit that is currently pending in the Northern District of Georgia. The details of this

[1] The analysis done for Hydrologics, Inc Demand memorandum mentioned here will be provided in a technical memorandum at a later date

dispute exceed the scope of this analysis, but the outcome could have a substantial effect on the water supply that is available to CCMWA under its existing contract at Allatoona Lake.

The USACE Accounting Baseline assumes that no changes to the storage accounting will be made, and thus that the available water supply will be defined by the existing contract using the USACE's storage accounting. The gap between 2050 supplies and 2050 demands under this scenario is shown in Table 2-2 below, as provided by HydroLogics, Inc.

Table 2-2: Water Supply Needs — USACE Accounting Baseline

Water Provider	Supply Available Under Current Contracts and USACE Accounting	Projected 2050 Demand	Gap in Meeting Need
Cobb County-Marietta Water Authority	24.9	57	32.1
City of Cartersville (including Bartow County as its wholesale customer)	12.2	37	24.8
Total	37.1	94	56.9

2.2 Correct Storage Accounting Alternative (CCMWA and Cartersville)

Under this alternative, the yield of existing storage will increase, and the need for additional storage capacity in Allatoona Lake will decrease, if CCMWA prevails in the storage accounting litigation. Based on analysis by Hydrologics, Inc., CCMWA has advised that it will have sufficient water supply to meet its projected 2050 demands if the storage accounting is corrected. Cartersville's future need will remain essentially the same. The gap between 2050 supplies and 2050 demands if the storage accounting is corrected is shown in Table 2-3 below, as provided by Hydrologics, Inc.

**Table 2-3: Water Supply Needs —
Existing Contracts with Corrected Accounting**

Water Provider	Supply Available Under Current Contracts with Corrected Accounting	Projected 2050 Demand	Gap in Meeting Need
Cobb County-Marietta Water Authority	57	57	0
City of Cartersville (including Bartow County as its wholesale customer)	13.0	37	24.0
Total	70	94	24

2.3 Impact of Water Supply Shortages and Unmet Future Demand

If Georgia's updated water supply request is not granted, water supplies available from Allatoona Lake would be insufficient to meet current and/or future water demands. The impact of unmet demand is considered in this section. Section 2.3.1 addresses the impact of actual water shortages, or gaps between current supply and current demand. Section 2.3.2 assesses the impact of unmet future demands.

2.3.1 Impact of Immediate Water Shortages

Because significant time is required to permit and construct water supply sources, any gap between supply and demand would take time to fill. Therefore, any action by the USACE to cut the supply from Allatoona Lake below the current level of use would likely result in immediate water shortages in the near term.

Capping supplies at the levels available under the USACE storage accounting would result in very significant water supply shortages for existing customers, including residences, businesses, hospitals, universities and military installations. These water supply shortages would be expected to persist until alternative sources of supply could be developed and brought on line. The USACE's Environmental Impact Statement (EIS) developed to support its update of the Master Water Control Manual for the ACT Basin examined the level of shortages that would occur if the USACE's storage accounting rules were applied. The EIS projected that limiting withdrawals in this manner would result in "frequent shortages of large amounts." As shown in Figure 2-1 below, which is reproduced from the USACE's EIS, these shortages would be significant, often exceeding 50 mgd. The shortages would also be projected to occur as frequently as one out of every two years.

Figure 2-1: Snapshot of Account Shortages from USACE's Modeling Report

Water shortages on this scale in a major U.S. metropolitan area would be unprecedented. A detailed examination of the effects of such shortages is beyond the scope of this alternatives analysis, and the effects of such shortages would have to be studied in detail in any EIS prepared to support the USACE's current reallocation study. However, water supply shortages resulting from a failure to meet current water needs from Allatoona Lake would have catastrophic consequences.

CCMWA, as a wholesale water provider, lacks the capacity to ration water among high-priority end users like hospitals, nursing homes, fire departments, and emergency first responders. For both systems, cycling the system from full to empty would release tuberculation (sediment buildup on pipe walls, rendering the water supplied virtually unusable and fouling valves, meters toilets, ice makers, and other plumbing fixtures.

Reduced water quality would dramatically impact critical community sectors and services, including fire protection, schools, and healthcare service providers. For example, fire protection would be compromised, and fires that would normally be limited to a single structure would likely spread. The lack of adequate fire protection and potential sanitation impacts would force schools to close and/or limit critical services like school lunch programs. Finally, dialysis and certain hospital services would likely be halted in the service area, as they are designed to process incoming potable water.

Unmet local water demand would likely spread to surrounding areas. Potable water would have to be purchased and trucked in, an enormous logistical challenge in urban and suburban areas. Private groundwater wells would likely proliferate and be constructed on an unprecedented scale to meet demand by those who can afford it. As has been seen in prior droughts, these well systems would, in many cases, be connected to household plumbing, which would create cross connection issues between private well sources and public supply.

Recent experience shows the potential effects of municipal and industrial water supply shortages. In Cape Town, South Africa, recent threatened water shortages were estimated to cost tens of thousands of jobs in the service, hospitality and food sectors. Residents were faced with collecting 6.5 gallons of water per day from one of 200 different collection points, an "astoundingly difficult" logistical challenge. In this circumstance, if every family sent one member to fetch its water allocation, about 5,000 people would arrive at each water collection site each day, with limited ability to transport the water home by hand.

In one reported instance in the United States, water supply shortages occurred in East Porterville, California, a city with a population of approximately 7,400 residents, or less than 1% of the population of Cobb County. In that instance, state officials trucked water to residents and forced them to go without showers, while residents used grey water to flush toilets. The estimated cost of this effort was $650,000 per month.

2.3.2 Impact of Unmet Future Demands

The second type of impact is the impact of unmet future demand. These impacts could be felt if the water supply from Allatoona Lake is limited and if state and local officials did not develop alternative supplies. Given the magnitude of these impacts, it is almost a certainty that alternative supplies will be developed. The following information is provided to demonstrate why that is the case.

Municipal and industrial water supply is widely understood to be the most economically valuable use of water. Industrial Economics (IEc) has estimated the value of water supplies for municipal and industrial uses relative to other purposes (IEc, 2012). This work shows that municipal and industrial water supply is by far the most valuable use of water, with values that range from approximately $100 to over $17,000 per acre foot in 2012 dollars, or $18,900 in 2018$.[2] The economic activity supported by water supplied from Allatoona Lake is significant. For example, based on information from CCMWA, we understand that Cobb County's impact on Georgia's economy is approximately 15% of the state's GDP, while the 6.5 square-mile area that includes the Cumberland Community Improvement District alone produces approximately 5.4% of the state's GDP. Given this, a value in the upper end of this range would be reasonable. In fact, the value of water for this purpose is so large that other entities facing water supply shortages and/or unmet municipal and industrial demands have pursued alternatives with costs ranging into the billions to ensure that municipal and industrial water needs are met. Examples of these projects include large-scale desalination projects in the Middle East and the extensive interbasin transfers from the Colorado and Sacramento-San Joaquin Rivers in the western United States.

[2] Price scaled based on CPI Inflation Calculator at www.bls.gov.

We are not aware of any major water utilities or local governments that have allowed water shortages or supplies that are inadequate to meet demonstrated needs of this nature to persist. Given this, it is not reasonable to assume that Georgia, CCMWA, and/or Cartersville would allow water shortages to continue if water supply demands from Allatoona Lake are not met. Instead, it is reasonable to assume that CCMWA and Cartersville would pursue alternatives to develop new supplies to meet any needs that the USACE declines to accommodate from Allatoona Lake.

2.4 Action Alternatives

This section addresses non-federal projects that could be implemented to close any gap between future water supply and future water demand. Of these, four would utilize water from outside the Allatoona Lake watershed: piping desalinated water from the Georgia Coast, piping water from the Tennessee River, increasing withdrawals from the Chattahoochee River, and pumping water from the Etowah River below Allatoona Dam. None of the out-of-watershed alternatives appears viable for reasons described below.

The remaining alternatives would all utilize sources from within the Allatoona Lake watershed. Because the water would be removed from the same watershed, none of the in-basin alternatives is likely to reduce impacts to Allatoona Lake in comparison to the preferred alternative of correcting the USACE storage accounting and reallocating storage in Allatoona Lake. Each of these alternatives pose a higher risk of economic, environmental, and other impacts within the same watershed when compared to the impacts of reallocating storage in Allatoona Lake.

2.4.1 Conservation (CCMWA and Cartersville)

This alternative considers whether additional conservation measures could be implemented to decrease the water supply demands for CCMWA and the City of Cartersville. As detailed in the Metropolitan North Georgia Water Planning District's (the "District") Water Resource Management Plan (the "Plan"), multiple conservation measures are already being implemented in both water provider's service areas, notably including increasing block-rate pricing structures ("conservation pricing"). The State of Georgia's 2010 Water Stewardship Act also mandates that only low-flow toilets, lavatory faucets, and showerheads be installed in Georgia, among other conservation and efficiency measures.

Conservation and efficiency programs in Georgia and the District have been widely recognized. For example, in a 2012 study, the Alliance for Water Efficiency and the Environmental Law Institute ranked Georgia among the very best states in the nation for water conservation and efficiency, tying for 4th nationally and receiving the highest score awarded to any state east of the Mississippi. Georgia also leads the nation in progress on auditing of public water systems and has been recognized as a leader for its water conservation, education, and customer outreach programs.[3] The District and Cobb County Water System (CCMWA's largest retail customer), have been repeatedly recognized by EPA as water conservation and efficiency leaders:

[3] Alliance for Water Efficiency and the Environmental Law Institute entitled Water Efficiency and Conservation State Scorecard: An Assessment of Laws and Policies, (September 2012).

- In 2015, the District was awarded the prestigious 2015 EPA WaterSense Excellence in Education and Outreach award, and the Cobb County Water System was awarded the 2015 WaterSense Promotional Partner of the Year award.

- On October 6, 2016, the EPA awarded two of only five 2016 WaterSense Promotional Partner of the Year awards to each of the Metro Water District and the Cobb County Water System. With the award, Cobb County Water System became a *five-time* Partner of the Year Award winner.

- In 2017, the EPA awarded Cobb County Water System Sustained Excellence Award and the Metro Water District the Promotional Partner of the Year Award.[4]

The USACE recognized the success of Georgia's water conservation efforts in the Final EIS for the ACF Basin Water Control Manual (USACE, 2016), noting that per capita water use for the metro area has declined by 30% since 2000, falling from 150 gallons per person per day (gpcd) to 99 gpcd in 2015.

The successes of these conservation and efficiency measures, and the related lower per capita water demand, were incorporated into the base year water demand in the 2017 Plan. Increased efficiency resulting from these measures was also incorporated into the 2050 water demand projections. Because the efficiency measures put into place are expected to continue to drive indoor per capita water use lower into the future, the District's demand projections also accounted for the effects of State and Federal plumbing code and laws, including the Georgia Water Stewardship Act, the National Energy Policy Act of 1992 and the US EPA Energy Star program and included demand reductions resulting from the replacement of toilets, urinals, showerheads and clothes washing machines. Because of these investments in conservation and efficiency, the District projects that the water use in 2050 will be 25% less than was predicted in the 2009 water plan.

CCMWA's and Cartersville's demands reflect the effects of these aggressive conservation programs, and conservation and efficiency savings for these water providers are incorporated into the District's demand projections included in Georgia's updated water supply request. It should be noted that, while per capita demand in the Cartersville service area has declined, future conservation efforts focused on residential and commercial water use are not likely to result in substantial savings in this area. Approximately 85% of the water withdrawn by Cartersville is used to supply large industrial water users for which water is a process input. Thus, while it is possible these industrial users will increase their efficiency and reduce demands in the future, those reductions would result from process changes implemented by the users and their specific business situation. Additional conservation measures would not significantly affect these uses.

Given this significant reduction in the 2050 demand projections, the widely-recognized successes on conservation and efficiency by the District and its utilities, and the specific mix of residential, commercial, and industrial users in CCMWA's and Cartersville's service areas, any reductions from future efficiency technology and practices will likely be smaller and more expensive than in the past. While further reductions are possible in the future, the specific effect of future changes in technology and standards is uncertain. Additionally, development patterns and the mix of residential, commercial, and

[4] https://www.epa.gov/sites/production/files/2017-10/documents/ws-2017-sustainedexcellence-poy_awards-fact_sheet-poy.pdf.

industrial development have the potential to put upward pressure on demands and are also uncertain. Consistent with principles of risk-informed planning, the demand projection methodology used in the District Plan and the State's Updated Water Supply Request is a reasonable one.

Therefore, it is unlikely that any additional water conservation measures would result in significant reductions in the 2050 water need.

2.4.2 Construct a Pipeline to Convey Water from Hickory Log Creek (HLC) Reservoir to Wyckoff WTP (CCMWA)

The "HLC Pipeline" alternative assumes that a portion of CCMWA's 2050 need will be met with water from the Hickory Log Creek Reservoir delivered through a new water pipeline connecting the reservoir to CCMWA's Wyckoff Water Treatment Plant (WTP). This alternative will only be pursued if the storage accounting is not corrected to provide a "credit" to CCMWA's storage account for any water transferred to Allatoona Lake from the HLC reservoir. The crediting of HLC reservoir releases is one of the issues presented in the storage accounting litigation discussed in Section 2.3 above. If the accounting is not corrected, the most likely alternative for CCMWA is to construct a pump station and pipeline to transport water from the HLC reservoir (or from an appropriate location on the Etowah River above Allatoona Lake) to the Wycoff WTP.

The evaluation of this alternative focuses on the water pipeline infrastructure and any other related infrastructure that would be required to convey water from the reservoir to the treatment location. As described above, it differs from the "Correct USACE Storage Accounting" alternative above which would utilize the natural Etowah River channel to convey water from the Hickory Log Creek Reservoir to CCMWA's existing intake in Allatoona Lake and its Wycoff WTP.

CCWMA completed an engineering study in 2013 (ESI, 2013) to evaluate the potential pipeline routes and associated costs for construction of the pipeline to connect the reservoir to the Wyckoff WTP. This study estimated the costs for construction of a new water intake on the Etowah River downstream of the HLC reservoir and the existing Canton intake, together with a pipeline to transfer up to 70 MGD (which is the maximum amount of water that can be released from the HLC reservoir to the Etowah River on any given day) to the Wyckoff WTP.

Engineering constraints for this alternative would include having to bore under I-75 with two 48-inch pipelines, as well as the need to construct crossings over both Little River Embayment on Allatoona Lake and Lake Acworth.

The total estimated costs for the pump station, pipeline, and additional pre-sedimentation facility were $208 million. Escalating these costs to 2018 dollars (2018$) based on a GDP price index escalation factor[5], the total cost would be $223 million. Note that operational costs for the pump station and pipeline (including energy) were not included in the cost estimate but would be significant.

[5] Average of 1.53% per year from 2013 to 2018.

Potential environmental impacts associated with construction of the pipeline would include over 2,000 linear feet of wetlands and 20 stream crossings. Much of the stream areas are considered habitat for the Cherokee and/or Etowah darters, as well, which would increase the potential environment permitting constraints for this alternative.

2.4.3 Pipe Desalinated Water from the Georgia Coast (CCMWA and Cartersville)

The "desalination" alternative assumes that the 2050 need would be met by desalinated water from the Georgia coast. The evaluation of this potential alternative focuses on the desalination plant, water pipeline infrastructure, and any other related infrastructure that would be required.

Desalination options for meeting water supply needs in the metro Atlanta area were evaluated as part of the Georgia Governor's Water Contingency Planning Task Force in 2009 (the "Task Force"). The options included the construction of a new desalination plant on the Georgia coast near Savannah and pumping the treated water to the metro Atlanta area. Costs for desalination can vary significantly based on plant capacity, distance to the end user, power costs, and potential environmental considerations (permitting and mitigation costs, increased emissions from energy required for pumping and transmission). The desalination alternative evaluated in 2009 was based on a need of 200 MGD and included capital (piping and pumps, water treatment facilities, and other construction costs) and annual operating (power for pumping, treatment costs, and annual O&M) costs. Because this alternative would require enormous infrastructure construction that is not practicable to down-scale, and because reducing the volume of water to be supplied would dramatically increase the costs on a per-MGD basis, we assume that Georgia would pursue the full 200 MGD project if this alternative were selected.

Based on the Task Force study, the total cost to provide 200 MGD of treated water would be $21.6 billion or $108 million/MGD in 2010 dollars. Total costs would equal $24 billion and $122 million/MGD in 2018$.[6] However, several factors would likely increase the costs over the Task Force evaluation. These include the pipeline length (the report assumed a direct line from the coast to the metro area), the cost for storage of the desalinated water in the metro area, and the need to mix desalinated water with other existing surface water sources before distribution, which, as discussed elsewhere, can create significant challenges and risks due to differences in water chemistry. Recent uncertainties in the cost of metal pipe (due to the pending tariffs) would likely increase the cost for pipeline construction, as well.

Potential environmental considerations associated with desalination include impacts from entrainment of aquatic resources (on the coast), disposal of concentrated brine (at the coast from the treatment process), impacts on wetland and waters of the US associated with the pipeline and pump station construction and required storage facilities, and energy use. These impacts were not quantified during the conceptual evaluations considered by the Task Force but are likely to be significant considering the size of the required pipeline and construction corridor and the number of streams and wetlands between the coast and the metro Atlanta area.

As a result of the economic and environmental concerns, the USACE did not evaluate the desalination alternative in detail in the ACT Basin Water Control Manuals EIS.

[6] Average of 1.54% per year from 2010 to 2018.

2.4.4 Pipe Water from the Tennessee River (CCMWA and Cartersville)

The "Tennessee River" alternative assumes that the 2050 need will be met with water from the Tennessee River. The evaluation of this potential alternative focuses on the withdrawals, water pipeline infrastructure, and any other related infrastructure that would be required to convey water from the Tennessee River to treatment facilities in the metropolitan Atlanta area.

This alternative would be highly contentious due to the interbasin and interstate transfer of water. In addition, any project to obtain water from the Tennessee River would require multiple permits and approvals at the state and federal level. For example, in addition to a Section 404 permit from USACE for the intake and multiple stream crossings, at least two permits would be required from the State of Tennessee – an Aquatic Resources Alteration Permit, *see* TENN. CODE ANN. § 69-3-108(b)(1) & TAC 0400-40-07-04(c); and an Inter-Basin Water Transfer Act permit, *see* TENN. CODE ANN. s. 69-7-204(a). Given that the Tennessee General Assembly reportedly enacted its Inter-Basin Water Transfer Act to resist transfers to Georgia, the challenge presented by these requirements could prove to be substantial. In addition, because Nickajack Lake and other portions of the Tennessee River close to Georgia are controlled by the Tennessee Valley Authority (TVA), the transfer would also require approval from TVA.

This alternative was evaluated in the Task Force Report in 2009 and the data on the potential costs to construct this alternative were updated for this evaluation. In 2009, the Task Force evaluated the costs for withdrawal and conveyance of 250 MGD of water from the Tennessee River. Like the desalination alternative above, this alternative would require construction of very significant infrastructure, and reducing the volume of water to be supplied would dramatically increase the costs on a per-MGD basis. We therefore assume that Georgia would pursue the full 250 MGD project if this alternative were selected.

Estimated costs, including the pipeline, treatment facilities, and annual operating costs were a total of $4.08 billion or $16.3 million per MGD in 2010 dollars. This would equal $4.62 billion or $18.5 million per MGD in 2018$ based on a GDP price index escalation factor.[7] It should be noted that these costs do not include the costs for any required returns of reclaimed water to the Tennessee River basin or the costs for mitigation of environmental impacts.

Additional challenges to this alternative would be similar to those encountered in the Desalination alternative above. These include the potential energy and environmental impacts associated with construction of 90 miles of pipeline including the impacts on wetlands, streams, historic resources, and protected species habitat.

Due to the permitting uncertainties and costs associated with this alternative, it is unlikely that a withdrawal from the Tennessee River could be implemented to meet the 2050 water supply need.

[7] This is an average of 1.56% per year from 2008 to 2017.

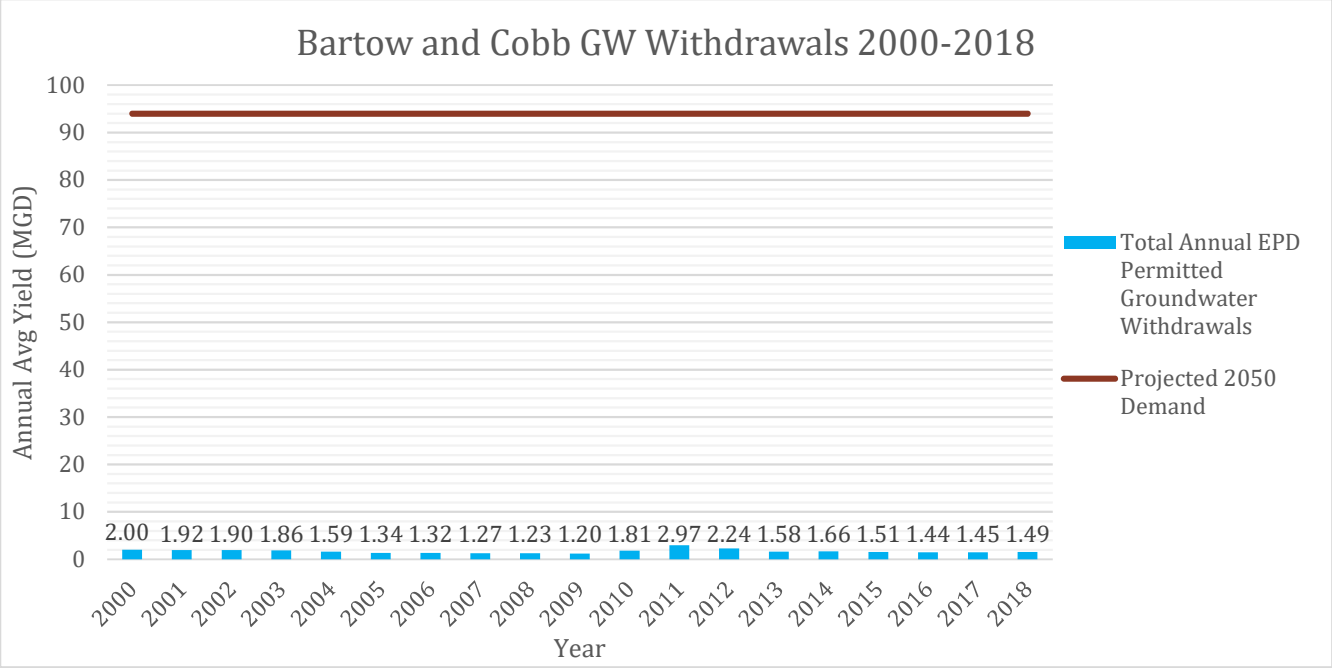
2.4.5 Drill New Groundwater Wells (CCMWA and Cartersville)

The “groundwater alternative” evaluates whether the 2050 need can be met through groundwater sources. The evaluation of this potential alternative focuses on the availability and quality of groundwater resources in Cobb County and Bartow County as well as the wells, water pipeline infrastructure, and any other related infrastructure that would be required.

2.4.5.1 Groundwater Availability

Several groundwater investigations have been conducted in Cobb and Bartow Counties to identify potential water supply sources, and several wells have been constructed to supplement available surface supplies. As part of the state-wide water planning efforts in 2010, Georgia EPD developed the Groundwater Availability Assessment to estimate the potential yield of aquifers throughout the state, including the Paleozoic-rock aquifers in northwest Georgia. The northwestern Georgia region in this analysis is defined as an area that encompasses the majority of Bartow County along with parts of Floyd and Polk Counties. Groundwater yield is limited in northwest Georgia with a potential sustainable annual yield ranging from 27 to 70 MGD. But even after the extensive groundwater availability analyses conducted in Bartow and Cobb Counties during the past few decades, as described below, Figure 2-3 shows that Georgia EPD groundwater withdrawal data for the period from 2000-2018 for the permitted wells in both Bartow and Cobb Counties (industrial and municipal wells) cumulatively produced only an annual average of 1.67 MGD.

Figure 2-3: Bartow and Cobb Groundwater Withdrawals 2000-2018 Compared to Water Supply Need



Recently, Bartow County conducted a survey on potential groundwater sources and new well sites (Crawford Consulting, 2018). This study evaluated the potential groundwater yield above 0.144 MGD at specific sites or properties currently owned by Bartow County. Results indicated that the available wells had very low to moderate potential to meet the goal of 0.144 MGD per well, and those sites that had good potential were highlighted as potential risks for sinkhole development. Therefore, Bartow County decided not to pursue additional groundwater development investigations at these sites.

Bartow County contracted an additional groundwater evaluation in 2018 to look at the feasibility of groundwater well development on three additional specific sites – the Cass Point Log, Paga Mine Road, and Central Kingston sites (Freese and Nichols, 2018). Of the three sites, only the Paga Mine site was found to have the potential to provide more than 0.288 MGD.

CCMWA engaged in an extensive study process in the 1990s to identify potential groundwater resources. This included a 10 year county-wide survey to determine ideal well locations based on highest potential groundwater yield, test well siting and drilling. Based on this work over a 10-year period, CCMWA drilled approximately 20 wells in the highest priority areas, but less than 1 MGD was developed. Most of the wells drilled by CCMWA had individual yields of less than 0.1 MGD and could be operated only intermittently (3 days out of 10, for instance) to allow the yielding fissures in the bedrock to recharge. Ultimately, CCMWA abandoned its permits for its two largest wells due to low production levels. An additional well was tested between 2008-2013 by CCMWA with comparable results.

These studies and results suggest that groundwater sources within the Bartow and Cobb County area are unlikely to provide a significant source of water supply and definitely could not meet the 2050 need. The graph below shows the annual average groundwater yield from Georgia EPD permitted wells with an average yield greater than zero in Bartow County and Cobb Counties.

2.4.5.2 Water Quality Evaluation - Mixing Water from Different Sources

Crystalline and Paleozoic rock aquifers have potential water quality issues including elevated levels of hardness, iron, manganese, and radionuclides. Direct use of groundwater by Cartersville, Bartow, and Cobb Counties would likely require additional and even separate treatment systems to address water quality differences between the surface and groundwater sources. This would result in additional capital costs, operational costs and uncertainty in source water quality. An evaluation would be needed to determine whether the combined water sources would meet water quality standards.

In addition, altered finished water quality could affect corrosion in the distribution system which would impact levels of copper, lead, and iron content in the water delivered to customers. A modern case study of degraded water quality due to water source mixing occurred in Flint, Michigan. The city's shift from using purchased treated water from the Detroit Water and Sewage Department (DWSD) to using water supplied from the Flint River not optimized for corrosion control like the DWSD water, led to elevated lead levels.[8]

[8] Masten et al., Journal of American Water Works Association, 108(12): 22-34., Flint Water Crisis: What Happened and Why? (Mar. 2016).

As the situation in Flint, Michigan demonstrates, mixing of two dissimilarly treated waters, or intermittent use of two dissimilarly treated water sources, could affect the release of lead and copper from home plumbing systems and distribution system appurtenances. The same mixing or intermittent use can also have other deleterious effects, such as releases of iron and manganese scale from the inside of distribution piping, which maintains stability when carrying water of consistent chemical quality. Changes in the combined water source quality could also impact disinfection processes and the formation of disinfection by products in the distribution system. Overall, combining groundwater and surface water sources would pose new challenges in the water treatment and distribution system.

2.4.5.3 Industry-Specific Water Quality Concerns

As described below, a significant portion of Cartersville demand is for large, water-dependent industrial users, including those in the beverage, carpet, and chemical industries. The processes employed by these users are highly sensitive to even minor changes in water quality and chemistry.

According to information provided by Cartersville, certain large industrial users located their facilities in the Cartersville service area specifically based on the high quality and chemical characteristics of water supplied by Cartersville from Allatoona Lake. In addition, at least one industrial user reported substantial interference with its processes during an upset at the Cartersville water treatment plant that resulted in minor changes to water chemistry.

Given this, groundwater from Bartow County would have to be extensively treated so that its chemistry mirrors that of water withdrawn from Allatoona Lake. It is unclear whether this high water quality could be achieved. Assuming that it could, however, significant new treatment infrastructure would be required. While it is not possible in this report to provide a detailed estimate of the costs associated with these treatment systems, the costs are expected to be very significant.

2.4.6 Construct New Reservoirs (CCMWA and Cartersville)

The “new reservoir” alternative assumes that the 2050 need will be met with water stored in a new reservoir. The evaluation of this potential alternative focuses on identifying reservoir sites and water sources as well as the dam, water pipeline infrastructure, and any other related infrastructure that would be required.

2.4.6.1 Viability of Potential Sites

Existing reports on the potential reservoirs within the Cobb, Cherokee, Bartow and Paulding counties were reviewed to identify potential new reservoir sites. The USACE’s ACT Basin Water Control Manual EIS identified 9 potential reservoirs based on their review of existing studies (USACE, 2014, Table 2.1-20). The Georgia Inventory and Survey of feasible sites for Water Supply Reservoirs, prepared by the Georgia Environmental Facilities Authority in 2008 (Mactec, 2008), identified 5 potential new reservoirs in the immediate area (Bartow, Cherokee, and Paulding Counties). Of these, the two reservoir sites considered most likely alternatives for CCMWA and Cartersville are evaluated below.

2.4.6.1.1 Sharp Mountain Reservoir

CCMWA has identified a site on Sharp Mountain Creek in Cherokee County and is in the process of acquiring land for use either as a reservoir site or as a potential mitigation bank. Preliminary estimates from the 1990s indicate that the safe yield of a reservoir project at the site may range from 30 to 36 MGD, but these estimates will need to be verified through more detailed analysis and in light of more recent droughts. Reservoir safe yields in the ACT Basin have declined significantly due to the 2007 drought, which represents the new drought of record for the basin. While the specific impacts of the new critical drought depend on the particular characteristics of each reservoir, decreases in yield of as much as 30% have been reported under the 2007 drought.

Impacts from the construction of this project would include the loss of forested, wetland, and stream habitats for the impoundment. Construction of the pipeline would also require crossing of jurisdictional wetland areas; although the total areas of impact have not been determined. The Sharp Mountain reservoir site is in an area of the Etowah River basin designated as critical habitat for the Cherokee Darter (*Etheostoma scotti*) and the Etowah Darter (*Etheostoma etowahae*), which are both federally protected species under the Endangered Species Act.

Finally, this project would impound water from the Allatoona Lake watershed. Therefore, any impacts on yield of the federal reservoir are likely to be similar to the proposed reallocation of storage in Allatoona Lake itself.

2.4.6.1.2 Stamp Creek Reservoir

The GEFA report also identifies a potential reservoir site on Stamp Creek in Bartow County. The report estimates that the topography of the site would support a reservoir with approximately 49,000 acre-feet of storage. The potential yield of this project has not been estimated at this point.

Like the Sharp Mountain Reservoir, a reservoir constructed at the Stamp Creek site would present similar environmental, protected species, and habitat concerns. This project would also impound water from the Allatoona Lake watershed. Therefore, any impacts on yield of the federal reservoir are likely to be similar to the proposed reallocation of storage in Allatoona Lake itself.

2.4.6.2 New Reservoir Construction Cost

Detailed cost estimates are not available for either project, but the costs for a new reservoir can be broken down into several components: (1) construction of the pump station and pipeline to fill the reservoir; (2) construction of the dam and reservoir site; (3) construction of the pump station and pipeline to convey water from the reservoir to the existing treatment works.

The USACE estimated new reservoir water supply costs estimates at $8.1 million/MGD for the ACF Water Control Manual EIS (USACE, 2016, Table 19). These costs included the dam, major pipelines, and pumping infrastructure. Reservoir costs can vary widely depending on several factors so there is some significant uncertainty about actual costs for new water supply reservoirs especially without more detailed preliminary engineering analysis.

Beyond the USACE's cost estimate described above, other data sources have attempted to estimate the cost of water supply reservoirs. For example, Georgia EPD provided information to USACE in 2014 in connection with its water supply request in the ACF Basin, which attempted to summarize the cost of completed water supply reservoirs between 1999 and 2007 per million gallons per day of safe yield. This report stated that costs ranged from $0.49 million for a project completed in 1999 to $2.8 million for the Hickory Log Creek Reservoir completed in 2007.

For a number of reasons, this other information is of limited utility and it has been discounted in this report in favor of the USACE cost estimates, which appear to be more reliable for purposes of this alternatives analysis. The lower-bound cost estimates are not consistent with actual costs incurred in constructing reservoirs in more recent years. The costs provided appear to be in raw dollar amounts that are not standardized across years. The estimates also appear to exclude costly transmission infrastructure such as major pipelines and pump stations. For example, for the Hickory Log Creek Reservoir, the Georgia EPD table lists total cost of $99 million, or $2.8 million per MGD. Based on information received from CCMWA, this estimate understates the actual cost of the reservoir itself and does not include transmission infrastructure (described above), which we estimate would cost $223 million in 2018$. Including these costs and scaling costs in the Georgia EPD table to 2018$ would more than triple the cost-per-MGD included in the Georgia EPD table, bringing the total to $9.6 million per MGD.

2.4.6.2.1 Sharp Mountain Reservoir

Using the USACE's cost metric, the Sharp Mountain reservoir, with a safe yield of approximately 36 MGD, would cost $288 million dollars for reservoir construction. Although the USACE's cost estimates for reservoir construction do include the estimated costs of pipelines and pump stations, CCMWA's reliability standards requires redundant pipelines. These additional costs are not considered in the USACE's estimates.

Based on this, the pipeline costs for the Sharp Mountain project would be significantly higher. The reservoir is approximately 26 miles from the Wyckoff WTP. Assuming pipeline width of 48", a cost of $469/ln-ft[9], and double redundancy to meet CCMWA's standards, the total cost of the pipeline would be $138.1 million in 2018$. Assuming that one half of the pipeline costs are included in the USACE's metric, the additional pipeline costs would be $69 million for a total estimated project cost of $357 million in 2018$.

2.4.6.2.2 Stamp Creek Reservoir

Because the potential yield of Stamp Creek is not known, it is not possible to use this formula to generate a cost estimate for the project on a per-MGD basis. However, we note that the actual and estimated cost of constructing large storage reservoirs in the region have often exceeded $200 million. It is reasonable to assume the costs of constructing a storage reservoir on Stamp Creek would be similar.

[9] Based on 48-inch DIP, restrained construction, and pressure class 250 from ESI, 2013.

Beyond the cost of constructing the impoundment, Stamp Creek reservoir site is approximately 6 miles from the Cartersville WTP and using the same pipe size and cost assumptions that total cost in 2018$ would be $15.9 million.

2.4.7 Purchase Water from Existing Non-Federal Reservoirs (CCMWA and Cartersville)

The "non-federal reservoirs" alternative evaluates whether the 2050 need can be met with water stored in existing non-federal water supply reservoirs located in the counties that surround Bartow and Cobb Counties. The evaluation of this potential alternative focuses on whether water is available in any of these existing non-federal reservoirs to serve either CCMWA or Cartersville.

The Metro Water District has evaluated water supply availability in existing reservoirs as well as reservoirs under construction. A copy of the Metro Water District's evaluation is included as an appendix to this alternatives analysis. Reservoirs evaluated by the Metro Water District are shown in Table 2-4 below.

Table 2-4: Non-Federal Water Supply Reservoirs Evaluated as Potential Alternate Supply Sources

County	Owning Entity	Reservoir Name
Cherokee County	Cherokee County Water and Sewerage Authority	Hollis Q. Lathem
Douglas County	City of East Point (in Fulton County)	George Sparks/Sweetwater Creek
Douglas County	City of Villa Rica	Lake Paradise and Cowens Lake (two reservoirs permitted together)
Douglas County	Douglasville-Douglas County Water and Sewer Authority	Bear Creek
Douglas County	Douglasville-Douglas County Water and Sewer Authority	Dog River
Floyd County	Berry College	Berry (formerly Possum Trot) Reservoir
Fulton County	City of Palmetto	Cedar Creek Reservoirs (two reservoirs permitted together)
Paulding County	Paulding County	Richland Creek Reservoir (under construction)
Pickens County	Bent Tree Community	Lake Tamarack

As discussed in the Metro Water District evaluation, several reservoirs were eliminated from further consideration due to their insufficient yield. Five remaining reservoirs were evaluated further: Richland Creek reservoir in Paulding County, Lathem Reservoir owned by the Cherokee County Water and Sewerage Authority, Dog River Reservoir and Bear Creek Reservoirs owned by the Douglasville-Douglas County Water and Sewer Authority, and the George Sparks Reservoir owned by the City of East Point.

Based on an analysis of the projected future demands, available yield, and information provided by the project owners, none of these projects includes excess capacity that could be made available to CCMWA or Cartersville. In each case, the full yield is needed to meet the needs of the communities for which the

projects were constructed, and therefore is not available for either CCMWA or Cartersville. As a result, no additional analysis of this alternative is warranted.

2.4.8 Withdraw More Water from the Chattahoochee River (CCMWA)

The "Shifting Demand" alternative assumes that CCMWA's 2050 need will be met by shifting demands that would have been met by additional storage in Allatoona Lake to the Chattahoochee River. This alternative would not meet the water supply needs for Cartersville.

The evaluation of this potential alternative focuses on the availability of water in the Chattahoochee as well as the expanded water treatment plant, water pipeline infrastructure, and any other related infrastructure that would be required.

Implementation of this alternative would require CCMWA to utilize its intake location on the Chattahoochee River to increase withdrawals to compensate for the reduced use of Allatoona Lake to meet its 2050 needs. In this scenario, water treatment requirements would be shifted from the Wyckoff WTP to the Quarles WTP in the Chattahoochee River Basin.

2.4.8.1 Water Availability

It is not clear that water would be available in the Chattahoochee River to support the increased withdrawals. The USACE recently completed a lengthy process to update to its Apalachicola-Chattahoochee-Flint Master Water Control Manual. Under the ACF Master Manual adopted in 2017, the USACE will operate Lake Lanier and the Chattahoochee River to provide a total withdrawal of 379 MGD from the Chattahoochee River above Peachtree Creek. This aggregate demand was based on the projected water needs of all users that withdraw water from the Chattahoochee River below Buford Dam, including CCMWA, the City of Atlanta, Atlanta-Fulton Water Resources Commission, and DeKalb County. Additional future withdrawals by CCMWA beyond the amounts included in the ACF Master Manual were not contemplated and could reduce the supply available to other water users, which the USACE has determined are needed and should be accommodated.

Finally, we note that the State of Florida has challenged Georgia's water use in the ACF Basin in litigation before the US Supreme Court. In that litigation, Florida requests that Georgia's water consumption from the basin be capped at 1992 levels, well below what is used today. Others, including the State of Alabama and a coalition of environmental organizations, have challenged the USACE's updated Master Manual in litigation. In that case, the State of Alabama claims that the USACE's current operations exceed the USACE's authority and place too much emphasis on water supply uses from Lake Lanier and the Chattahoochee River.

The State of Georgia and the Georgia Water Supply Providers dispute these claims and are currently defending both existing uses from the ACF River Basin and the USACE's updated Master Water Control Manual in the litigation, Nevertheless, existing pressure on the Chattahoochee River, including claims by the States of Florida and Alabama in interstate litigation challenging existing levels of use, as well as the possible need for revisions to the ACF Master Water Control Manual, raise significant questions

regarding the viability of increased future withdrawals by CCMWA in excess of what is provided in the updated ACF Master Water Control Manual.

2.4.8.2 Stranded Assets

Even if the water is available in the Chattahoochee River, shifting CCMWA's demand from Allatoona Lake to that source would also effectively strand substantial investments made by CCMWA at the Wyckoff WTP on Allatoona Lake. Since the 1980s, CCMWA has invested more than $110 million to expand its treatment capacity at the Wyckoff WTP. These investments, including substantial recent upgrades, would be largely be wasted.

The risk that valuable assets could be stranded underscores the challenges created by the long-term inability to resolve water supply issues at Allatoona Lake. Based on information from CCMWA, their service area population has grown by approximately 300% since the 1980s, when CCMWA first requested additional storage. To meet its growing demands, CCMWA was required to expand its facilities and make infrastructure investments without knowing the source of its future supply. CCMWA reasonably chose to expand the capacity of its existing facilities at Allatoona Lake and to construct the HLC reservoir to provide additional water supply storage. Under these circumstances, the cost of any stranded assets resulting from an adverse decision on Georgia's water supply request should be included in added to the cost of any other selected alternative.

2.4.9 Withdraw Water from the Etowah River Below Allatoona Dam (Cartersville)

The "Increased Etowah Withdrawal" alternative assumes that Cartersville's 2050 need will be met by increasing Cartersville's withdrawals from the Etowah River downstream of Allatoona Lake. This alternative would not meet the water supply needs for CCMWA.

The evaluation of this potential alternative focuses on water availability and the modifications to the existing Cartersville Clarence B. Walker water treatment plant (Cartersville WTP), water pipeline infrastructure, and any other related infrastructure that would be required.

The City of Cartersville currently has a temporary intake and pipeline infrastructure in place to withdraw up to 5 MGD of water from the Etowah River below Allatoona Lake. The intake and pipeline infrastructure are currently limited to emergency use only and would have to be significantly improved to meet their future demands. For example, there is no permanent pumping equipment at the site other than a small concrete pad where a portable pump can be placed for emergency withdrawals.

2.4.9.1 Water Availability

The USACE recently updated its Master Water Control Manual for the ACT Basin. Under the USACE's operations, hydropower releases may be curtailed under drought operations. In that circumstance, releases from Allatoona Lake would be limited to 240 cfs from the small turbine. This release would not be sufficient to satisfy Cartersville's future water demands, downstream municipal and industrial water supply needs in the reach, and minimum instream flow thresholds.

2.4.9.2 Additional Infrastructure

Even if releases were sufficient to meet Cartersville's needs, significant additional infrastructure would be required to implement this alternative. The current capacity of the intake and pumping system is only 5 MGD, while the 2050 need for Cartersville is 37 MGD. Cartersville would need to construct a permanent intake structure and pump station on the river and additional raw water pipeline capacity to transfer the required volume to the Cartersville WTP.

To meet the anticipated peak day demand of 60 MGD (37 MGD x 1.6) a permanent intake and pump station would need to be constructed on the Etowah River and a pipeline installed to the Cartersville WTP. We have assumed that the intake would be located where the existing emergency intake is on the river; approximately 0.5 miles from the Cartersville WTP. Using the USACE's cost estimates for pump stations from the ACF Water Control Manual EIS (USACE, 2016, Appendix C) of $87,937/MGD, the total costs for the pump station would be $5.6 million in 2018$. Assuming a 48" diameter pipeline of 0.5 miles from the intake to the WTP and a cost of $469/ln-ft. The cost of the pipeline would be $1.3 million in 2018$. Total costs for constructing the pump station and pipeline would be $6.9 million. However, this estimate does not include the annual O&M costs.

Like the HLC pipeline alternative, Cartersville would need to construct additional pre-treatment or sedimentation facilities at the WTP to address the increased levels of turbidity in the river water compared to using water directly from Allatoona Lake. While no engineering studies have been developed for this alternative, the engineering estimate for the CCMWA HLC pipeline alternative (ESI, 2013) was based on pre-treatment of 33 MGD. Therefore, it would be conservative to assume that an additional $14 million (2013 dollars) would need to be added to this alternative to provide the required pre-treatment for sedimentation. The total costs for the pump station, pipeline, and pre-treatment would be approximately $22.0 million in 2018$.

3. Conclusions

The alternatives identified in this memorandum are provided to support the development of the EIS for the Allatoona Lake Reallocation Study. Based on this high-level review, a total of 10 potential action alternatives in addition to the required no action alternative were identified for consideration. We have also provided additional clarification on the recommended no action alternative including the potential variations of capping water supplies. Overall, the no action alternative(s) would result in significant water shortages and result in major economic impacts for the region. By correcting the USACE storage accounting rules, CCMWA would be able to meet its current and future water needs through its existing infrastructure and storage, avoiding both the need to reallocate storage and environmental and economic impacts associated with other alternatives. Options for piping desalinated water from the coast and pumping water from the Tennessee River are cost prohibitive, logistically complex, and result in major environmental impacts. The other alternatives to reallocation are either infeasible because the water is not available or highly uncertain or because the alternative would require significant new infrastructure resulting in major costs and environmental impacts. As a result, the correcting the USACE storage accounting in combination with a reallocation of existing storage in Allatoona Lake for Cartersville can be demonstrated to be the lowest cost alternative with lowest potential environmental impacts.

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USACE, 2016. Final Environmental Impact Statement, Update of the Water Control Manual for the Apalachicola-Chattahoochee-Flint River in Alabama, Florida, and Georgia and A Water Supply Storage Assessment, Volume 3: Appendix B.

Attachment 3. State of Georgia's Allatoona Lake Water Supply Request (January 24, 2013)

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STATE OF GEORGIA
OFFICE OF THE GOVERNOR
ATLANTA 30334-0900

Nathan Deal
GOVERNOR

January 24, 2013

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army for Civil Works
108 Army Pentagon
Washington, D.C. 20310-0108

Re: Lake Allatoona - Request for Final Agency Action

Dear Secretary Darcy:

More than 915,000 Georgians rely upon water withdrawals from Lake Allatoona for water supply. The United States Army Corps of Engineers currently provides for water supply storage in Lake Allatoona through existing contracts with the Cobb County-Marietta Water Authority (CCMWA) and the City of Cartersville. The population of the counties served by CCMWA and Cartersville, and their needs for water from Lake Allatoona, are projected to increase significantly by 2040.

The purpose of this letter is to request final agency action under 5 U.S.C. § 702 et seq. by the United States Army Corps of Engineers in the form of a response to the request by the State of Georgia relating to the operation of Lake Allatoona. The State of Georgia requests that the Corps manage the resources of Lake Allatoona so that the projected water supply needs for water stored in Lake Allatoona may be met. Specifically, the State of Georgia requests that the Corps take the following actions:

- Allow gross municipal and industrial water withdrawals from Lake Allatoona to increase to 123.9 million gallons per day (mgd) annual average. Note that the proposed Richland Creek Reservoir is planned to supply Paulding County's 2040 needs that exceed the 23 mgd that will be provided to Paulding County by CCMWA from Lake Allatoona. If Richland Creek Reservoir for any reason is not built, gross municipal and industrial withdrawals from Lake Allatoona will need to be 147.9 mgd annual average to meet 2040 demands.

- Allow CCMWA to withdraw from its existing intake in Lake Allatoona water that is released from the Hickory Log Creek Reservoir specifically for CCMWA, without requiring CCMWA to use existing storage space or acquire additional storage space for such withdrawals. Georgia currently estimates that such water supply releases from Hickory Log Creek Reservoir should allow CCMWA to withdraw approximately 27 mgd from its intake in Lake Allatoona without using any storage for that withdrawal.

- In determining the yield of the storage that a water supply user has purchased, credit to that user exclusively all returns of treated wastewater to Lake Allatoona or its tributaries that the Georgia Environmental Protection Division has permitted and allocated to that user for withdrawal.

- To provide long-term certainty for all of those involved, enter into storage contracts that document the parties' understanding as to how the Corps will operate in support of Georgia's water supply needs.

Operating Lake Allatoona in this manner represents the highest and best use of Lake Allatoona. I am confident that the Corps will concur in this assessment.

To assist the Corps in making its review based on the best and most current information available, I enclose with this letter an Affidavit by Judson H. Turner, Director of the Georgia Environmental Protection Division. Mr. Turner's Affidavit contains demographic and water demand data that confirm the need for the requested reallocation, as well as an analysis of the impact of granting Georgia's request on other project purposes and waters downstream.

I ask that you act on Georgia's request at the earliest possible date. If the Corps determines not to grant Georgia's request in its entirety, the Corps should specify to what degree it will grant the request. Understanding that the process for allocating storage and executing storage contracts could take some time, I request that you not allow that process to delay implementation of the storage accounting measures referenced above (allowing withdrawal of water released from Hickory Log Creek Reservoir without need for storage and crediting of return flows as Georgia has allocated). Finally, I request that you clarify both that any Water Control Plans or Manuals that may be issued before you have rendered a decision on this request do not reflect the Corps' determination of the amount of water withdrawals that it intends to allow from Lake Allatoona, and that any such Water Control Plans and Manuals will be revised when the Corps has made a decision whether or to what extent to grant Georgia's request.

If you desire further information from Georgia, please let me know.

Sincerely,

Nathan Deal

Nathan Deal

cc: Colonel Donald E. Jackson, Commander, South Atlantic Division, U.S. Army Corps of Engineers
Colonel Steven J. Roemhildt, Commander, Mobile District, U.S. Army Corps of Engineers

Affidavit of Judson H. Turner

1. My name is Judson H. Turner. I am Director of the Georgia Environmental Protection Division ("EPD") of the Georgia Department of Natural Resources.

2. The Governor of Georgia is tendering a request to the United States Army Corps of Engineers, through the Assistant Secretary of the Army for Public Works, for the Corps to operate Lake Allatoona to accommodate Georgia's current and projected future needs for water supply from Lake Allatoona. The purpose of this Affidavit is to provide information in support of the Governor's request.

3. The State of Georgia is responsible for managing the quantity and quality of the waters of the State for public and private water supply, and for agricultural, industrial, and recreational uses, while protecting the environment and human health. Georgia law provides that "the government of the state shall assume responsibility for the quality and quantity of such water resources and the establishment and maintenance of a water quality and water quantity control program adequate for present needs and designed to care for the future needs of the state." O.C.G.A. § 12-5-21(a).

4. EPD is the state agency to which state law delegates the responsibility for regulating withdrawals of water from, and discharges of pollutants into, the surface waters of the State. To fulfill this responsibility, EPD maintains data on the population of counties and municipalities within the State, and projections of the State's future population growth and water needs. EPD's expertise in hydrologic and water quality modeling allows it to assess the impact of water withdrawals and wastewater returns. EPD prioritizes water needs and evaluates alternatives for meeting these needs from the State's finite water resources.

GEORGIA'S NEED FOR WATER SUPPLY FROM LAKE ALLATOONA

Current Population and Projections for Future Growth.

5. More than 915,000 Georgians currently rely upon withdrawals of water from Lake Allatoona to meet their water supply needs. Two municipal water systems withdraw water from Lake Allatoona: Cobb County-Marietta Water Authority ("CCMWA") and the City of Cartersville ("Cartersville"). CCMWA provides water within Cobb, Cherokee, Douglas, Fulton, and Paulding Counties. Cartersville provides most of the water within Bartow County.

6. Attached as Appendix 1 is a table showing the historical and forecasted population of those counties that receive water supply from Lake Allatoona. The information and data in the table are taken from United States Census Bureau reports and the most recent published projections generated by the Georgia Office of Planning and Budget ("OPB").

7. The rates of population growth of Bartow, Cherokee, Cobb, Douglas, and Paulding counties from 1990 to 2010 all exceeded the rate of growth of the population of the State of Georgia as a whole for the same period. *See* Appendix 1. The projected rates of population growth of these counties from 2010 through 2040 is also expected to be greater than the projected rate of population growth of the State of Georgia as a whole. *See id.*

8. Counties that rely on water withdrawals from Lake Allatoona comprise a portion of the population for the Atlanta Metropolitan Statistical Area ("MSA"), which according to the U.S. Census Bureau, is the ninth largest MSA by population in the United States. From 2000 to 2010, the Atlanta MSA grew by 24%, a growth rate exceeded by only two other MSA's in the United States.

Municipal and Industrial Water Supply Needs

9. Attached as Appendix 2 are the 2011 statistics for water withdrawals by CCMWA and Cartersville from Lake Allatoona. The annual average rate of gross water withdrawal from Lake Allatoona in 2011 was 49.5 million gallons per day (mgd). The highest average rate of gross withdrawal for an individual month by CCMWA and Cartersville in 2011 was 64.3 mgd.

10. Appendix 2 also shows EPD's projected gross water withdrawals from Lake Allatoona for 2040. EPD projects that gross water withdrawals from Lake Allatoona for the year 2040 will increase above current levels by up to 150%, to an annual average gross withdrawal of 123.9 mgd. The daily average use for the maximum month and maximum day will be higher than the annual average daily use. EPD developed its forecasts for future water supply need projections in cooperation with the Metropolitan North Georgia Water Planning District (the "Metro District"). These forecasts are based on a number of factors, including population, employment, and commercial and residential consumption rates.

11. Included in EPD's projection for CCMWA's future water withdrawal from Lake Allatoona is water that CCMWA will store in Hickory Log Creek Reservoir upstream of Lake Allatoona, release to the Etowah River, and withdraw from CCMWA's existing intake in Lake Allatoona. CCMWA will not rely upon, and should not be required to purchase, storage in Lake Allatoona for this portion of its withdrawal. EPD currently estimates that Hickory Log Creek Reservoir will yield approximately 27 mgd for withdrawal by CCMWA at CCMWA's Lake Allatoona intake.

12. Paulding County is one of the jurisdictions that CCMWA serves with water from Lake Allatoona. Paulding currently receives 10.2 mgd of CCMWA's withdrawal from Lake Allatoona on an annual average basis. EPD projects that Paulding County will need at least 23 mgd from Lake Allatoona in the year 2040. To meet that portion of its water needs that exceeds 23 mgd, Paulding County proposes to build a reservoir on Richland Creek, a tributary to the Etowah River below Lake Allatoona. The application for this reservoir states that it is planned for an ultimate yield of 35 mgd and therefore is intended to meet Paulding County's needs beyond 2040 levels. If Paulding County could not meet that portion of its projected 2040 needs that exceeded 23 mgd through construction of Richland Creek reservoir, additional water would be needed from Lake Allatoona. EPD currently projects that Paulding County's total 2040 water supply need will be 47 mgd. If all of Paulding County's year 2040 water supply need had to be met from withdrawals from Lake Allatoona, the total gross annual average withdrawal from Lake Allatoona in 2040 would be 147.9 mgd.

Water Conservation

13. The per capita water use rate in the Metropolitan Atlanta Region has fallen in recent years, and the projected demand for the region assumes that per capita water use within the region will continue to fall. The current use rate is approximately 148 gallons per capita per day (gpcd), and is expected to decline to 135 gpcd by 2040. The decline in per capita water use has and is expected to continue to result from implementation of aggressive state and local water conservation policies, explained in greater detail below. Note that per capita water use and total population are among the factors, but are not the only factors, used to calculate total projected water use in the areas that are to be supplied by withdrawals and releases from Lake Allatoona.

14. In 2001, the Georgia General Assembly created the Metro Water District and charged it with developing and maintaining comprehensive long-term plans for water supply and conservation, wastewater management, and watershed management for metro Atlanta. The Metro Water District is comprised of 15 counties, 92 cities, and 56 water supply systems. The plans are implemented by local water systems and local governments and are enforced by the State of Georgia through water permits and through eligibility for grants and loans. The Metro Water District completed development of its initial set of plans in September 2003. The governments within the Metro Water District spent the ensuing five years implementing the plans. In 2009, the Metro Water District adopted the first major update of its plans largely based upon lessons learned during the 2004-2009 implementation period.

15. Water conservation is an important element of the Metro Water District's Water Supply and Water Conservation Plan. The water conservation measures in the Plan are the most aggressive in Georgia and among the most aggressive in the United States. The 2003 Plan, as amended, included ten conservation measures applicable to all water systems and/or local governments. The 2009 update retained all and strengthened three of those measures. The Water Supply and Water Conservation Plan again was amended in December 2010, and seven measures were added– two measures applicable throughout the District and five others (denoted with asterisks) that apply to CCMWA and other water systems that withdraw from Lake Lanier or the Chattahoochee River. The water conservation measures in the Metro Water District Plan include: 1) conservation pricing; 2) replace older, inefficient plumbing fixtures; 3) pre-rinse spray valve retrofit education; 4) rain sensor shut-offs on new irrigation systems; 5) sub-unit meters in new multi-family buildings; 6) assess water losses with IWA/AWWA water audit methodology and develop programs to reduce systems water loss; 7) residential water audits; 8) low-flow retrofit kits for residential; 9) commercial water audits; 10) education and public awareness activities; 11) high-efficiency toilets and urinals in government buildings; 12) new car washes to recycle water; 13) expedited water loss reduction*; 14) multi-family high-efficiency toilet (HET) rebates*; 15) meters with point of use leak detection*; 16) private fire lines to be metered*; 17) maintain a water conservation program*; 18) water waste policy or ordinance; and 19) HET plumbing fixtures in new construction consistent with state legislation.

16. The Metro Water District has made water conservation a priority, and local water systems have shown a strong record of implementation of water conservation measures. In annual progress surveys, the District has found: that tiered water conservation rates are in place throughout the metro area; that water systems serving 96% of the population offer toilet rebates,

and over 76,872 older toilets have been replaced since 2008; that the larger systems have implemented programs to reduce system water losses, and, in 2010, over 10,000 leaks were repaired; and 98% of the population of the metro area is targeted with educational and outreach programs by local governments.

17. In 2010, the Georgia Water Stewardship Act was passed by the Georgia General Assembly and signed by Governor Sonny Perdue. The Water Stewardship Act amplified and supplemented the 19 water conservation policies and programs identified in the Metro Water District's Water Supply and Water Conservation Plan. Among the Act's provisions that supplement the Metro Water District's demand management initiatives are: 1) requiring state government agencies to examine their programs, practices, and rules to identify opportunities to provide for voluntary water conservation; 2) requiring local governments to include water conservation measures in local comprehensive plans; 3) incentives for public water systems to use full cost accounting; and 4) technical assistance to local governments and public water systems for water loss abatement activities.

Return Flows and Net Municipal and Industrial Consumption

18. Returns of treated wastewater to Lake Allatoona or tributaries immediately upstream of Lake Allatoona will help mitigate the effect of withdrawals from Lake Allatoona. As reflected in Metro District plans, EPD and the Metro District project that the average annual returns of treated wastewater to Lake Allatoona and its tributaries in 2040 will be 51.2 mgd, including a direct return to Lake Allatoona by Cobb County in the amount of 23.8 mgd. The net withdrawal from Lake Allatoona is therefore expected to be 100.1 mgd (assuming Richland Creek Reservoir is built).

19. The State of Georgia has allocated and will allocate the treated wastewater returned to Lake Allatoona and its tributaries to particular users of water supply storage in Lake Allatoona. This should increase the yield of the storage account or accounts to which the wastewater return is credited rather than count the same as natural inflows, which increase the yield of a water supply storage account only according to the percentage of total conservation storage owned by that user.

20. I am aware of no legal or legitimate policy reason why the Corps should not credit metered return flows to Lake Allatoona or its tributaries exclusively to individual water supply storage accounts to which the State of Georgia has allocated such returns.

21. In accordance with federal law, the Corps has long recognized that it is the State, not the Corps, that determines and allocates water rights, and that the Corps should defer to the State's allocation of water rights. Allocation of wastewater return flows to individual users is a matter of water rights that is best determined by the State.

22. The return of highly-treated wastewater back into an existing reservoir increases the yield of that reservoir by reducing the net withdrawals. As a result, return flows keep reservoir levels higher and mitigate the impact of water supply withdrawals. Return flows to a water supply reservoir are a form of water reuse that Georgia's statewide water plan favors.

23. EPD-permitted discharges from wastewater treatment plants are a function of water use and not rainfall, and therefore are more consistent and reliable than natural inflows. Because they are metered and reported to EPD, wastewater discharges also are easily monitored and accounted for, ensuring that a user would not obtain credit for any returns that do not actually occur.

24. It is more expensive for local wastewater utilities to discharge wastewater upstream of or into Lake Allatoona than to the Etowah River or its tributaries, because they must treat the wastewater to a higher degree to meet applicable water quality standards. To make it worthwhile for these utilities to return wastewater to Lake Allatoona, there must be policies in place that incentivize those returns. This is why EPD allocates to individual water users the exclusive right to withdraw or store the wastewater returns that are made. The Corps should defer to the State's allocation by crediting these return flows to users' contracted storage accounts.

25. Thus, consistent with federal law and good policy, in determining the yield of the storage space that is held by or for a water supply user, Georgia is requesting that the Corps count exclusively to that user's storage space such returns as the State has allocated to that user.

Why Assurance of Long-Term Supply is Needed Now

26. If Lake Allatoona were not available to satisfy the needs included in Georgia's water supply request, additional reservoirs and water resource projects would be needed to replace it. Due to the complexity and uncertainty associated with the permitting processes, planning for the development of new water supply reservoirs must generally begin 15 to 25 years, or even more, before there is a demand for the water.

27. The three major stages of the planning processes are 1) alternatives analysis and source evaluation; 2) detailed engineering and environmental studies; and 3) state and federal permitting. The first stage includes forecasting future service area population and water demands; evaluating demand management and supply alternatives for meeting the demands; evaluation of source water capacity, quality, and reliability; and development of environmental, historic/archeological, and socio-economic assessments of impacts. In the second stage, detailed engineering and environmental studies must be conducted on the preferred alternatives, and funding sources must be identified and secured. In the third stage, if a new or expanded water supply reservoir is the preferred alternative, the applicant must apply for and secure a Federal Clean Water Act Section 404 permit (issued by the Corps of Engineers), a Clean Water Act Section 401 Water Quality Certification (issued by the State of Georgia), a Safe Dams permit and a water withdrawal permit (both issued by the State of Georgia), and a Safe Drinking Water Act Permit (also issued by the State of Georgia). Before the Corps of Engineers can issue a Section 404 permit, it must comply with provisions of the National Environmental Policy Act (i.e., prepare an Environmental Assessment and possibly an Environmental Impact Statement) and federal regulations. Of all the stages, the Section 404 permitting process generally requires the greatest amount of time and often is followed by legal challenges to the issued permit. As shown in Appendix 4, the process of studying, designing, permitting, financing, and constructing water supply reservoirs in Georgia has required a range of 5 to 25 years to complete, based upon six cases selected for illustration.

28. Those who rely upon the waters of Lake Allatoona for water supply need the assurance of future water supply so that they may plan for future population and economic growth.

29. If Lake Allatoona cannot meet the aforementioned demands, customers who are projected to need water from Lake Allatoona will need to rely in part on alternative water supply sources, including some sources not yet developed.

Lake Allatoona Complements Local Water Supply Efforts

30. As reflected in Paulding County's efforts to build a water supply reservoir on Richland Creek and Cobb County's successful effort to develop Hickory Log Creek reservoir, local governments have been actively planning for their future water supply needs. The State of Georgia will encourage and support local governments in these efforts, as well as in efforts to meet a significant portion of future water supply needs through water conservation activities. When these projects are completed, they will provide additional sources of water to augment, but not replace, the water that Lake Allatoona supplies.

IMPACTS TO OTHER USERS OF LAKE ALLATOONA AND WATERS DOWNSTREAM

31. EPD has performed computer modeling of the reservoir operations and water withdrawals contemplated in Georgia's water supply request to determine the effects of those operations and withdrawals on Lake Allatoona and the Etowah River. EPD's modeling is summarized below and discussed in greater depth in Exhibit A, the Memorandum of Dr. Wei Zeng, manager of EPD's Hydrology Unit.

Hydropower Production at Lake Allatoona

32. The projected water withdrawals and Corps operations necessary to support them will have only a small impact on hydropower production at Lake Allatoona, and an even smaller impact on the combined hydropower production at the two federal reservoirs in the Alabama-Coosa-Tallapoosa ("ACT") River Basin. The impact is even smaller when one looks at the entire Alabama-Georgia-South Carolina system of reservoirs of which Lake Allatoona is a part.

33. The total generating capacity of the hydropower units at Lake Allatoona is 74,400 kilowatts ("kW"). Lake Allatoona has two large hydropower turbines with generating capacity of 36,000 kW, through which the Corps makes releases during hours of peak demand for electricity. In addition, there is a smaller 2,400 kW turbine known as the service unit through which the Corps makes releases to maintain a minimum flow of at least 240 cubic feet per second (cfs) in the Etowah River.

34. The annual production of power at Lake Allatoona in 2011 was 86,308 MWh. By comparison, the other federal hydropower project within the Alabama Coosa-Tallapoosa River Basin, Carters Lake, has 575 MW of installed capacity and generated 536,199 MWh in 2011.

35. Lake Allatoona is a relatively small source of energy. To give some perspective on the relative quantity of power generated at Lake Allatoona, as a percentage of the total electricity

consumed within the State of Georgia in 2010, 137.6 million MWh, Lake Allatoona's power production was only 0.063%.

36. As discussed further in the Memorandum of Wei Zeng, assuming that the Corps allows the withdrawals from Lake Allatoona that Georgia is requesting, the annual average generation for the period of analysis would be only 9.9% less than with current levels of water withdrawal from Lake Allatoona. In terms of the power generated by the two federal ACT Basin reservoirs combined, the decrease in energy production would be only 1.5%.

In-Stream Water Quality Demands Downstream of Lake Allatoona

37. Municipal water systems and businesses discharge treated wastewater to the Etowah River and Coosa River downstream of Lake Allatoona in Georgia. Those entities rely on the waste-assimilative capacity of the Etowah River and Coosa River downstream of Lake Allatoona. Georgia does not anticipate that these withdrawals will cause water quality violations.

Water Supply Downstream of Lake Allatoona

38. On the Etowah River downstream of Lake Allatoona, there are several municipal and industrial facilities that rely on flow in the Etowah River for their water supply needs. These facilities include Georgia Power Plant Bowen, New Riverside Ochre Company Inc., the City of Rome, and Inland-Rome Inc. The total combined withdrawal of these facilities in 2011 was 56.5 mgd on an annual average basis. Georgia EPD projects that the water supply needs of these facilities will be approximately 81.9 mgd as of 2040. According to EPD's analysis, the withdrawals from Lake Allatoona that are contemplated in Georgia's water supply request, with or without Richland Creek Reservoir, will not prevent or impair the supply of water for these downstream needs.

Lake Allatoona's Flood Control Function

39. The current request to reallocate the conservation storage to meet Georgia's projected future water supply needs does not involve changing the elevation of the top of conservation pool. As a result, the size of the flood control pool does not change. Thus, reallocating part of the conservation storage to accommodate Georgia's increased water supply should have no negative effect on flood control capability of Allatoona or the ACT system. Although changes to the size of the flood control pool are not necessary for the Corps to grant Georgia's request, Georgia may still recommend changes to the conservation pool, at the appropriate time, if and when it determines that the benefits of doing so exceed any costs.

Recreation at Lake Allatoona

40. The Corps has established three thresholds for assessing impact of reservoir elevation to recreation at Lake Allatoona. The first threshold is called Initial Recreation Impact Level ("IIL"), which is the level at which falling reservoir elevation first has some adverse effect on recreation. The Corps has determined that the IIL at Lake Allatoona is 837 feet above mean sea

level (msl). The second threshold, the Recreation Impact Level ("RIL"), is the level at which significant impacts to concessions and recreation occurs. The RIL at Lake Allatoona is 835 feet above msl. The third threshold is Water Access Limitation Level ("WAL"), which is the elevation at which more serious impacts to recreation are observed. The WAL at Lake Allatoona is 828 feet above msl.

41. As discussed at greater length in the attached Memorandum of Wei Zeng, assuming net consumption of 124.1 mgd from Lake Allatoona (if Richland Creek reservoir were not built), the increase in percentage of days of IIL, RIL, and WAL at Lake Allatoona will be only 9%, 7%, and 1% respectively.

State Line Flow

42. The water supply withdrawals contemplated in Georgia's water supply request will have only a minor effect on the flow in the Coosa River at the state line. Further, the impact on total stream flows into Lake Weiss at the state line is even more attenuated. The effect of such withdrawals, when they reach their maximum amount, will be around 120 cfs (if the entire withdrawal for Paulding is from Lake Allatoona). The annual average daily flow ("AADF") in the Coosa River at Rome, Georgia, near the state line, is 6,475 cfs. Therefore, Georgia's withdrawals will have no significant impact on the AADF in the Coosa River at the state line. Furthermore, because Lake Weiss is located at the state line and is fed by not only the Coosa River but also the Chattooga and Little Rivers, the flow from these other rivers further attenuate any insignificant effect that Georgia' 2040 withdrawals might have on the total annual average daily flow into Lake Weiss.

43. Because the impact on flow at the state line is very small, the impact in Alabama will be minor. Moreover, there are multiple Alabama Power Company reservoirs on the Coosa River and the Tallapoosa River in Alabama that mitigate any impact on Alabama.

44. EPD cannot reliably model and provide data on the impact of Georgia's water supply request on reservoir levels, hydropower production, navigation, or other uses in Alabama, because such data would depend in large part on how Alabama Power Company operates its reservoirs. EPD lacks information on how Alabama Power will operate its reservoirs in the future. Alabama Power has applied for new Federal Energy Regulatory Commission ("FERC") licenses for its Coosa River reservoirs and for its Martin Project on the Tallapoosa River. In the FERC licensing proceedings, EPD has requested that Alabama Power provide models of how it proposes to operate its reservoirs in the future, but to date Alabama Power has not provided any model that EPD can use to simulate Alabama Power's future operations.

CONCLUSION

45. The foregoing supports the Governor of Georgia's request that the Corps take the following actions:

CONCLUSION

45. The foregoing supports the Governor of Georgia's request that the Corps take the following actions:

(a) Allow gross municipal and industrial water withdrawals from Lake Allatoona to increase to 123.9 million gallons per day (mgd) annual average. Note that the proposed Richland Creek Reservoir is planned to supply Paulding County's 2040 needs that exceed the 23 mgd that will be provided to Paulding County by CCMWA from Lake Allatoona. If Richland Creek Reservoir for any reason is not built, gross municipal and industrial withdrawals from Lake Allatoona will need to be 147.9 mgd annual average to meet 2040 needs.

(b) Allow CCMWA to withdraw from its existing intake in Lake Allatoona water that is released from the Hickory Log Creek Reservoir specifically for CCMWA, without requiring CCMWA to use existing storage space or acquire additional storage space for such withdrawals. Georgia has determined that such releases from Hickory Log Creek Reservoir should allow CCMWA to withdraw approximately 27 mgd on an annual average basis from its intake in Lake Allatoona without using any storage for that withdrawal.

(c) In determining the yield of the storage that a water supply user has purchased, credit to that user exclusively all returns of treated wastewater to Lake Allatoona or its tributaries that the Georgia Environmental Protection Division has permitted and allocated to that user for withdrawal.

(d) To provide long-term certainty for all of those involved, enter into storage contracts that document the parties' understanding as to how the Corps will operate in support of Georgia's water supply needs.

FURTHER AFFIANT SAITH NOT.

This 24th day of January, 2013

Judson H. Turner

Sworn to and subscribed
before me this 24th day
of January, 2013

Yolanda P. Fanning

Notary Public

My commission expires: Sept. 29, 2013

YOLANDA P. FANNING NOTARY PUBLIC HENRY COUNTY EXPIRES GEORGIA SEPT. 29, 2013

APPENDIX 1

Historical and Forecasted Populations of Counties Using Lake Allatoona System for Water Supply

County	*1990*[1]	*2000*[1]	*2010*[1]	*1990-2010 Growth Rate*	*2020*[2]	*2030*[2]	*2040*[3]
Bartow	55,911	76,019	100,157	80%	120,673	143,751	171,242
Cherokee	90,204	141,903	214,346	138%	269,221	333,867	414,036
Cobb	447,745	607,751	688,078	54%	800,469	909,747	1,033,943
Douglas	71,120	92,174	132,403	86%	162,996	203,841	254,921
Fulton	648,951	816,006	920,581	42%	1,095,897	1,284,954	1,506,626
Paulding	41,611	81,678	142,324	242%	192,981	259,834	349,846
Georgia	6,478,216	8,186,453	9,687,653	50%	11,326,787	13,154,530	15,277,205

[1]From US Census Records

[2]From the Georgia Office of Planning and Budget 2012 population projections

[3]Projections based upon assumption that 2030 - 2040 growth rate (in percent) will be same as 2020 – 2030

APPENDIX 2

Facilities Relying on Lake Allatoona for Water Supply

Facility Name	2011 Annual Average Withdrawal (mgd)	2011 Highest Single Month Average Withdrawal (mgd)	Projected Water Demand in 2040 Assuming 24 mgd of Paulding 2040 Demand Provided by Richland Creek Reservoir (Annual Average, mgd)	Projected Water Demand in 2040 Assuming All Paulding Demand Met by Withdrawal from Allatoona (Annual Average, mgd)
City of Cartersville	11.3	13.1	42	42
Cobb-Marietta Water Authority	38.2	51.2	81.9*	105.9

APPENDIX 3

RETURNS (Annual Average)

Year	Total Return to Lake Allatoona and its Tributaries (mgd)	Cobb County's Direct Return to Lake Allatoona (mgd)
Recorded 2011	24.5	14.5
Projected 2040	51.2	23.8

APPENDIX 4

TIME REQUIRED TO PLAN, PERMIT, FINANCE, AND CONSTRUCT WATER SUPPLY RESERVOIRS IN GEORGIA

Project / Activity	Bear Creek Reservoir, Jackson Co.	Cedar Creek Reservoir, Hall Co.	Tussahaw Creek Reservoir, Butts Co.	Big Haynes Creek Reservoir, Rockdale Co.	Line Creek Reservoir (Lake McIntosh), Fayette Co.	Hickory Log Creek Reservoir, Cherokee Co.
Applicant's initial contact with EPD regarding a new reservoir.	2/2/1994	7/17/1996	9/22/2000	11/5/1987	10/27/1987	3/22/2000
Applicant initial contact with the Corps regarding 404 permit for reservoir.	2/2/1994	2/12/1997	9/22/2000	4/29/1991	1/6/1989	3/22/2000
Applicant submits water withdrawal permit application.	3/3/1997	4/2/2002	3/13/2001	6/21/1999	3/21/2001	10/4/2005
EPD comments on withdrawal application.	5/28/1997	4/22/2002	5/22/2001	12/7/1999	4/16/2001	11/22/2005
EPD provides confirmation of need (to the Corps).	4/20/1995	Information unavailable	11/3/2000	5/6/1991	11/20/2000	11/20/2000
Applicant submits 404 application to the Corps.	2/22/1995	8/26/1997	11/15/2000	5/28/1991	5/1/2002	4/27/2000
The Corps notifies public of the 404 application and requests comments.	5/26/1995	10/8/1997	12/27/2000	11/22/1991	10/3/2002	12/27/2000
The Corps responds to applicant's 404 application.	7/1/1995	11/13/1997	2/1/2001	12/28/1991	11/8/2002	2/28/2001
EPD **issues** 401 Water Quality Cert.	5/17/1996	8/21/1998	5/22/2001	8/31/1992	9/6/2006	8/2/2002
EPD issues withdrawal permit.	4/1/2002	8/1/2002	2/14/2003	3/22/2002	9/6/2006	9/12/2008
The Corps issues final 404 permit to applicant.	7/20/1996	11/16/1998	10/23/2002	10/2/1992	6/27/2007	5/24/2004
EPD issues Safe Dams	10/1999	10/2001	8/25/2003	5/31/1994	12/9/2009	4/29/2008

permit.						
Jurisdiction constructs dam.	04/2001	9/11/2003	June 2005	1/27/1997	April 2010	8/5/2005
Jurisdiction fills reservoir.	Spring 2002	8/11/2005	Sept. 2005	June 1998	Started November 1, 2012	6/30/2011

EXHIBIT A

Memorandum of Dr. Wei Zeng, Manager of EPD's Hydrology Unit

Georgia Department of Natural Resources
Environmental Protection Division
Watershed Protection Branch
4220 International Pkwy, Suite 101; Atlanta, Georgia 30354
Linda MacGregor, P. E., Branch Chief
(404) 675-6232

Memorandum

To: Judson Turner, Director, Georgia EPD

From: Wei Zeng, Hydrology Unit, Georgia EPD

Date: January 22, 2013

Subject: Technical Analysis of Georgia's Water Supply Request in Lake Allatoona in the Coosa River Basin

Introduction

You asked me to analyze the impact to the federal reservoirs in the Georgia portion of the Alabama-Coosa-Tallapoosa (ACT) River Basin, to hydropower production and recreation at those reservoirs, and to river flows at the state line with Alabama, of Georgia's projected year 2040 withdrawals from Lake Allatoona in the Coosa River Basin. Georgia is submitting a water supply request to the U.S. Army Corps of Engineers, asking for the Corps to operate Lake Allatoona to accommodate future municipal and industrial direct withdrawals from Lake Allatoona totaling up to 123.9 million gallons per day (mgd) (147.9 mgd if Richland Creek Reservoir does not supply 24 mgd of Paulding County's projected 2040 water supply demand).

The Hydrology Unit of EPD set up a mathematical model of the ACT Basin to analyze the potential impacts of Georgia's request. This memorandum documents the model settings and results.

Platform Model – HEC-ResSim

The mathematical model that we used for this analysis was developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center (HEC) for analyzing reservoir operations and basin-wide water resource management. The Corps calls this platform model "HEC-ResSim." The Corps periodically upgrades HEC-ResSim's capability. The Corps released its current version of the model to the public in May 2011. This version of the model reflected the Corps' then-current ACT Basin reservoir operating plan.

We modeled a 70-year period, assuming rainfall and inflow conditions that occurred from January 1, 1939 to December 31, 2008, and applied to each of these years the Corps' current mode of ACT operation and, as discussed below, varying levels of water supply use. We could only simulate hydrology through the end of 2008 because the Unimpaired Flow (UIF) data developed by the Corps only covers hydrologic conditions through that time.

Model Setting on Water Demand

To understand the impacts of Georgia's water supply request, we compiled current and proposed future water use conditions and ran five different scenarios: what we call Baseline Condition, Scenario A, Scenario B, Scenario C, and Scenario D. The Baseline Condition assumes current water use, as further defined below.

Scenario A isolates the effect of the withdrawals associated with Georgia's water supply request by applying to the model annual average gross withdrawals of 147.9 mgd from Lake Allatoona, which is the projected withdrawal for 2040 if Richland Creek Reservoir does not supply 24 mgd of Paulding County's projected year 2040 demand. Scenario A keeps current demands through the remainder of the ACT Basin. Scenario B is the same as Scenario A, except the gross withdrawal from Lake Allatoona is 123.9 mgd.

Scenarios C and D evaluate the effects of the water use contemplated in Georgia's Water Supply Request in combination with forecasted demands throughout the basin by assuming annual average gross withdrawals of 147.9 mgd (in Scenario C) or 123.9 mgd (in Scenario D) from Lake Allatoona and year 2040 water use throughout the remainder of the ACT Basin in Georgia.

For the Baseline Conditions and Scenarios A, B, C, and D, we kept the Alabama portion of the ACT Platform Model unchanged.

Baseline Condition

To capture the effect of current water use within the Georgia portion of the ACT Basin, we included in the model the most recent available annual (2011) withdrawal and discharge data of all permitted municipal and industrial facilities in the Basin. These include thermal electric power generating facilities that use water for cooling purposes and that incurred consumptive water losses as a result of their cooling operations. We included the estimate of agricultural water use in the Georgia portion of the Basin that Georgia developed as part of its statewide water planning in 2007, which is the best information that we have on Georgia's current agricultural use.

In the Baseline Condition, there is an annual average of 49.5 mgd of municipal and industrial withdrawal directly from Lake Allatoona and an annual average of 14.5 mgd of treated wastewater discharged into the lake. Also, we assumed the current ACT Basin operation, as captured by the May 2011 ACT baseline model, because that is the best available information; while we contemplate that the Corps might alter its operations, we do not have sufficient information on which to alter our assumptions regarding the Corps' operations in any specific way.

Scenario A – Impact of Water Supply Request without Richland Creek Reservoir

The projected 2040 water supply needs from Allatoona include 81.9 mgd to be withdrawn by Cobb County Marietta Water Authority ("CCMWA")(which includes 23 mgd that CCMWA will provide to Paulding County), 42 mgd to be withdrawn by the City of Cartersville, plus an additional 24 mgd to be withdrawn by or for Paulding County. The total amount of water supply withdrawal from Lake Allatoona therefore is 147.9 mgd. There is a projected direct discharge from Cobb County of treated wastewater in the amount of 23.8 mgd to Lake Allatoona.

As Scenario A is intended to isolate the impact of meeting the forecast water supply needs from Lake Allatoona, we held water use elsewhere in the Basin at current levels (that is, levels according to most recent data available).

Scenario B – Impact of Water Supply Request with Richland Creek Reservoir

In Scenario B, we made the assumption that the additional 24 mgd of Paulding County's year 2040 demand is not met by a direct withdrawal from Lake Allatoona. Thus, in comparison to Scenario A, Scenario B reduces the annual average gross withdrawal from Lake Allatoona by 24 mgd. In this scenario, the 2040 gross water withdrawal from Lake Allatoona is 123.9 mgd, which includes 81.9 mgd for Cobb County Marietta Water Authority and 42 mgd for the City of Cartersville. Again, there is a projected direct return of 23.8 mgd to Lake Allatoona.

As Scenario B is also intended to show the isolated impact of meeting the forecast water supply needs from Lake Allatoona, we again held water use elsewhere in the Basin at current levels.

Scenario C – Impact of Water Supply Request without Richland Creek Reservoir and with Georgia's Projected 2040 Water Demand Elsewhere in the Basin

Scenarios C and D mimic Scenarios A and B, respectively, in direct withdrawals from and returns to Lake Allatoona. The difference is with water demands elsewhere in the Georgia portion of the ACT Basin. Scenarios C and D are for analyzing the cumulative effects of such forecast 2040 demands.

In Scenario C, we assumed that, as in Scenario A, 47 mgd of Paulding County's 2040 water need is met by withdrawals from Lake Allatoona. Elsewhere in the Georgia portion of the ACT Basin, we applied projected 2040 water demands. These include projected municipal, industrial, and agricultural water needs. EPD developed the forecasts for those demands as part of the planning associated with the State Water Plan and Regional Water Development Plans. In this scenario, the total direct withdrawal from Lake Allatoona is 147.9 mgd and the return of wastewater to Lake Allatoona is 23.8 mgd.

Scenario D – Impact of Water Supply Request with Richland Creek Reservoir and with Georgia's Projected 2040 Water Demand Elsewhere in the Basin

In Scenario D, we assumed that Richland Creek Reservoir is built and can supply 24 mgd of Paulding County's 2040 demand. This reduces the total withdrawal from Allatoona to 123.9 mgd. The direct return to Allatoona is projected to be 23.8 mgd. Elsewhere in the Georgia portion of the ACT Basin, we applied the projected 2040 water demand (including 24 mgd for Paulding County downstream of Allatoona), as developed in Georgia's State Water Plan and Regional Water Development Plans.

Results and Analysis

In my discussion of the modeling results, Scenarios A, B, C, and D are compared to the Baseline Condition. The potential impact of Georgia's Request is described with regard to:

(1) Average elevations in Lake Allatoona,
(2) Minimum elevations in Lake Allatoona,
(3) Elevation duration curves in Lake Allatoona,
(4) Daily average power generation in the federal reservoirs of Allatoona and Carters,
(5) Percentage of time when there is some level of recreational impact, and
(6) State line flow duration curve.

Reservoir Elevations

Using the ResSim Model, we determined the average and minimum daily elevations, and the elevation duration curves, of Lake Allatoona under the Baseline Condition, Scenarios A, Scenario B, Scenario C, and Scenario D. The average and minimum daily elevations of a reservoir are obtained by looking at the daily elevation of the period of simulation, from January 1, 1939 to December 31, 2008, and calculating the average and minimum daily value for each of the 365 days in a year. The elevation duration curve shows the percentages of time over the entire 70-year period that the reservoirs will exceed certain elevations.

As shown in Slides 9, 17, 25, and 33 of the attached Exhibit 1, the average daily elevation of Lake Allatoona under Scenarios A, B, C, and D respectively will be no more than a few inches lower around May 1 as compared with the Baseline Condition. May 1 is the date on which the top of conservation pool guide curve for Lake Allatoona rises to 840 feet for the first time in the year. Similarly, the average daily elevation of Lake Allatoona around October 1 under Scenario C is less than 2.0 feet lower than under the Baseline Condition, with the difference in Scenarios A, B, and D being 1.6 feet, 1.1 feet, and 1.5 feet respectively.

The difference between the Baseline Condition and Scenarios A, B, C, and D is less pronounced in terms of the daily minimum elevation in Lake Allatoona. (See Slides 10, 18, 26, and 34.) At the lowest point on the minimum daily elevation curve, which usually takes place in the month of December, the elevation under Scenarios C is approximately 0.26 feet lower than in the Baseline Condition. When the other scenarios are compared to the Baseline Condition, there is barely any difference at the lowest point on the minimum daily elevation curve.

The elevation duration curves for Lake Allatoona are shown on Slides 11, 19, 27, and 35. For the upper 10% of the duration curve (representing the times of higher reservoir elevation), the elevation of Lake Allatoona is essentially the same in the Baseline Condition and Scenarios A, B, C, and D. For the lower 90% of the elevation duration curve, the maximum difference between the Baseline Condition and Scenario C is roughly a foot, with the other scenarios having an even smaller difference from the Baseline Condition.

Power Generation

The projected water withdrawals and Corps operations necessary to support them will not have a material impact on the production of hydropower at Lake Allatoona. When Georgia has reached demands of 147.9 mgd from Lake Allatoona, combined with 2040 water supply demands throughout the Georgia portion of the basin, the annual average energy generated at Lake Allatoona is modeled to be 101,470 MWh, in comparison to 114,610 MWh with 2011 water demand throughout the Georgia portion of the basin (Scenario C). Thus, assuming 2040 water supply demands, there would be an 11.5% reduction in power produced at Allatoona. When the comparison is made to isolate the impact of just the Georgia Water Supply request in Lake Allatoona, the impact on hydropower production is only 9.9%. The impact will be even less in the years before Georgia's water demand has reached 147.9 mgd.

As shown by Slides 12, 20, 28 and 36, as well as a summary table in Slide 42, Georgia's future water supply demands will have very little impact on the total amount of energy produced by the two federal reservoirs in the Georgia portion of the ACT Basin, Lake Allatoona and Carters Lake. Under Scenario A, when Georgia has reached demands of 147.9 mgd, there will be only a reduction of 31 MWh in daily average generation at Allatoona and Carters combined. Under Scenario C, the reduction in daily average generation will be only 36 MWh. In comparison to the baseline total daily average energy production of 2,127 MWh (annual average energy production of 776,355 MWh) from Allatoona and Carters combined, the reduction under Scenario A is 1.5%, and the reduction under Scenario C is only 1.8%, of the daily energy output in the Baseline Condition. When the assumption of RCR providing 24 mgd of water supply to Paulding County is made, these reductions only constitute 1.1% (Scenario B) and 1.4% (Scenario D) of reduction in energy production in the Baseline Condition.

Recreational Impact

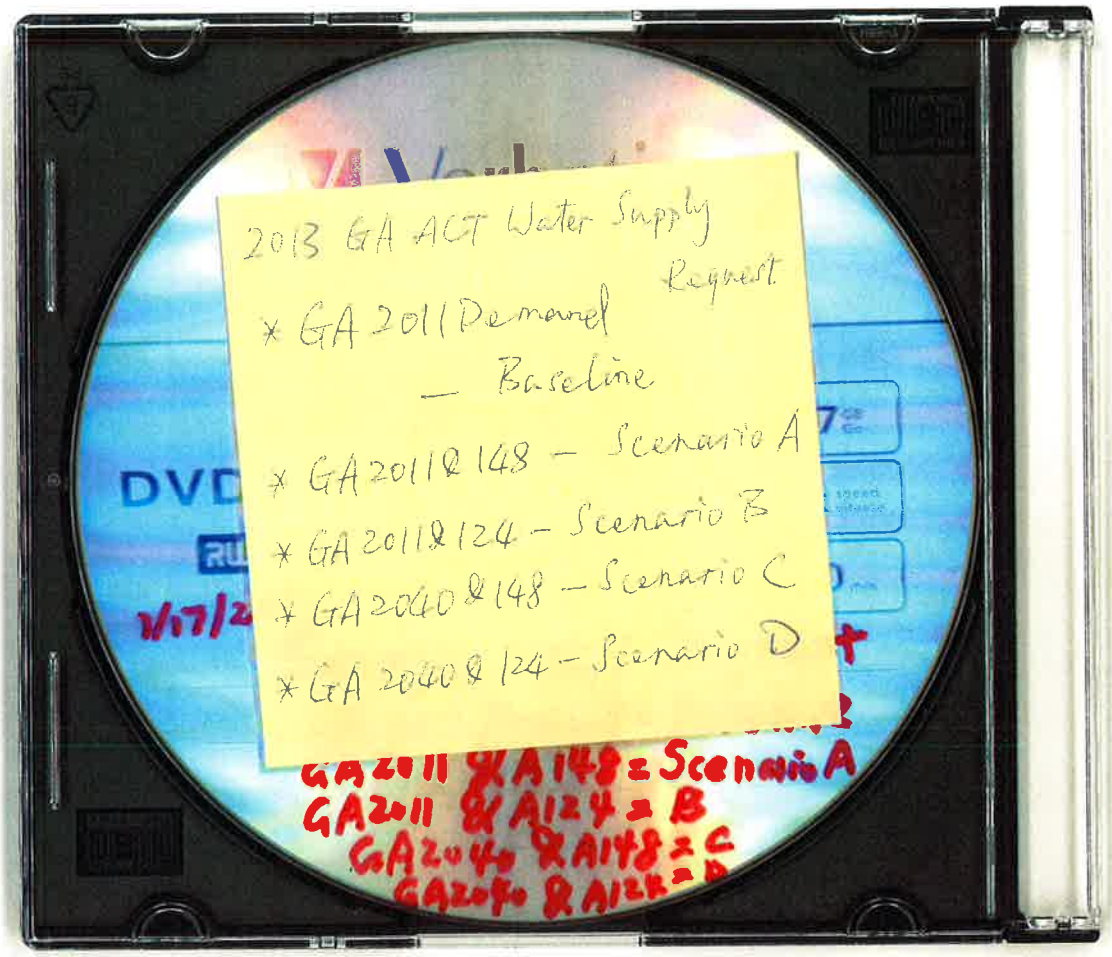
We evaluated the recreational impact at Lake Allatoona by looking at the peak recreational season, defined by the Corps as Memorial Day through Labor Day, and tallying the percentage of days when elevation of a reservoir is lower than the three levels of recreational impact, which are, in increasing degree of impact, the Initial Impact Line (IIL) at 837 feet, Recreational Impact Line (RIL) at 835 feet, and Water Access Limitation (WAL) at 828 feet.

The impact to Allatoona recreation is shown on Slides 13, 21, 29, and 37, and summarized in a table on Slide 43. In Scenario A, as compared with the Baseline Condition, the increase in percentage of days of IIL, RIL, and WAL at Lake Allatoona will be 9%, 7%, and 1% respectively. Assuming 2007 hydrologic conditions, which were very dry, the total number of days when Allatoona experiences WAL under Scenario A, B, C, or D is 36 days, and in the Baseline Condition is 31 days. Under all scenarios, including the Baseline, Lake Allatoona would be below IIL and RIL for the entire 2007 recreation season. Thus, Georgia's Water Supply Request does not have a big impact on recreation over all years, nor a major impact in an extremely dry year like 2007.

State Line Flow

There is a very small difference, around 120 cfs, between Scenario A and the Baseline Condition alternative in terms of state line flow duration curve, which suggests that the isolated increase in water supply in the metro Atlanta area itself will not result in any significant change in state line flow. (See Slides 14 and 15.) The difference between Scenario B and the Baseline Condition is even smaller, less than 90 cfs. (See Slides 22 and 23.) For Scenarios C and D, in which we assumed projected 2040 water demands elsewhere in the Georgia portion of the Basin, the difference between the two scenarios and the Baseline Condition is about 230 cfs. (See Slides 30, 31, 38, and 39.)

This 230 cfs is less than 3.6% of the long term (1950-2011) average of 6,475 cfs at Coosa River near Rome, Georgia. Overall, the change in state line flow is minor in comparison to the magnitude of the observed state line flow under the Corps' existing operation.


2013 GA ACT Water Supply
Request
* GA 2011 Demand
– Baseline
* GA 2011 & 148 – Scenario A
* GA 2011 & 124 – Scenario B
* GA 2040 & 148 – Scenario C
* GA 2040 & 124 – Scenario D
GA 2011 & A148 = Scenario A
GA2011 & A124 = B
GA2040 & A148 = C
GA2040 & A124 = D

ACT Water Supply Request Evaluations

Georgia EPD

Hydrology Unit

January 2013

ACT Water Supply Request Modeled Scenarios

- Baseline conditions
  - 2011 recorded M&I water use through out the Georgia portion of the basin, including on Allatoona
  - Total withdrawal on Allatoona 49.5 mgd
  - Cobb County return to Allatoona 14.5 mgd
  - 2007 estimated agricultural water use through the Georgia portion of the basin
  - May 2011 version of the Corps ACT baseline model otherwise

ACT Water Supply Request Modeled Scenarios

- Scenario A Isolating Water Supply Impacts
  - 2040 water supply needs on Allatoon
  - CCMWA projected 81.9 mgd withdrawal
  - Paulding County's 24 mgd additional needs projected on Allatoona (RCR not built)
  - City of Cartersville's 42 mgd on Allatoona
  - Total Allatoona withdrawal 147.9 mgd
  - Cobb County's projected 23.8 mgd of discharge into Allatoona
  - All other conditions held as in Baseline

ACT Water Supply Request Modeled Scenarios

- Scenario B Isolating Water Supply Impacts
  - 2040 water supply needs on Allatoon
  - CCMWA projected 81.9 mgd withdrawal
  - Paulding County's 24 mgd additional needs NOT placed on Allatoona (RCR built)
  - City of Cartersville's 42 mgd on Allatoona
  - Total Allatoona withdrawal 123.9 mgd
  - Cobb County's projected 23.8 mgd of discharge into Allatoona
  - All other conditions held as in Baseline

ACT Water Supply Request Modeled Scenarios

- Scenario C Cumulative Impacts
  - 2040 water supply needs on Allatoon
  - CCMWA projected 81.9 mgd withdrawal
  - Paulding County's 24 mgd additional needs projected on Allatoona (RCR not built)
  - City of Cartersville's 42 mgd on Allatoona
  - Total Allatoona withdrawal 147.9 mgd
  - Cobb County's projected 23.8 mgd of discharge into Allatoona
  - 2040 demand in the rest of the ACT basin in GA

ACT Water Supply Request Modeled Scenarios

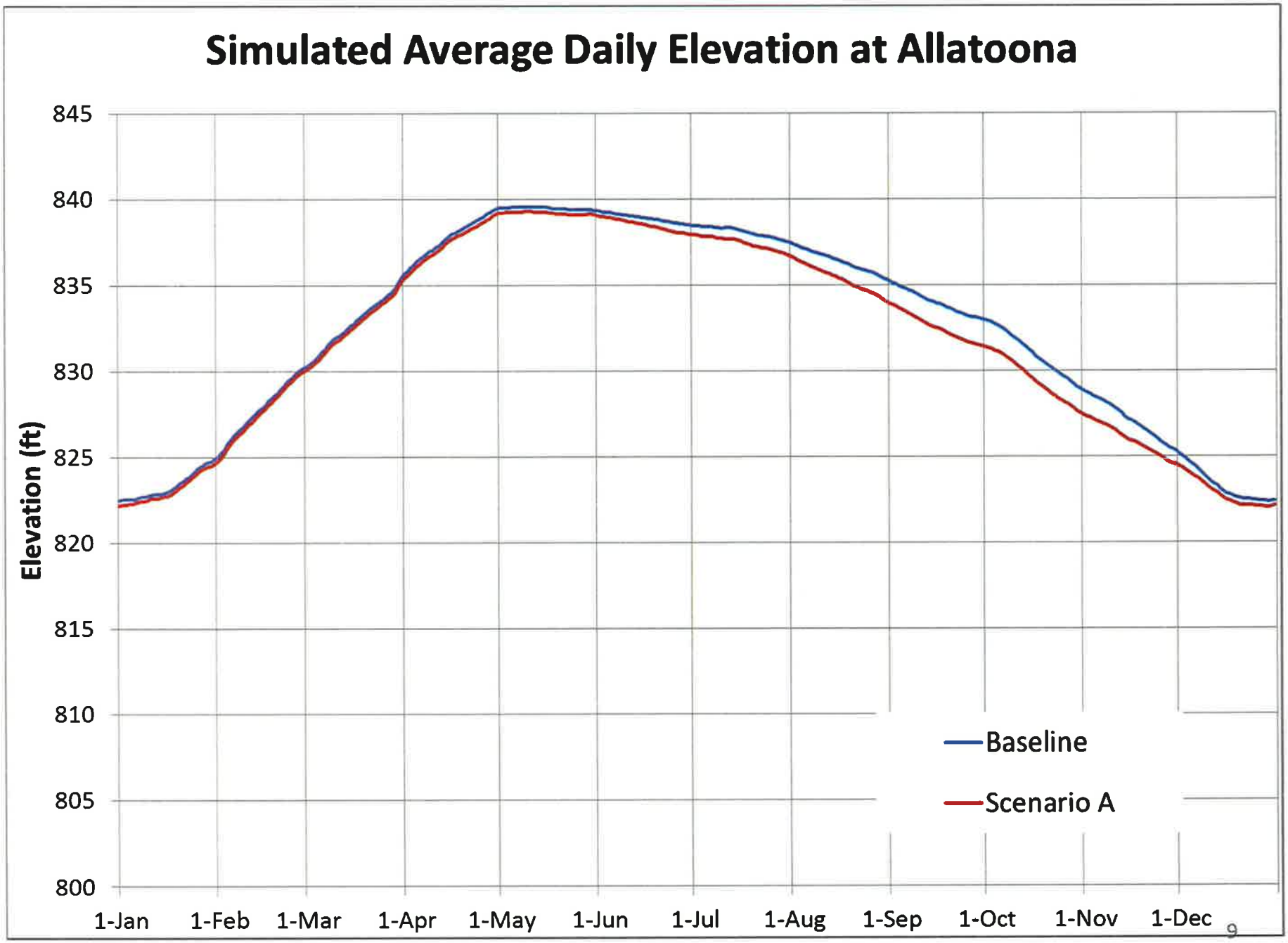
- Scenario D Cumulative Impacts
  - 2040 water supply needs on Allatoon
  - CCMWA projected 81.9 mgd withdrawal
  - Paulding County's 24 mgd additional needs NOT placed on Allatoona (RCR built)
  - City of Cartersville's 42 mgd on Allatoona
  - Total Allatoona withdrawal 123.9 mgd
  - Cobb County's projected 23.8 mgd of discharge into Allatoona
  - 2040 demand in the rest of the ACT basin in GA

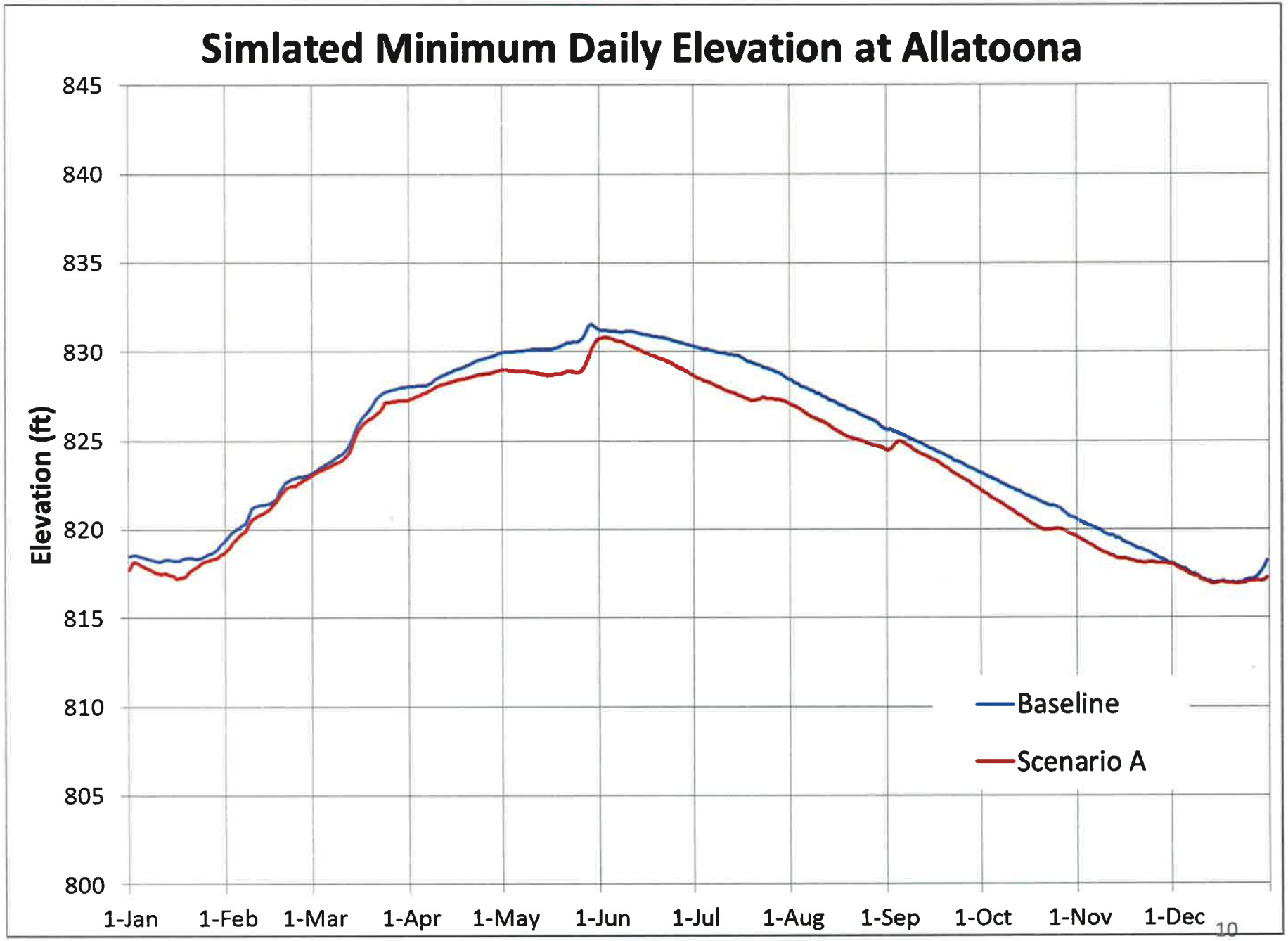
Evaluating Modeling Results

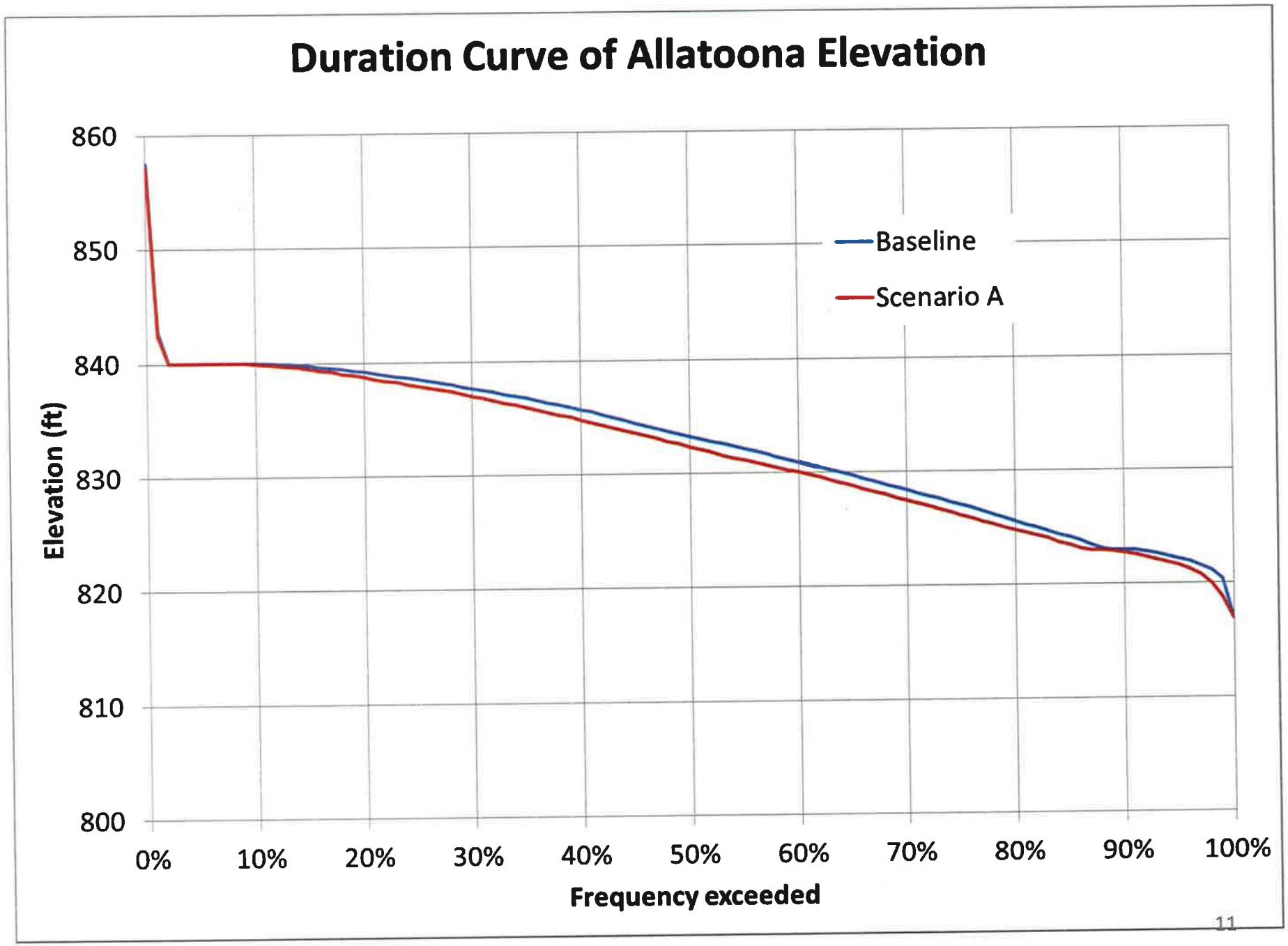
- Allatoona average daily elevation
- Allatoona minimum daily elevation
- Allatoona elevation exceedance curve
- Power generation in Corps projects in GA
- Recreational impacts
- State line flow duration

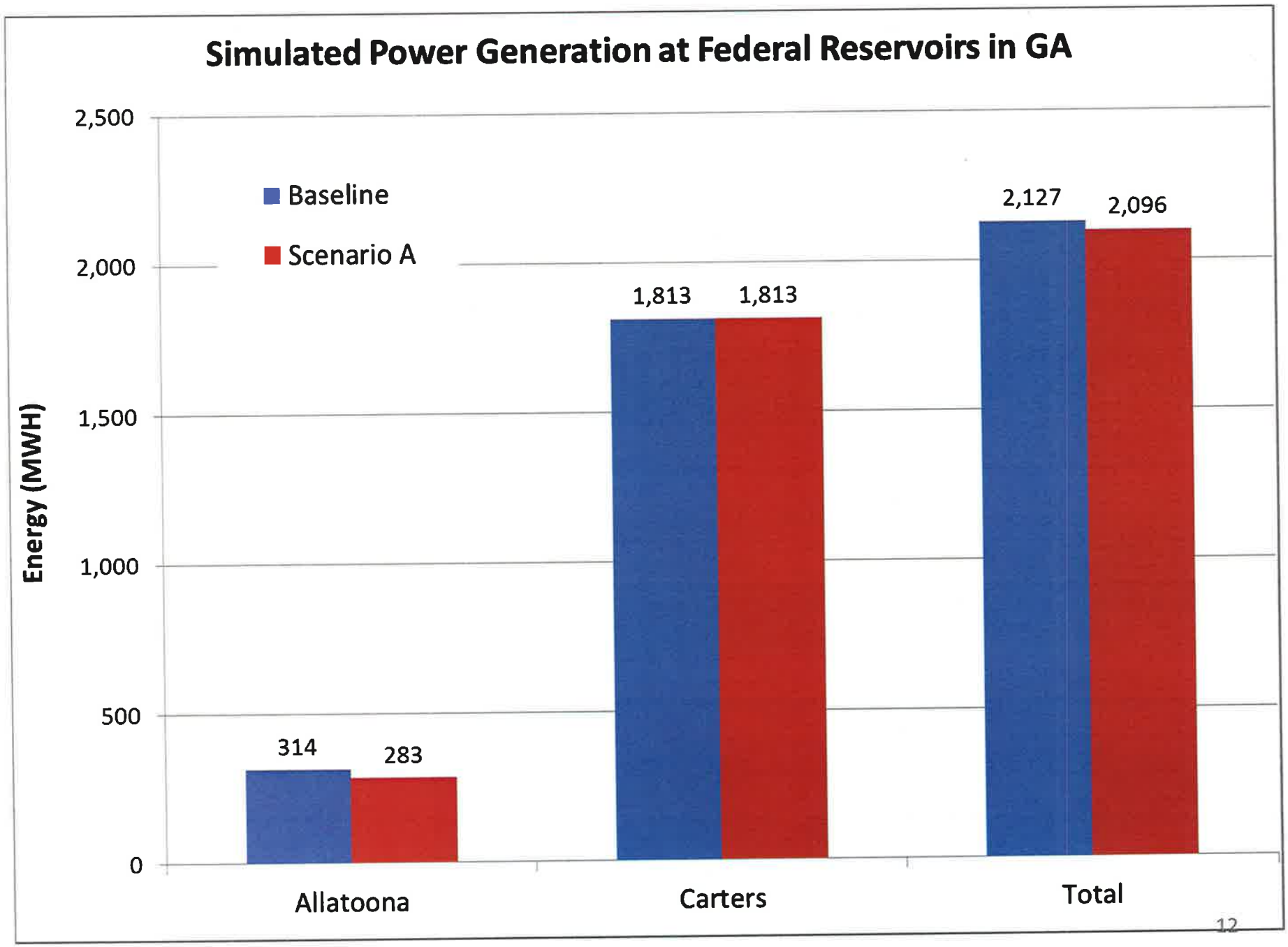
Modeling Results

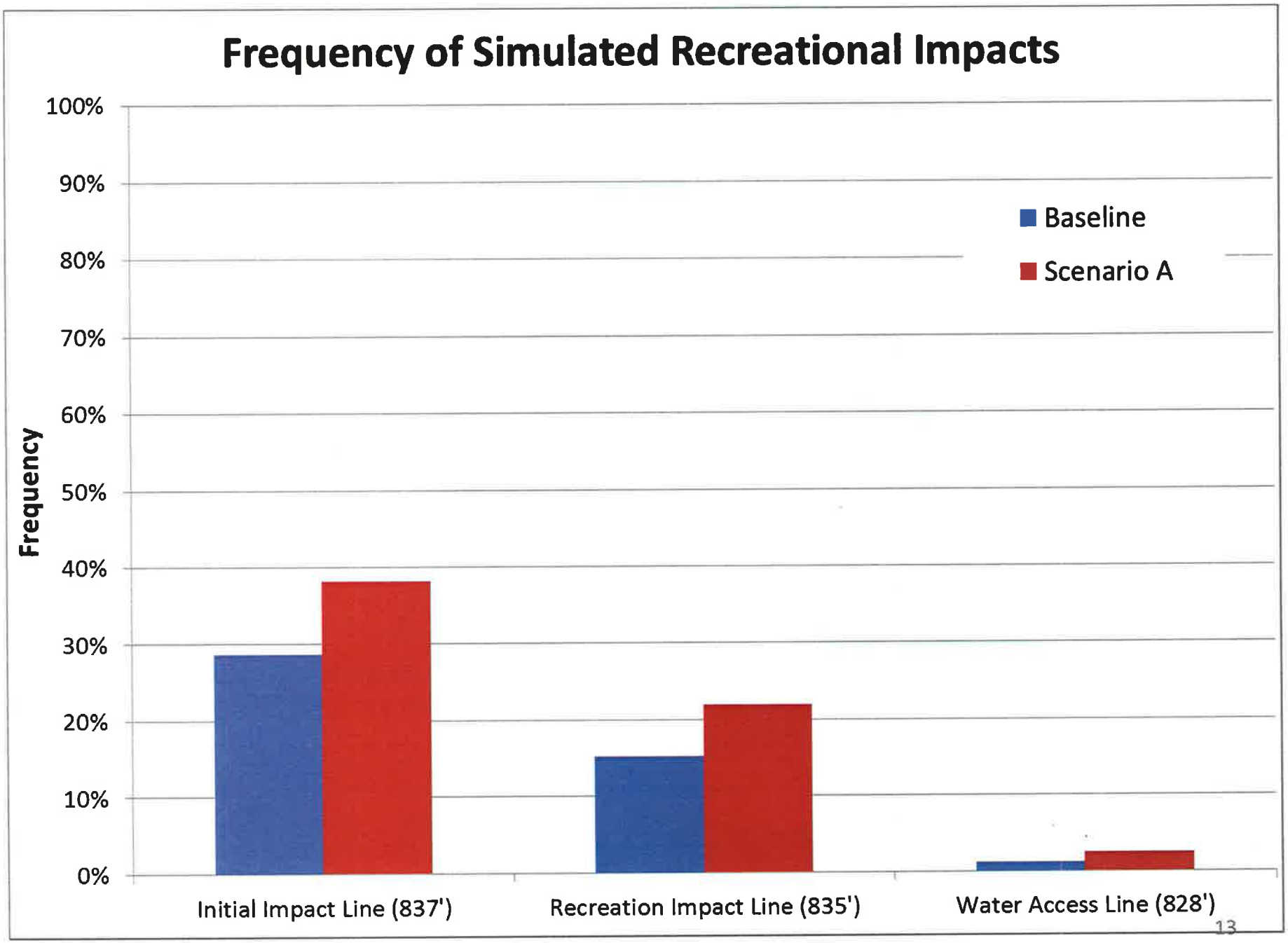
- Baseline vs. Scenario A

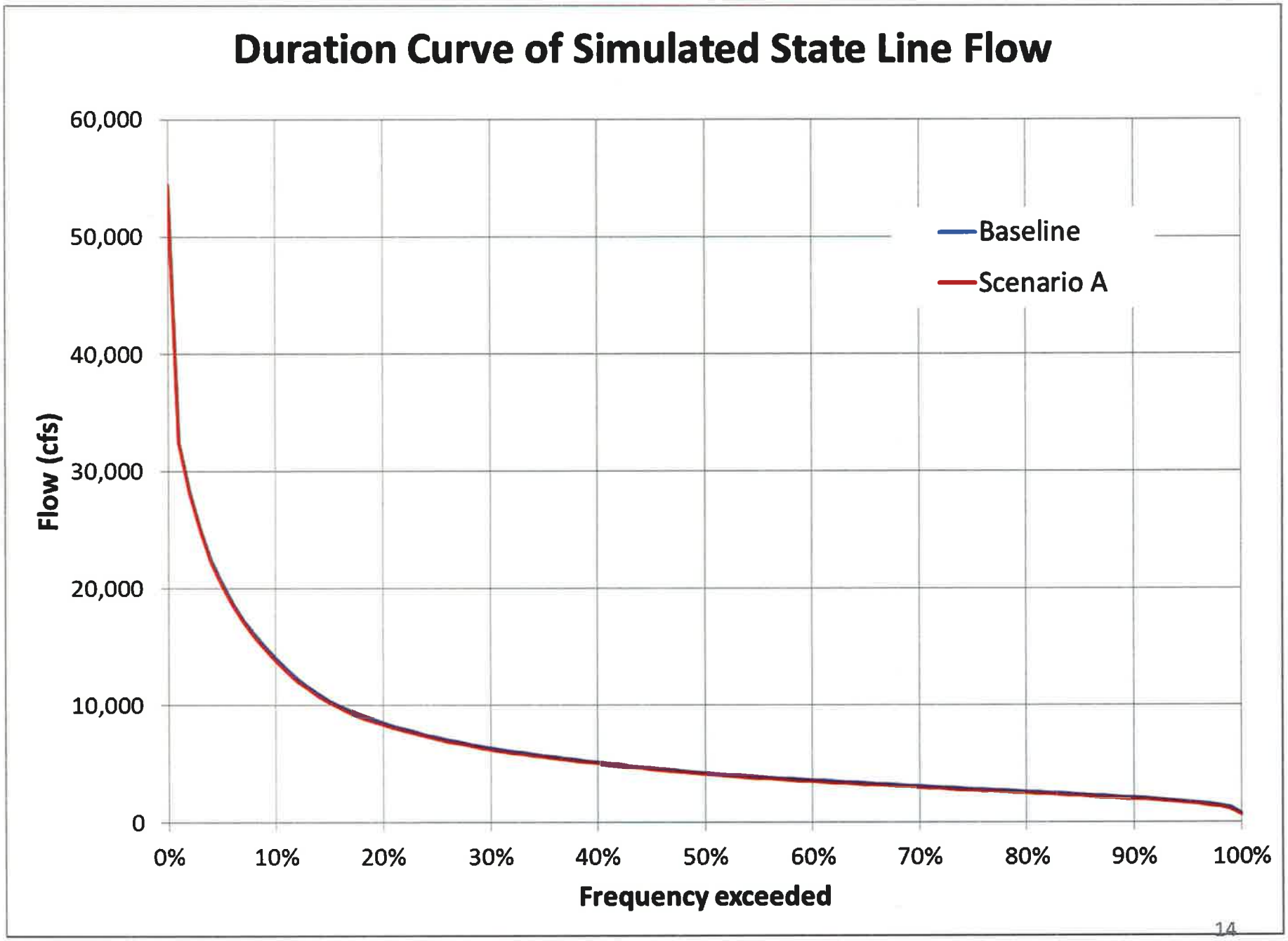

Simulated Average Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline
Scenario A


Simlated Minimum Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline
Scenario A

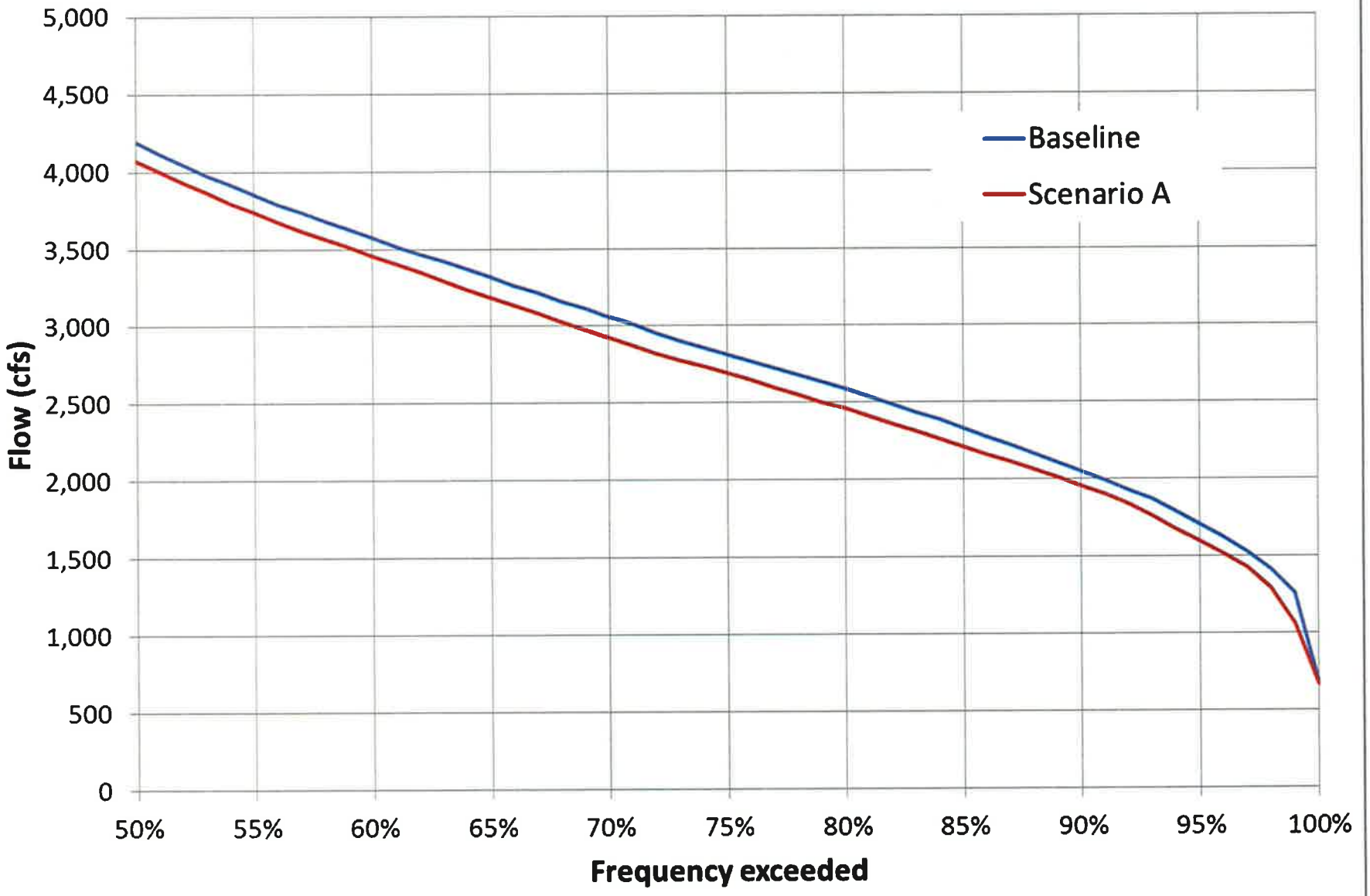

Duration Curve of Allatoona Elevation
860
850
840
830
820
810
800
Elevation (ft)
Baseline
Scenario A
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded


Simulated Power Generation at Federal Reservoirs in GA
Energy (MWH)
2,500
2,000
1,500
1,000
500
0
Baseline
Scenario A
314
283
1,813
1,813
2,127
2,096
Allatoona
Carters
Total


Frequency of Simulated Recreational Impacts
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Frequency
Baseline
Scenario A
Initial Impact Line (837')
Recreation Impact Line (835')
Water Access Line (828')

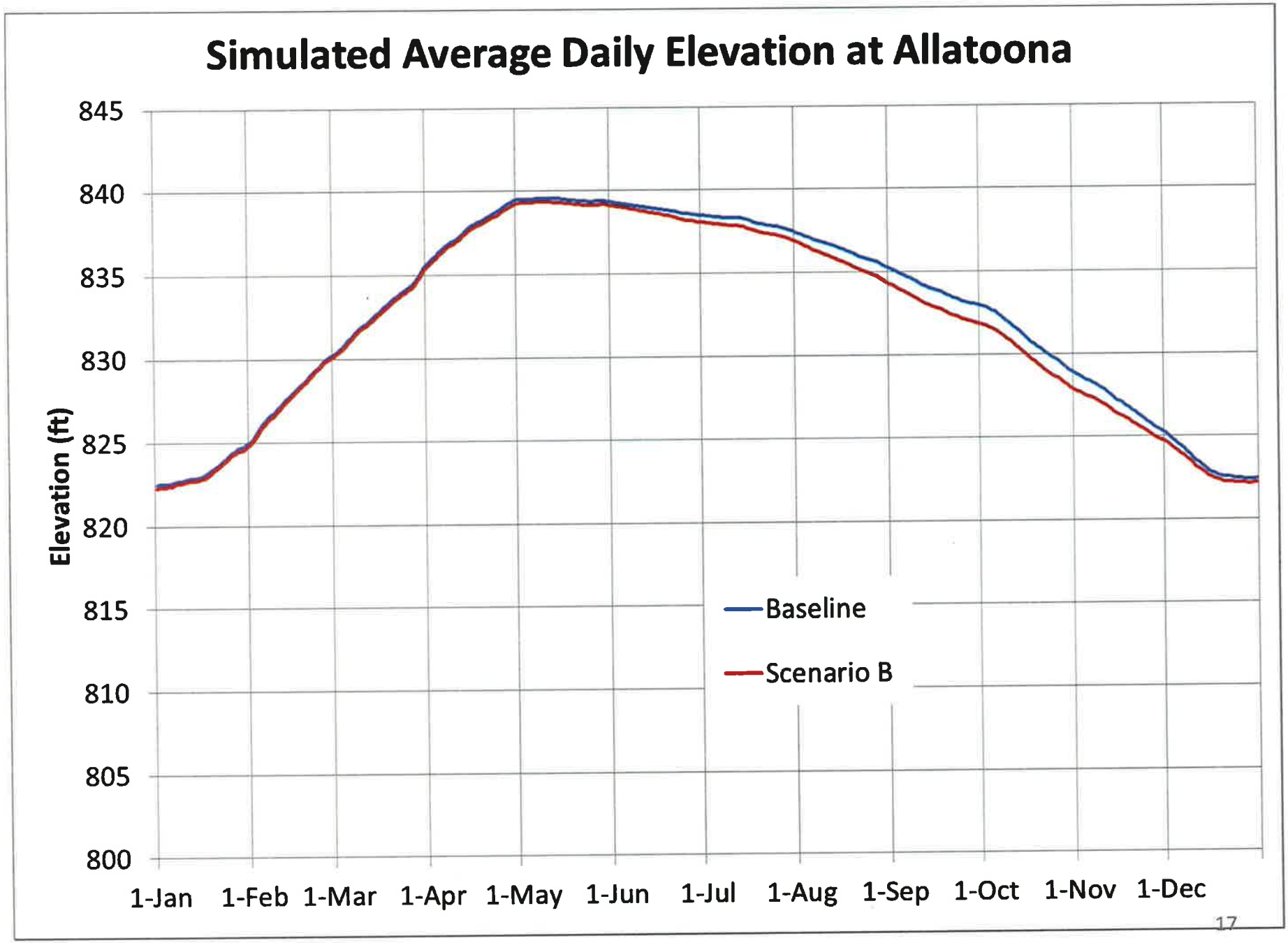

Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline
Scenario A
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded

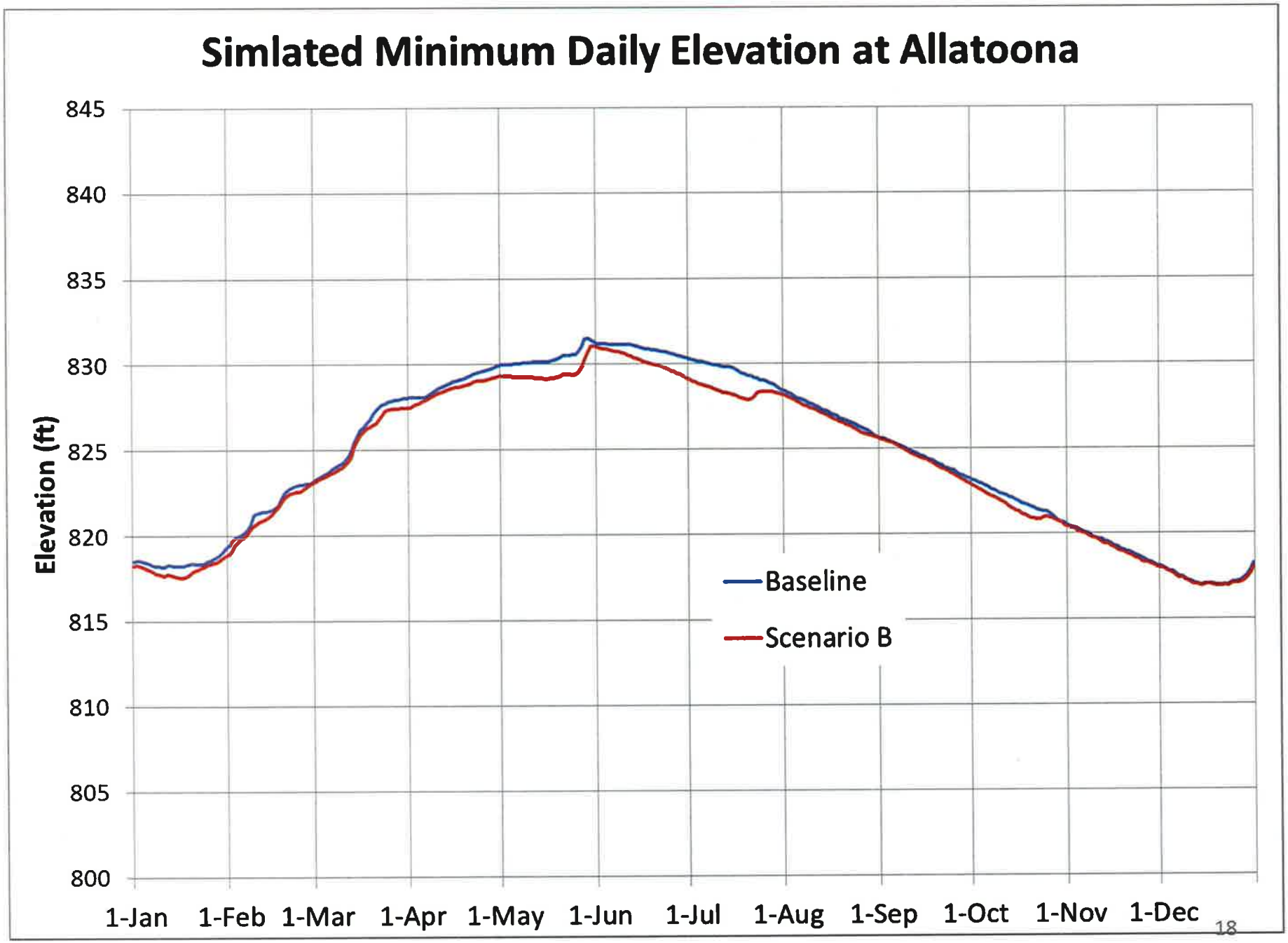
Duration Curve of Simulated State Line Flow

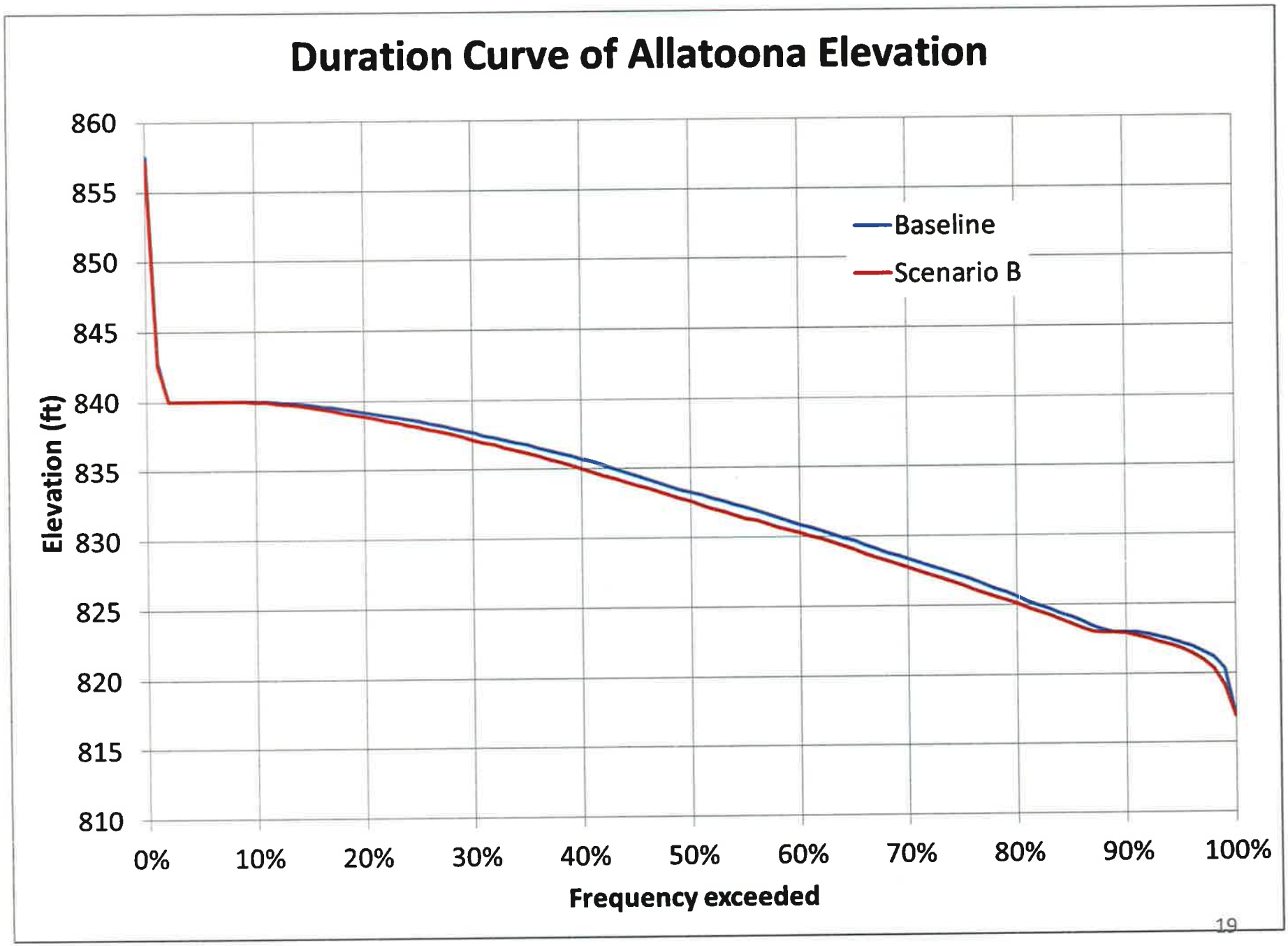


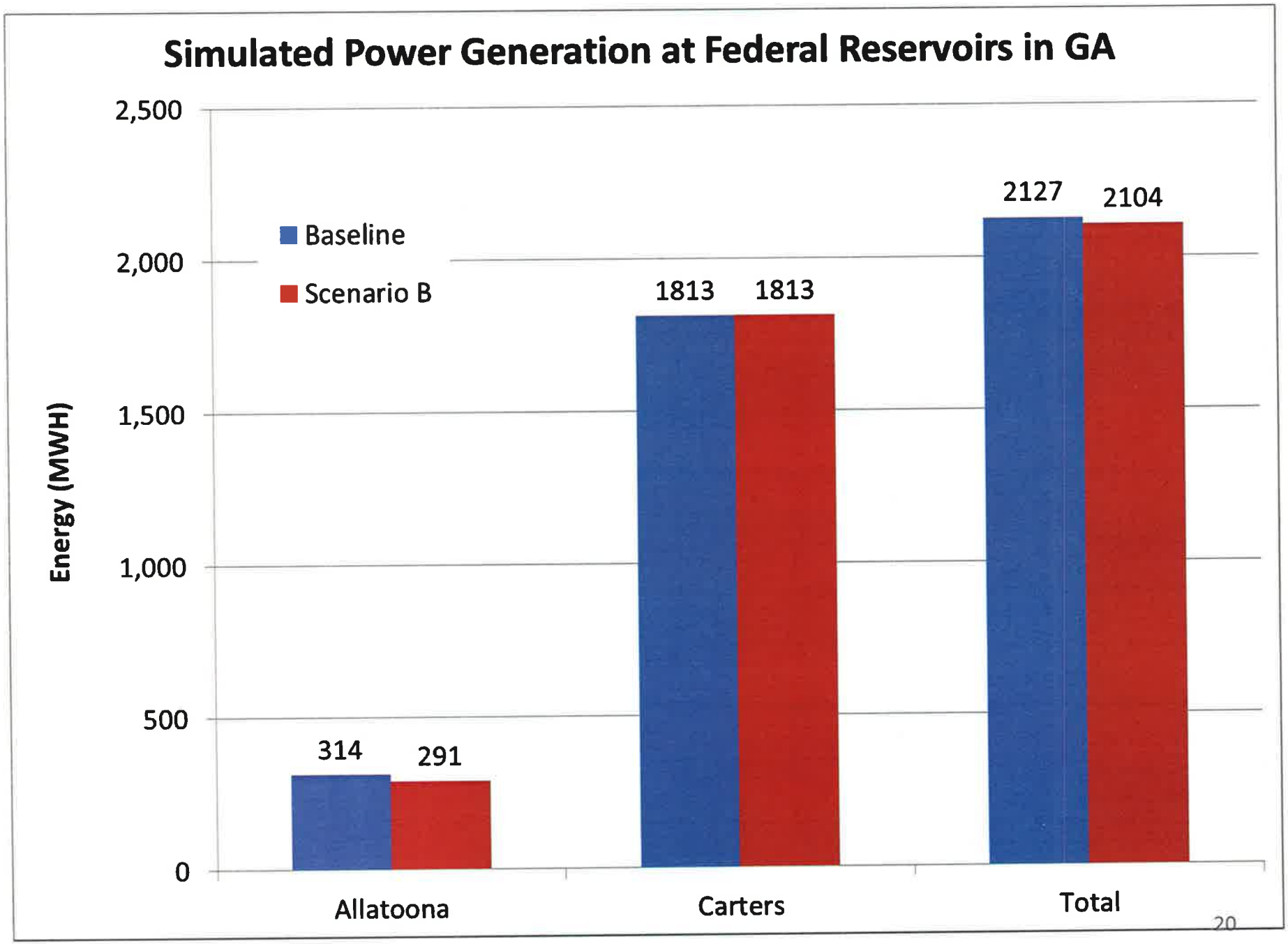
Modeling Results

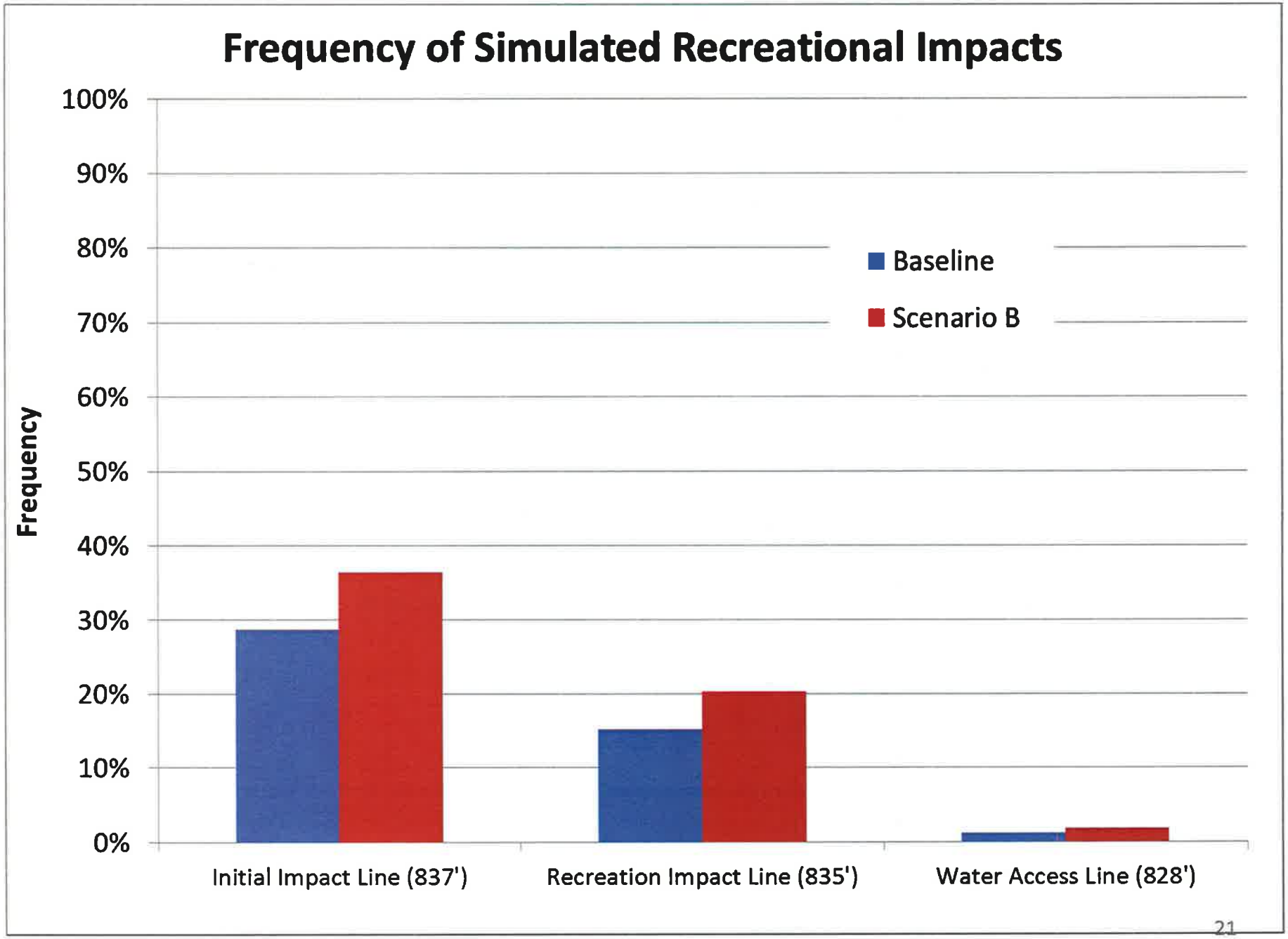
- Baseline vs. Scenario B

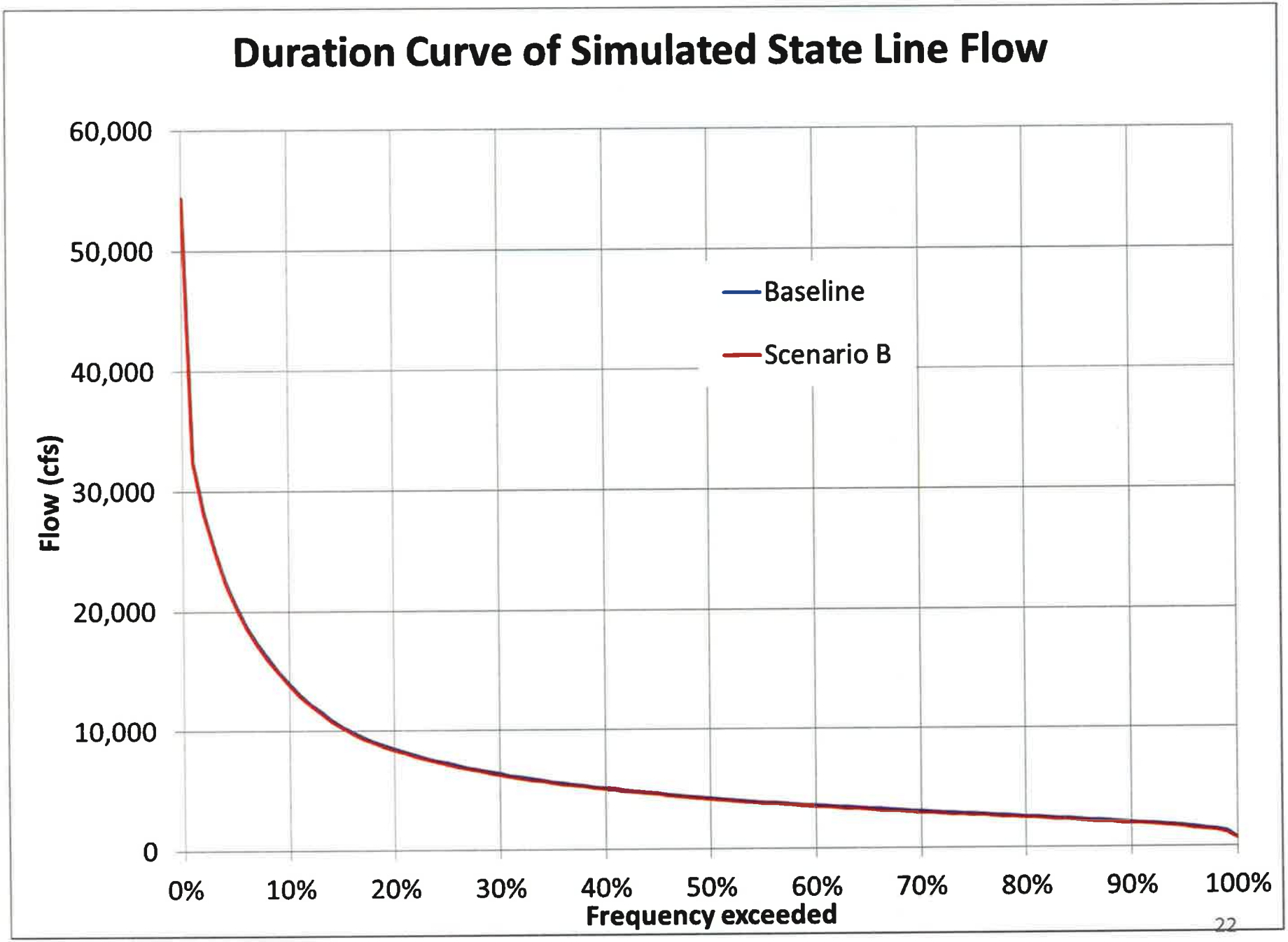

Simulated Average Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline
Scenario B


Simlated Minimum Daily Elevation at Allatoona
Elevation (ft)
845
840
835
830
825
820
815
810
805
800
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Baseline
Scenario B

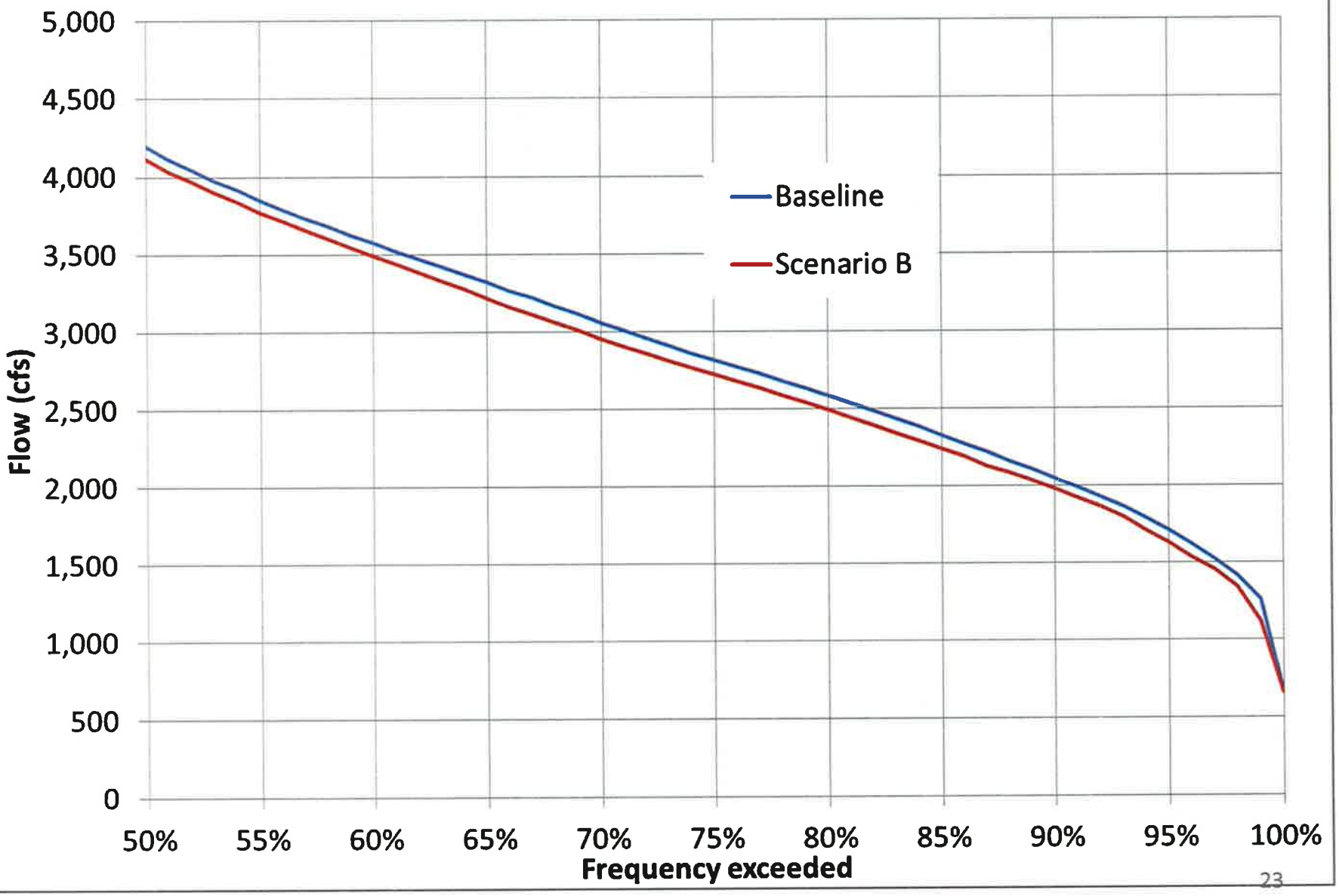

Duration Curve of Allatoona Elevation
860
855
850
845
840
835
830
825
820
815
810
Elevation (ft)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded
Baseline
Scenario B


Simulated Power Generation at Federal Reservoirs in GA
Energy (MWH)
2,500
2,000
1,500
1,000
500
0
Baseline
Scenario B
314
291
1813
1813
2127
2104
Allatoona
Carters
Total


Frequency of Simulated Recreational Impacts
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Frequency
Baseline
Scenario B
Initial Impact Line (837')
Recreation Impact Line (835')
Water Access Line (828')


Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline
Scenario B
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded

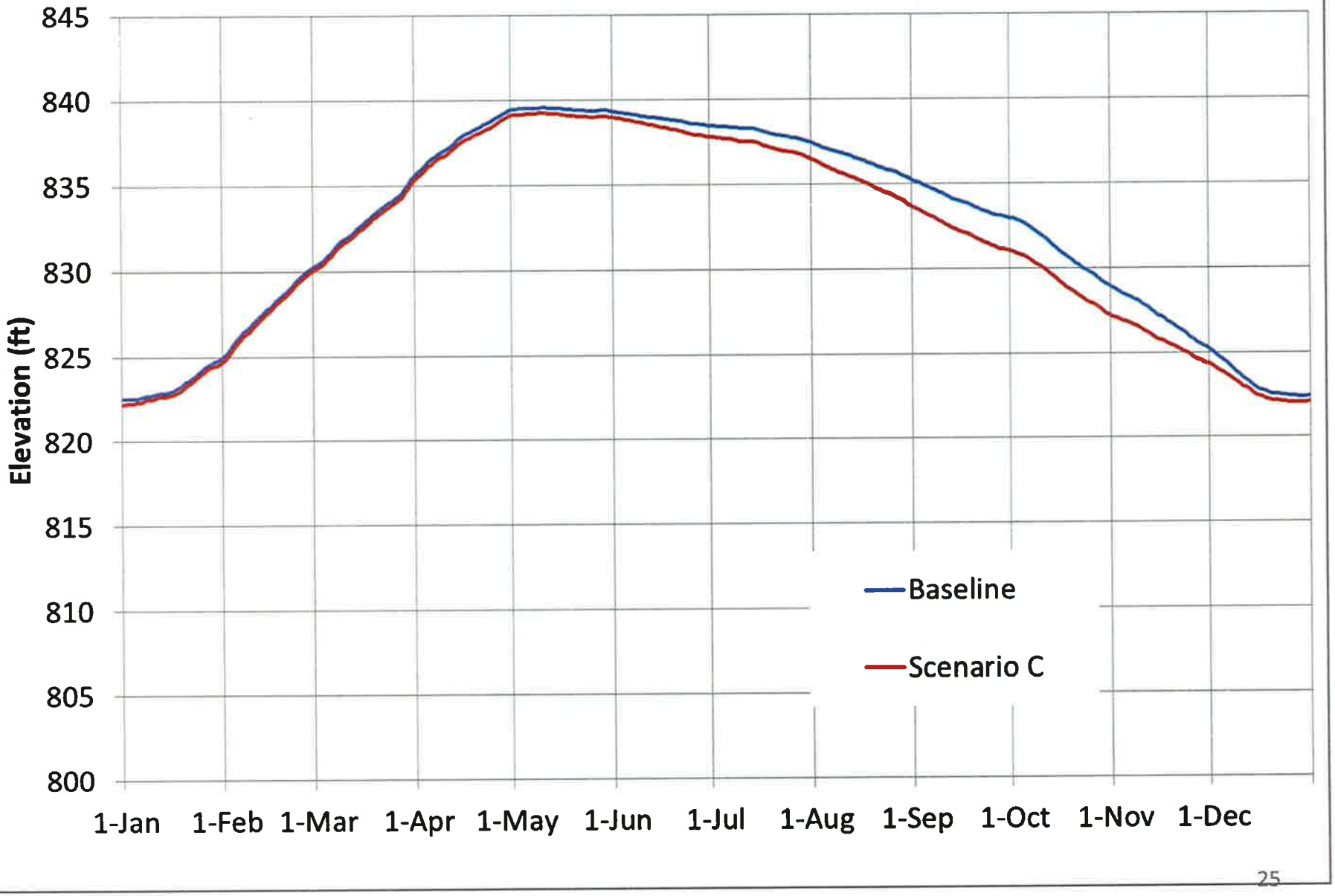
Duration Curve of Simulated State Line Flow



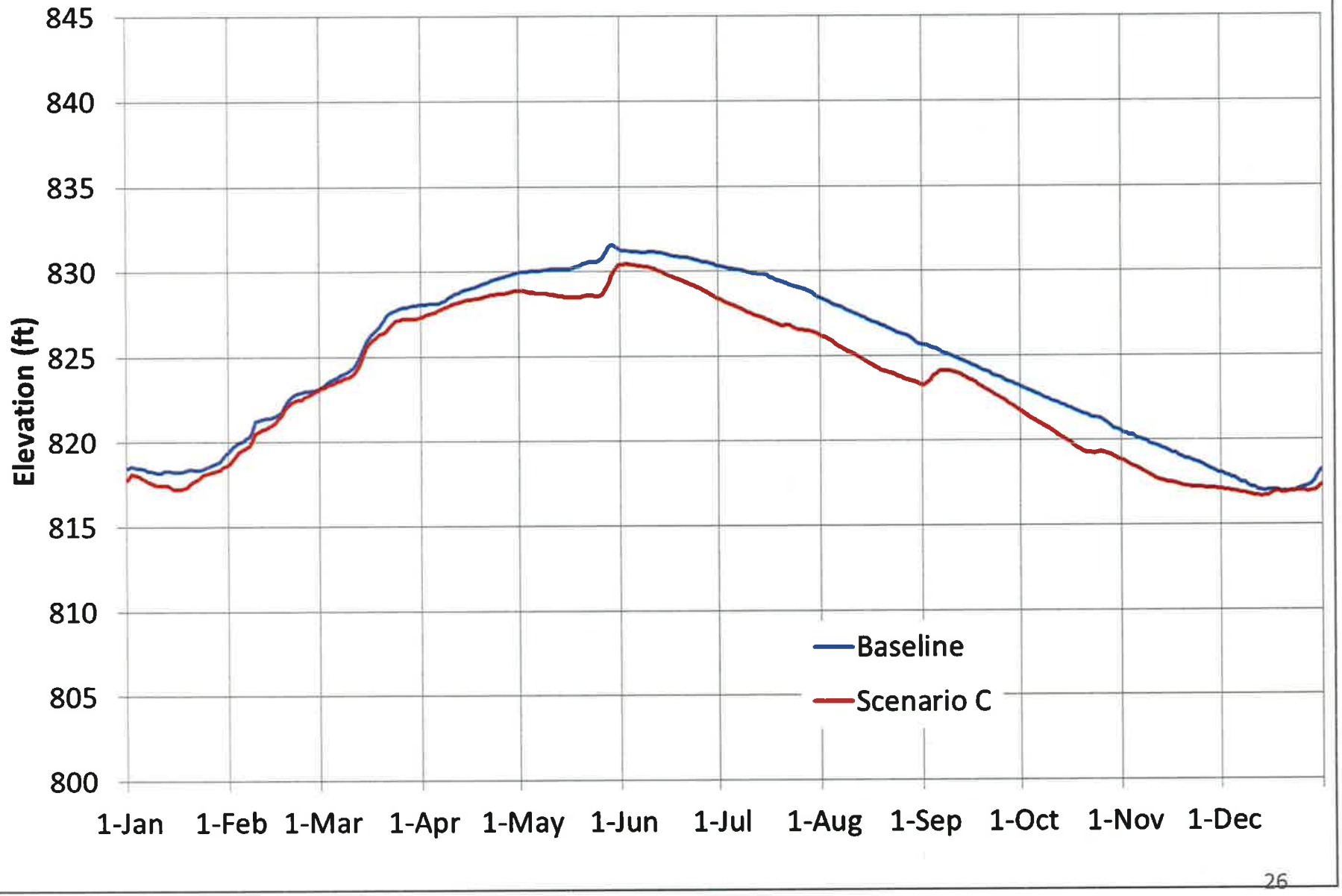
Modeling Results

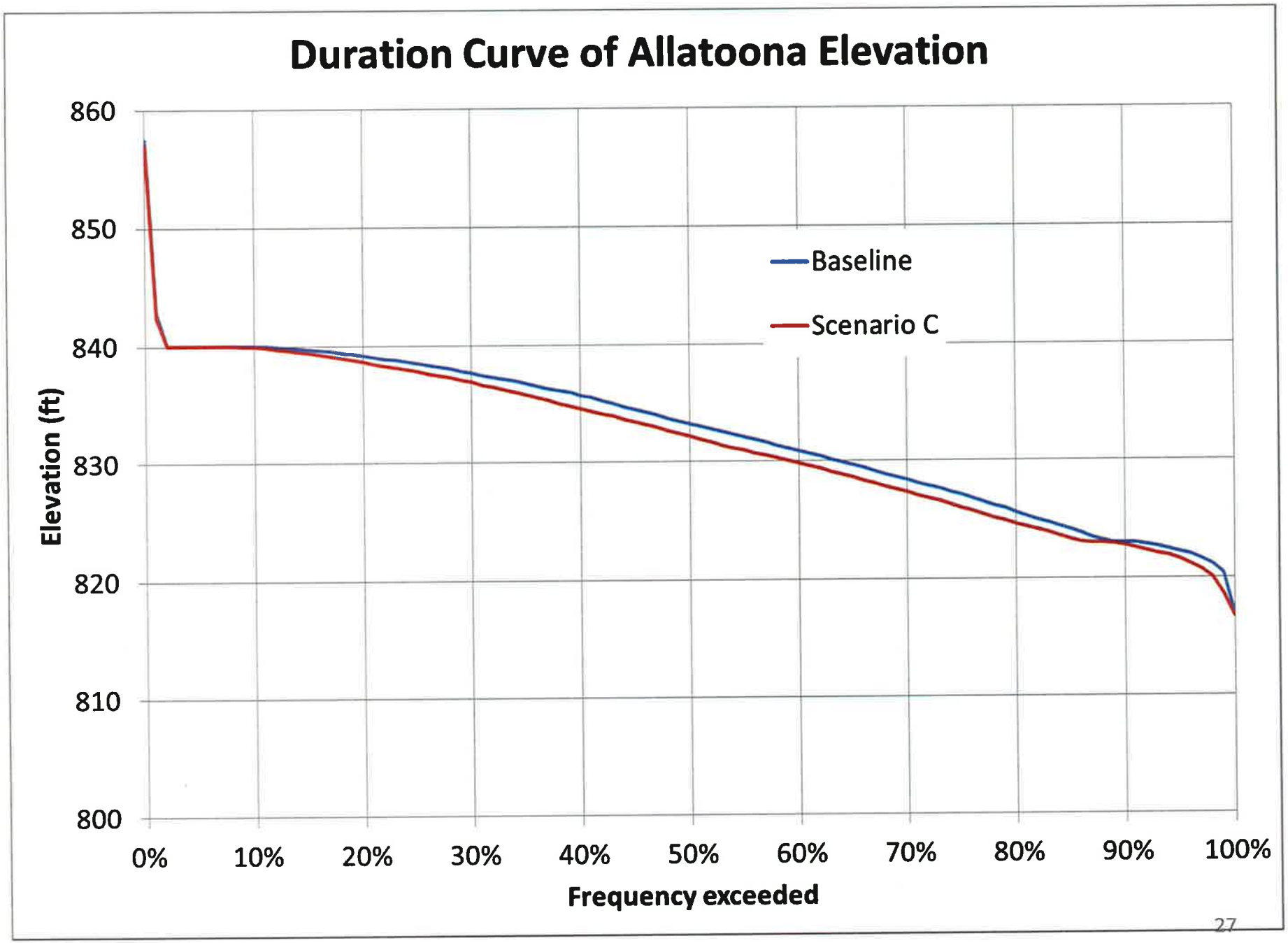
- Baseline vs. Scenario C

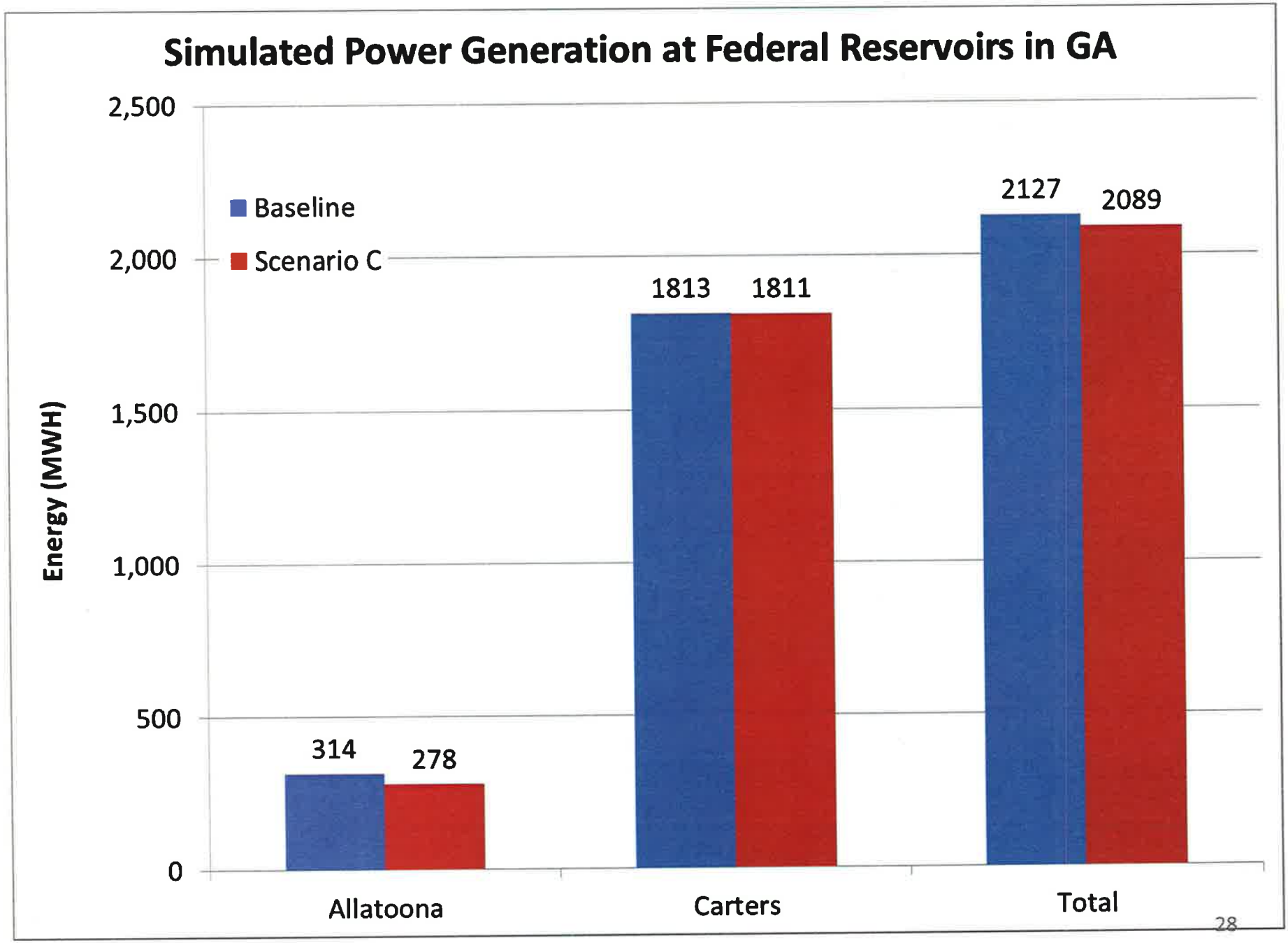
Simulated Average Daily Elevation at Allatoona

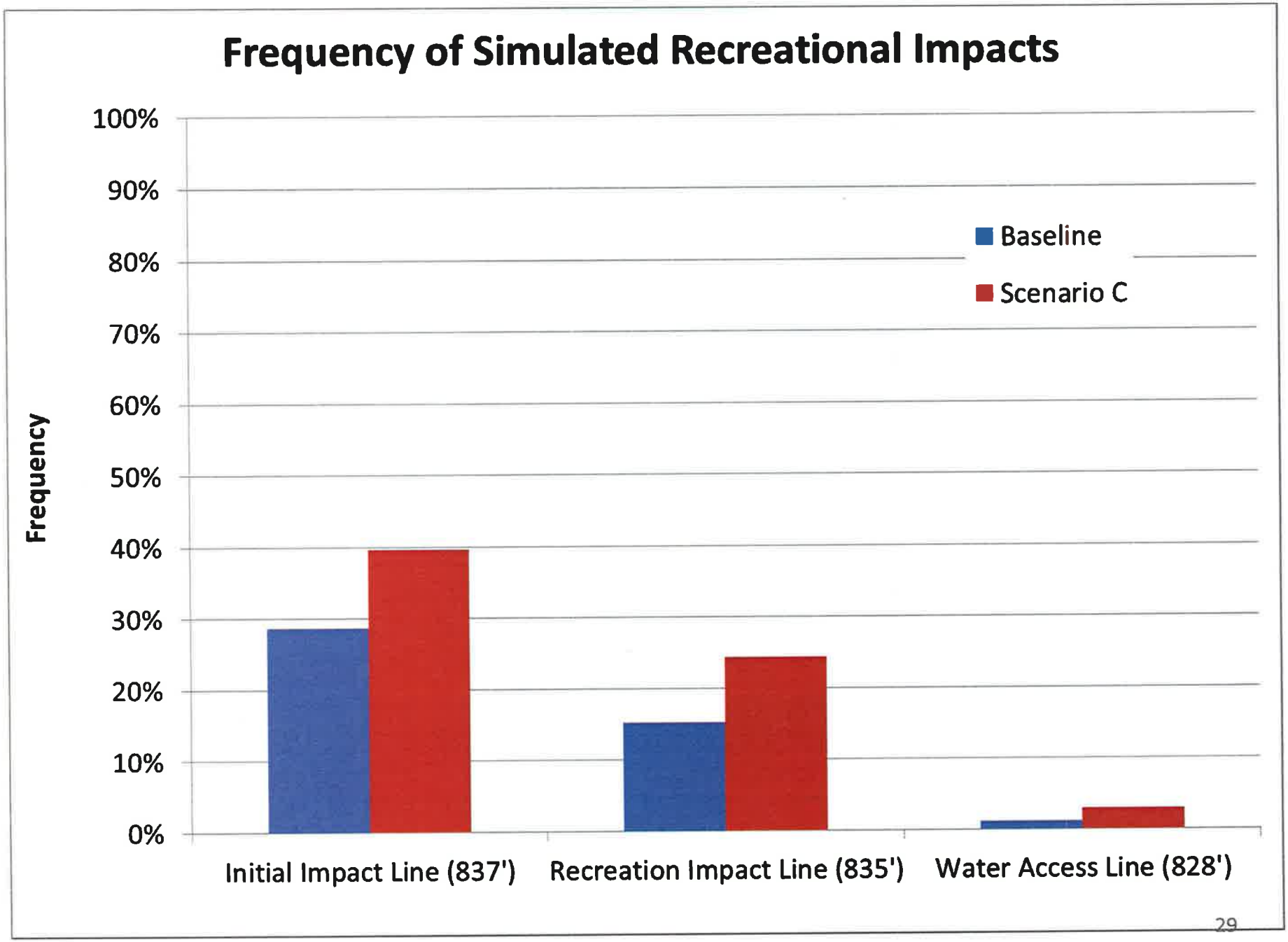


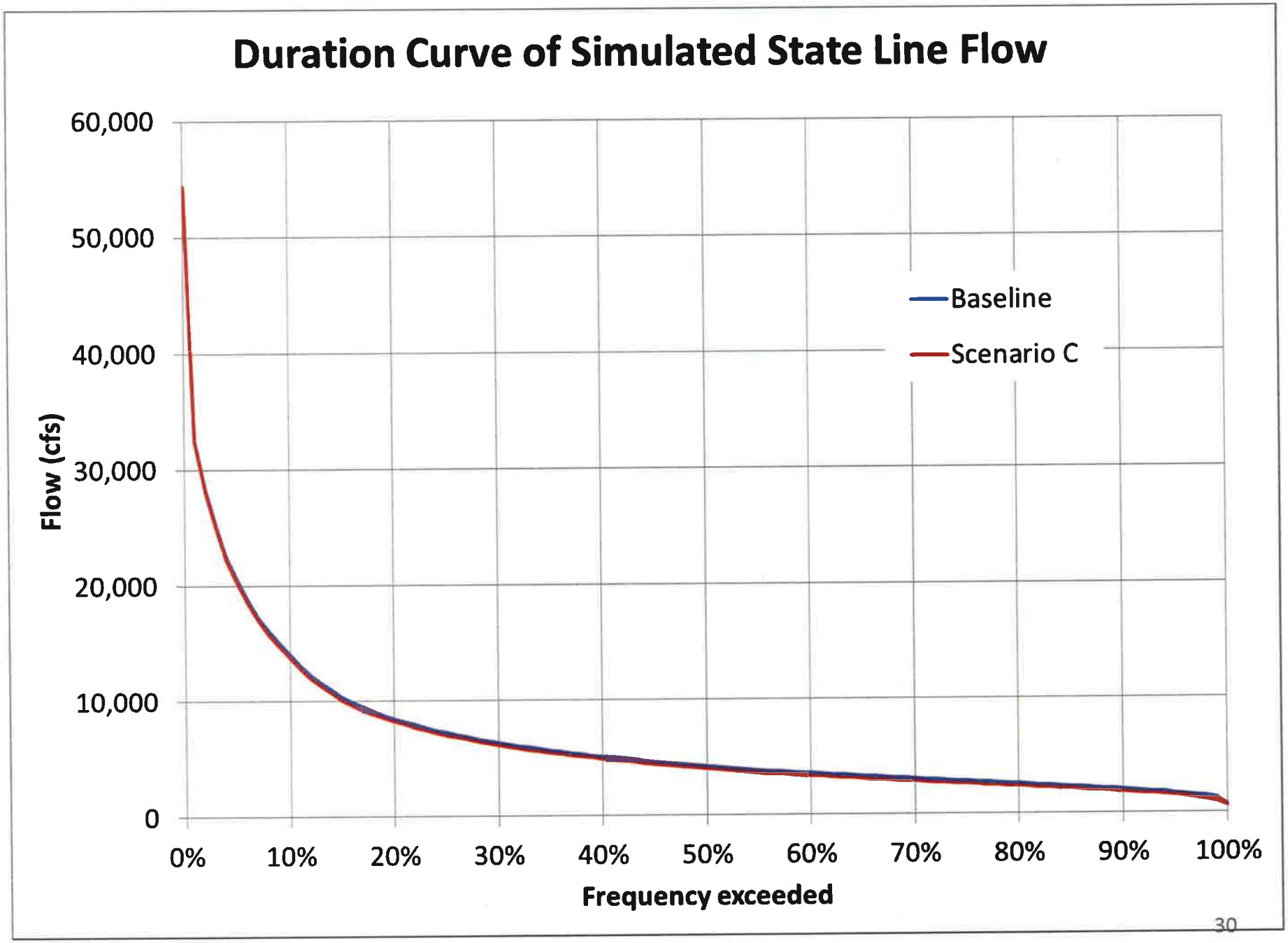
Simlated Minimum Daily Elevation at Allatoona



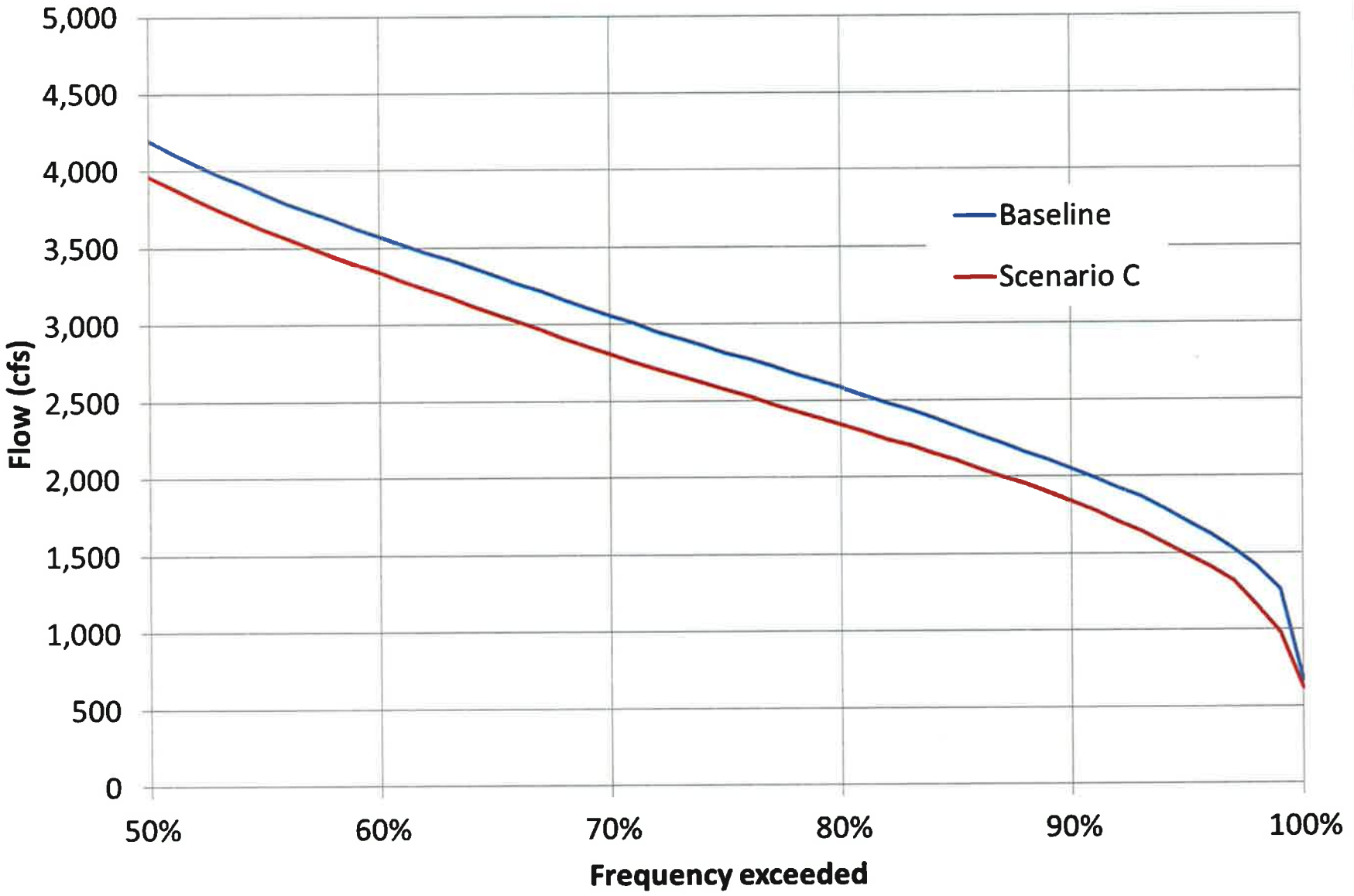

Duration Curve of Allatoona Elevation
860
850
840
830
820
810
800
Elevation (ft)
Baseline
Scenario C
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded


Simulated Power Generation at Federal Reservoirs in GA
Energy (MWH)
2,500
2,000
1,500
1,000
500
0
Baseline
Scenario C
314
278
1813
1811
2127
2089
Allatoona
Carters
Total


Frequency of Simulated Recreational Impacts
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Frequency
Baseline
Scenario C
Initial Impact Line (837')
Recreation Impact Line (835')
Water Access Line (828')


Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline
Scenario C
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded

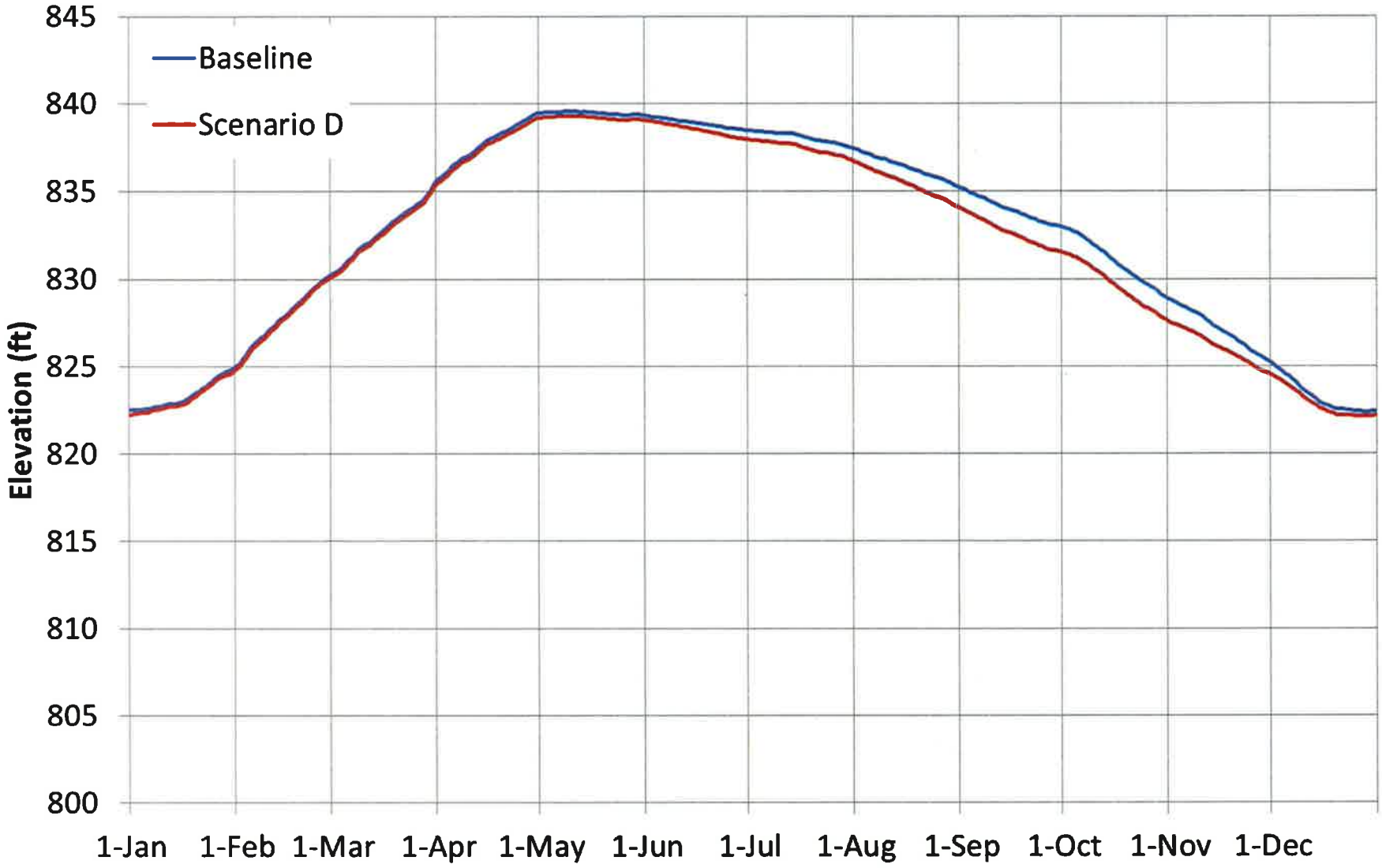
Duration Curve of Simulated State Line Flow



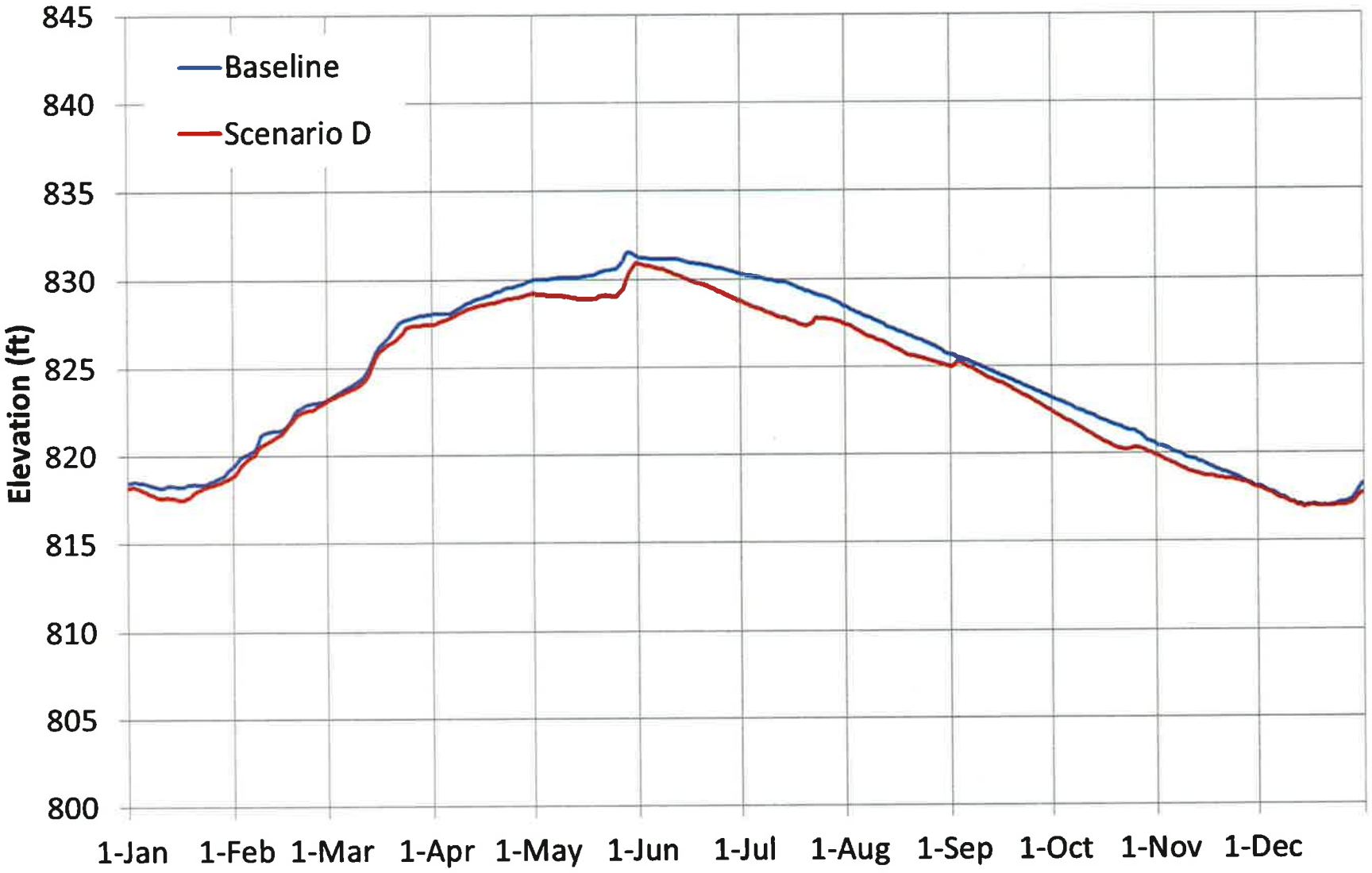
Modeling Results

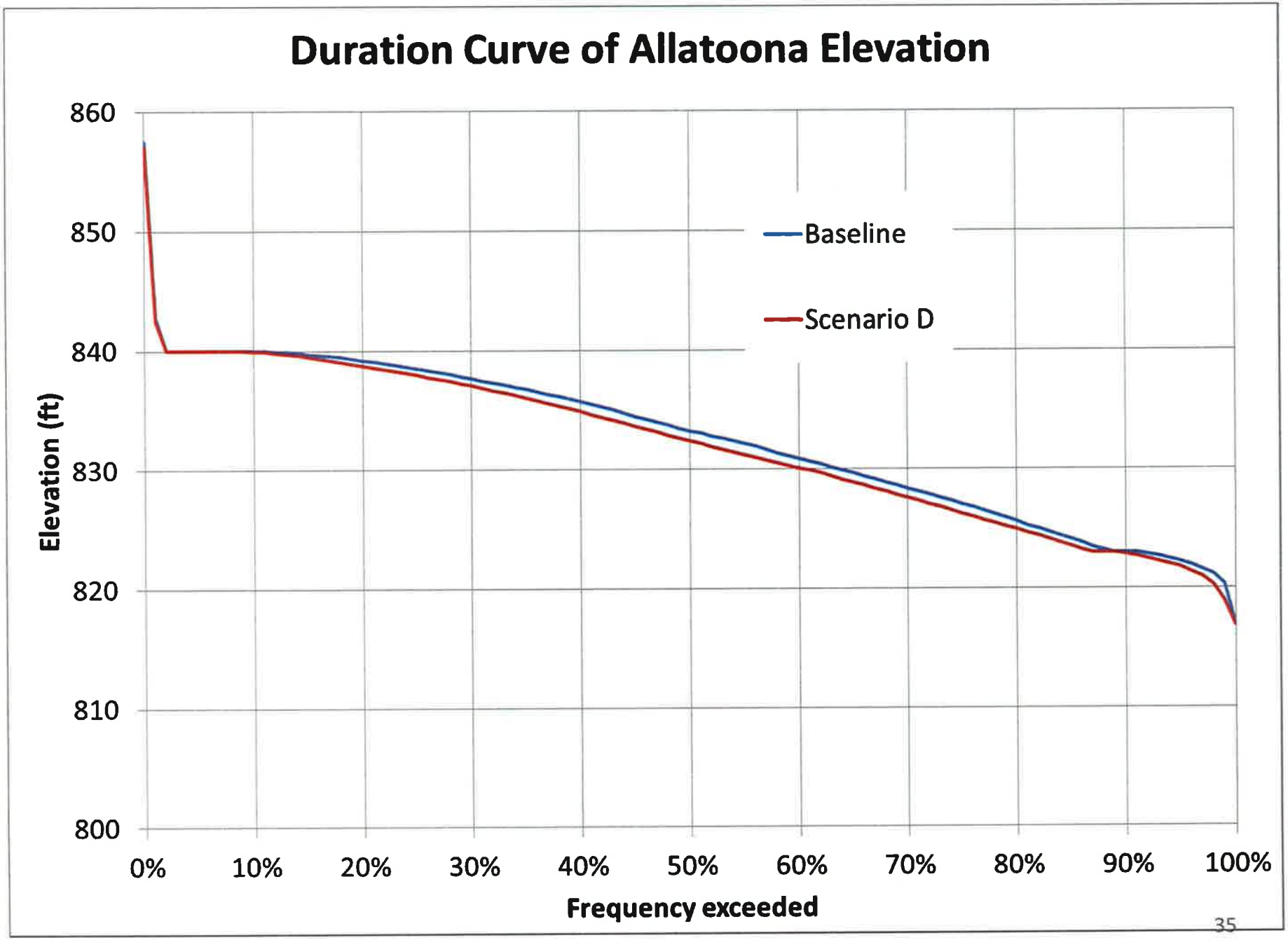
- Baseline vs. Scenario D

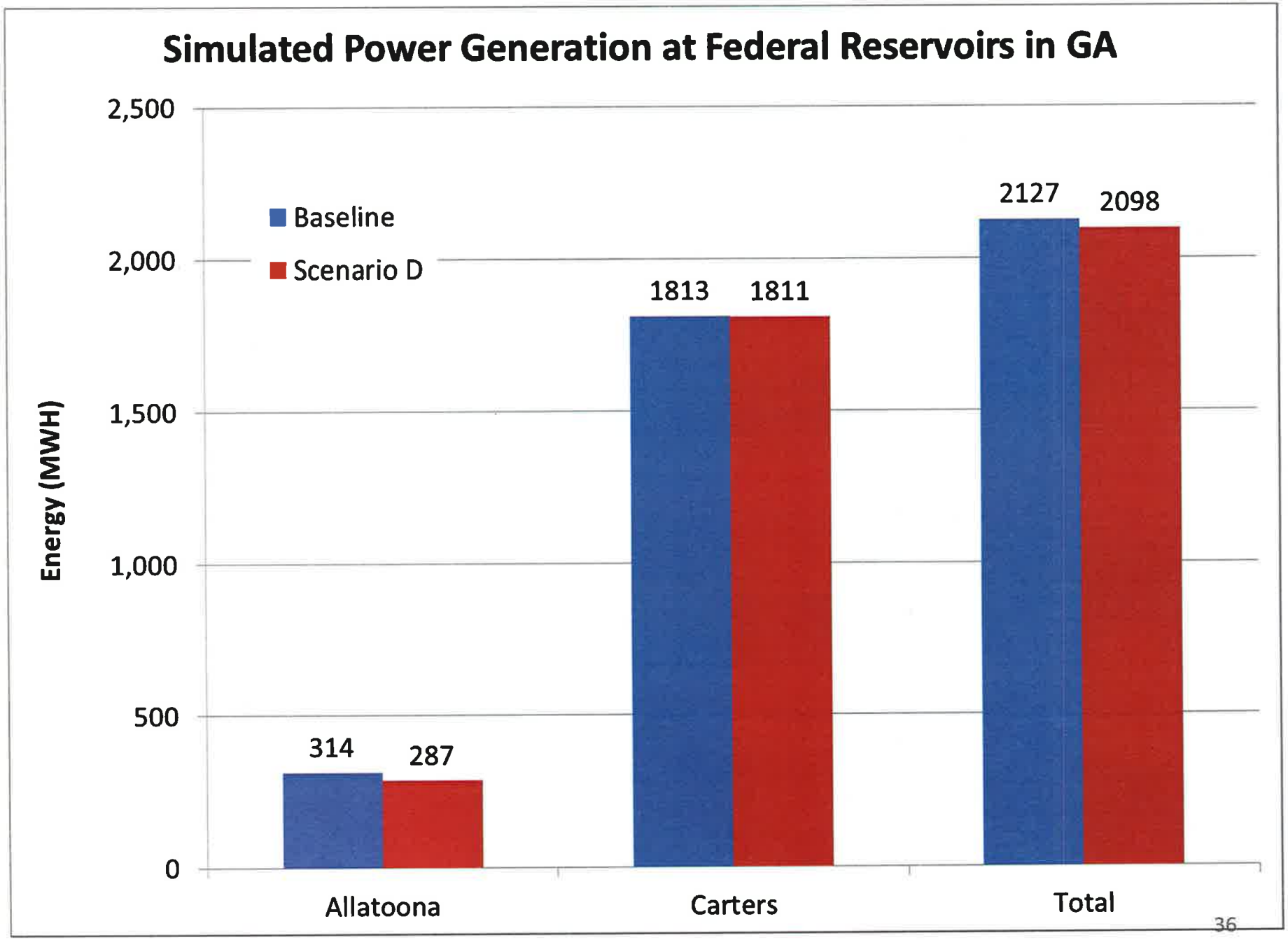
Simulated Average Daily Elevation at Allatoona

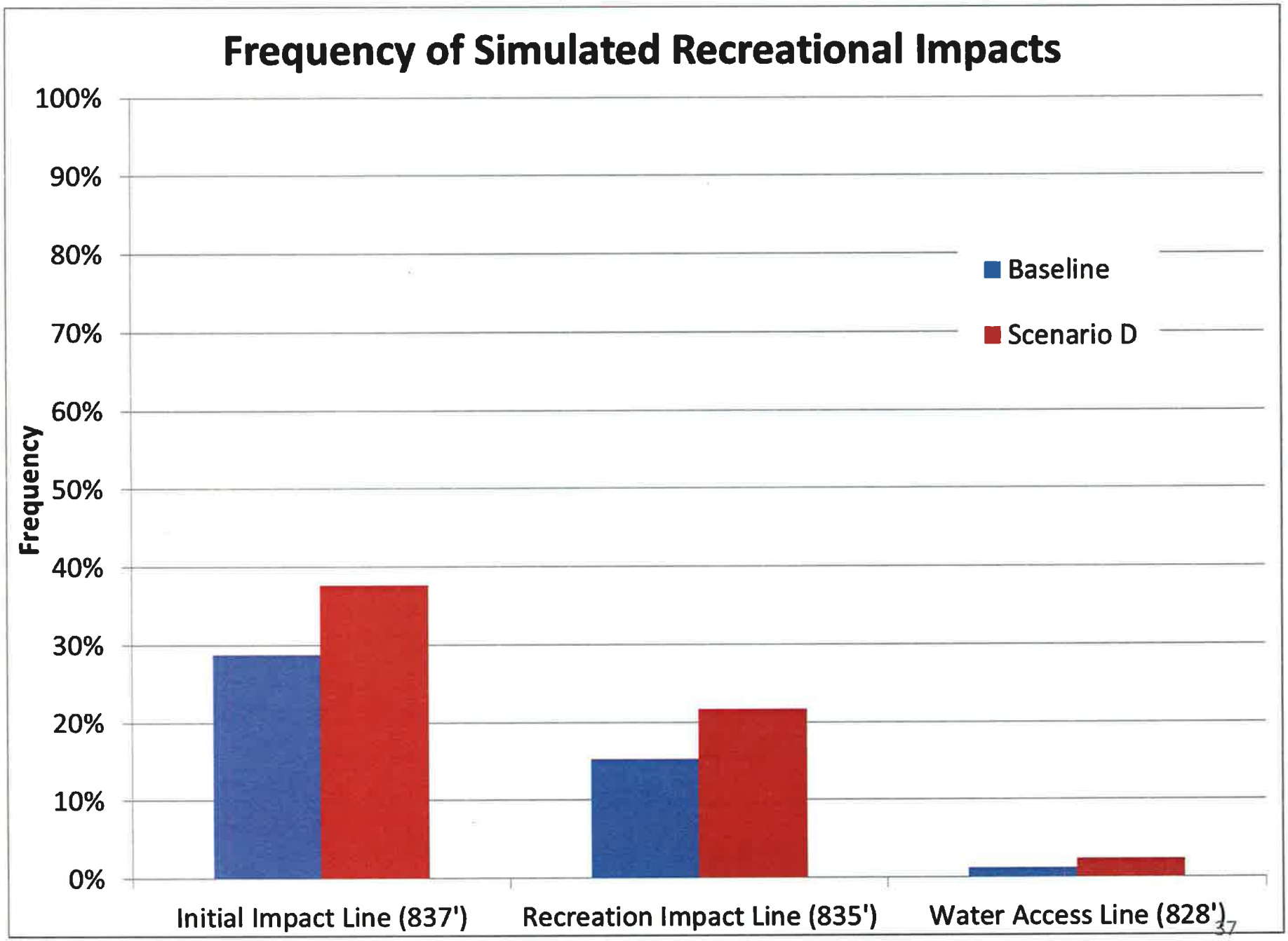


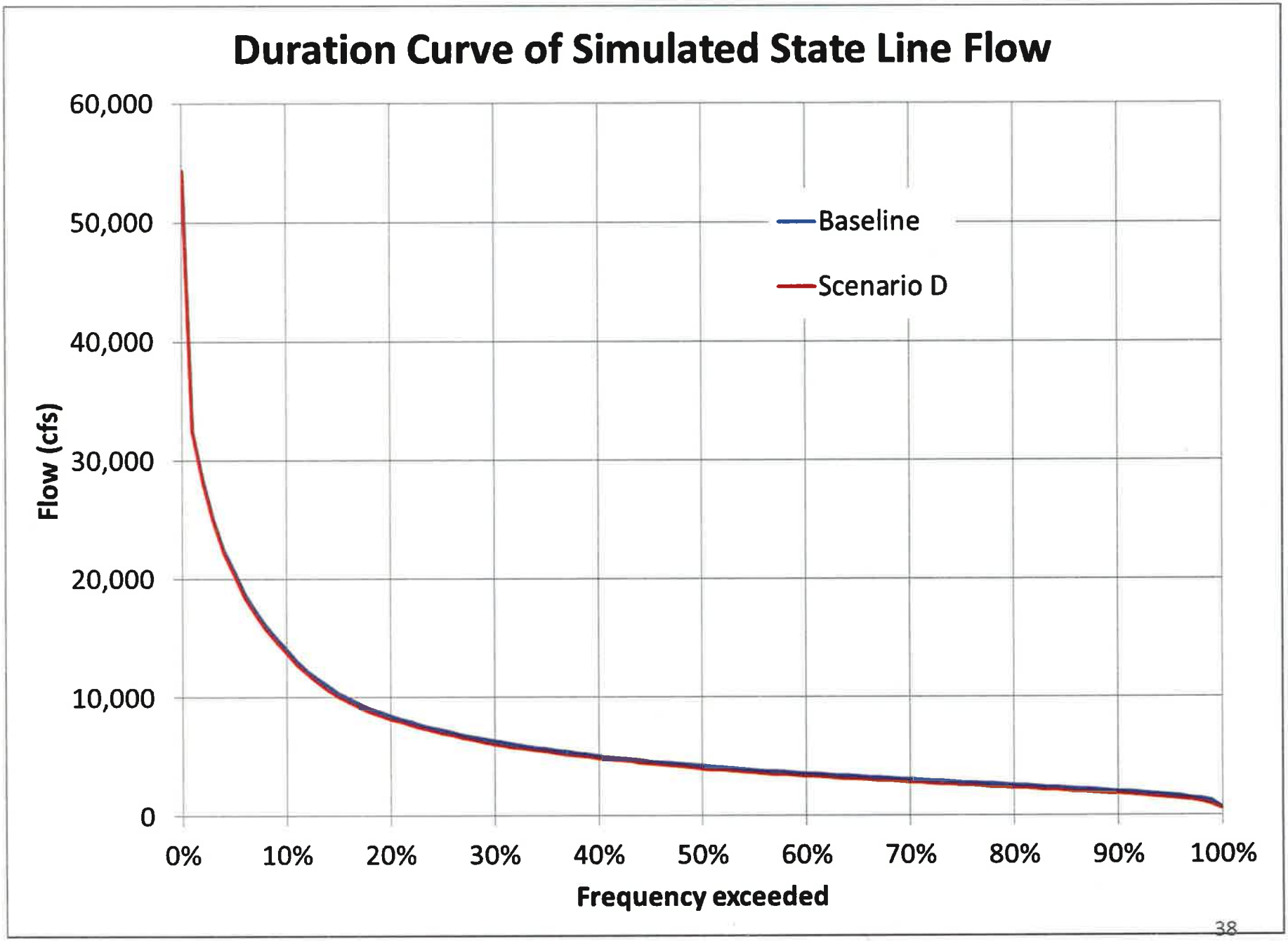
Simlated Minimum Daily Elevation at Allatoona

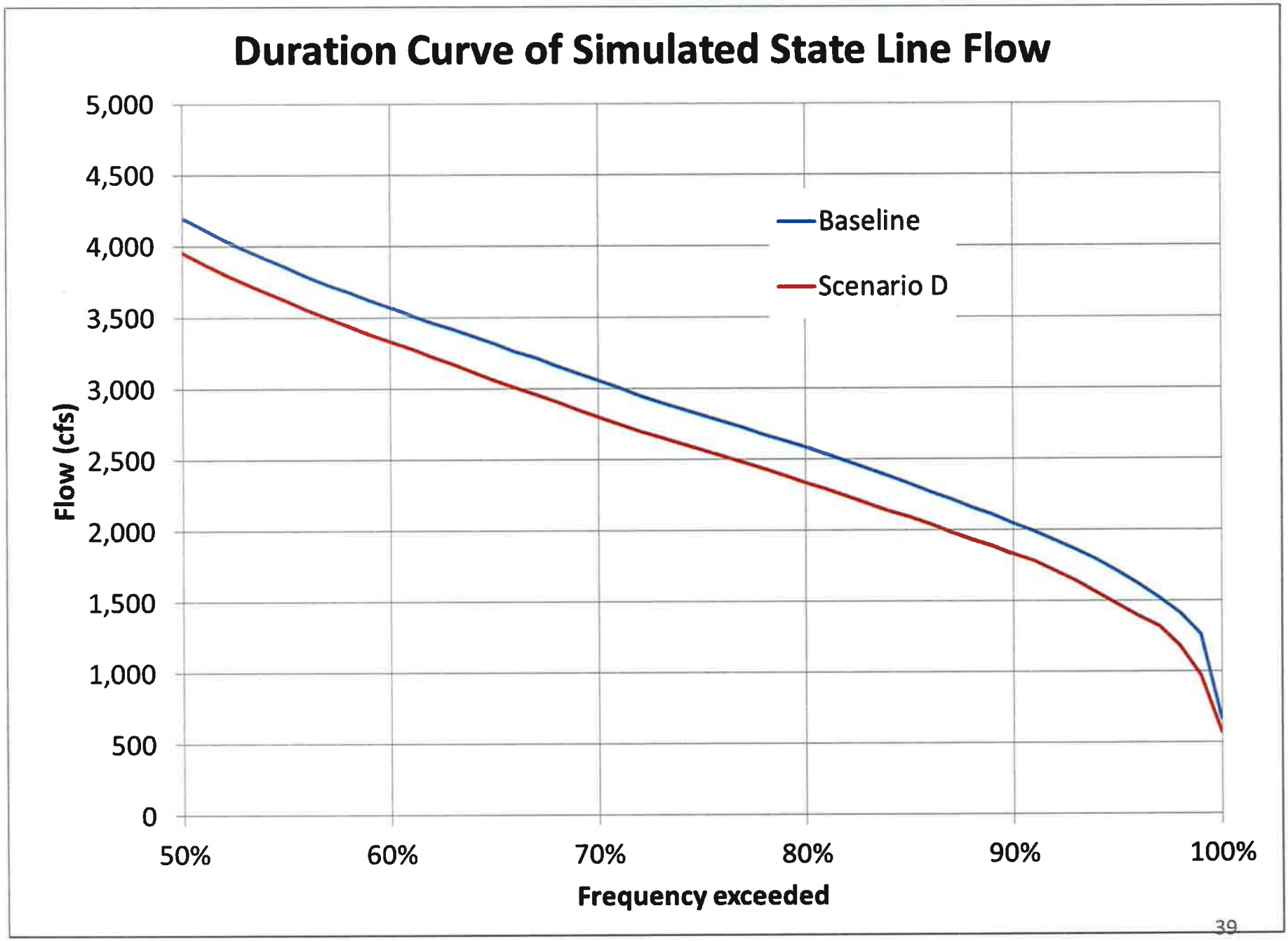



Duration Curve of Allatoona Elevation
860
850
840
830
820
810
800
Elevation (ft)
Baseline
Scenario D
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded


Simulated Power Generation at Federal Reservoirs in GA
2,500
2,000
1,500
1,000
500
0
Energy (MWH)
Baseline
Scenario D
314
287
1813
1811
2127
2098
Allatoona
Carters
Total


Frequency of Simulated Recreational Impacts
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Frequency
Baseline
Scenario D
Initial Impact Line (837')
Recreation Impact Line (835')
Water Access Line (828')


Duration Curve of Simulated State Line Flow
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow (cfs)
Baseline
Scenario D
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency exceeded


Duration Curve of Simulated State Line Flow
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Flow (cfs)
Baseline
Scenario D
50%
60%
70%
80%
90%
100%
Frequency exceeded

Summary Tables

- Allatoona minimum elevation
- Average power generation
- Frequency of Recreational impact

Allatoona Minimum Elevation

Scenarios	Minimum Elevation (feet MSL)	Change in Minimum Elevation (vs. Baseline) (feet)
Observed	818.9 (December 2007)	NA
Baseline	816.95	NA
Scenario A	816.91	-0.04
Scenario B	816.92	-0.03
Scenario C	816.69	-0.26
Scenario D	816.91	-0.04

Average Power Generation (Unit: MWH)

Scenario	Allatoona	% Change (vs. Baseline)	Allatoona and Carters	% Change (vs. Baseline)
Baseline	314	NA	2127	NA
Scenario A	283	-9.9%	2096	-1.5%
Scenario B	291	-7.3%	2104	-1.1%
Scenario C	278	-11.5%	2089	-1.8%
Scenario D	287	-8.6%	2098	-1.4%

Frequency of Recreational Impact (% of time with impact)

Scenario	Initial Impact Line	Change in % (vs. Baseline)	Rec. Impact Line	Change in % (vs. Baseline)	Water Access Line	Change in % (vs. Baseline)
Baseline	29	NA	15	NA	1	NA
Scenario A	38	+9	22	+7	2	+1
Scenario B	36	+7	20	+5	2	+1
Scenario C	40	+11	24	+9	3	+2
Scenario D	38	+9	22	+7	2	+1

Attachment 4. Metropolitan North Georgia Water Planning District - Water Supply Demand Projection Charts for Bartow County and Cobb County

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DSS Model - Plumbing Code Fixture Replacement Count
Bartow County

MADDUX WATER MANAGEMENT INC.

Demand Projections

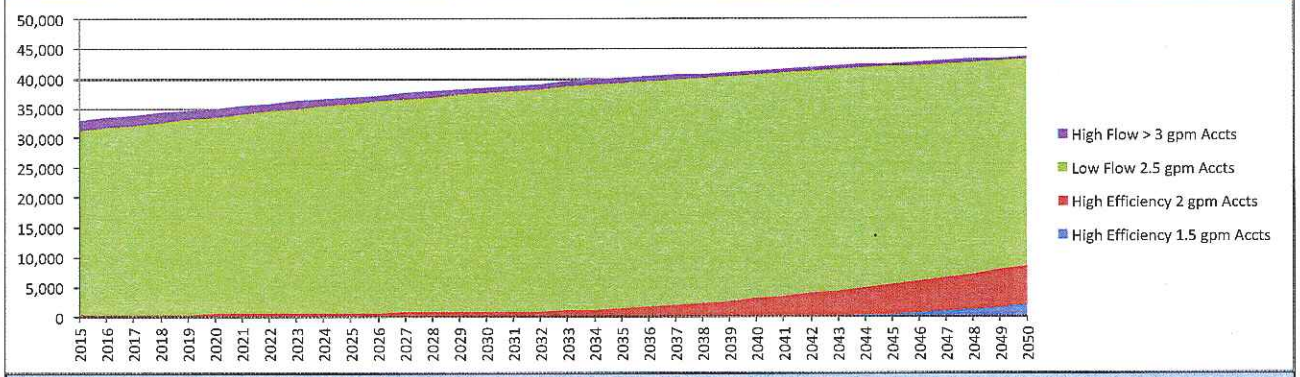
Review Fixture Counts

Bartow County

Previous Step | Demand Breakdown | Plumbing Code | Fixture Count | Code Check | Review Graphs | Next Step

Review Fixture Counts

Scenario: Scenario OPB Fixture Model: SF Showers



Year	High Efficiency 1.5 gpm Accts	High Efficiency 2 gpm Accts	Low Flow 2.5 gpm Accts	High Flow > 3 gpm Accts	Total SF Accts	SF Population	Annual Savings (mgy)
2015	221	220	30,800	1,701	32,943	77,096	0.00
2016	213	232	31,278	1,633	33,355	78,061	0.25
2017	204	251	31,744	1,568	33,767	79,025	0.51
2018	196	278	32,200	1,505	34,179	79,989	0.78
2019	188	311	32,631	1,445	34,575	80,916	1.06
2020	181	350	33,054	1,387	34,971	81,843	1.35
2021	173	395	33,467	1,331	35,367	82,769	1.65
2022	166	443	33,875	1,278	35,762	83,695	1.95
2023	160	492	34,279	1,227	36,158	84,621	2.25
2024	153	538	34,653	1,178	36,522	85,473	2.53
2025	147	586	35,023	1,131	36,886	86,325	2.81
2026	141	631	35,373	1,086	37,231	87,132	3.08
2027	136	678	35,719	1,042	37,576	87,938	3.35
2028	130	727	36,062	1,000	37,920	88,744	3.61
2029	125	777	36,402	960	38,264	89,550	3.88
2030	120	829	36,738	922	38,609	90,356	4.15
2031	115	870	37,037	885	38,907	91,055	4.38
2032	111	956	37,289	850	39,206	91,753	4.72
2033	106	1,086	37,496	816	39,504	92,452	5.18
2034	102	1,258	37,659	783	39,803	93,150	5.73
2035	98	1,471	37,780	752	40,101	93,848	6.39
2036	94	1,710	37,834	722	40,360	94,456	7.11
2037	90	1,988	37,849	693	40,620	95,063	7.93

DSS Model - Plumbing Code Fixture Replacement Count
Bartow County

Year	High Efficiency 1.5 gpm Accts	High Efficiency 2 gpm Accts	Low Flow 2.5 gpm Accts	High Flow > 3 gpm Accts	Total SF Accts	SF Population	Annual Savings (mgy)
2015	221	220	30,800	1,701	32,943	77,096	0.00
2016	213	232	31,278	1,633	33,355	78,061	0.25
2017	204	251	31,744	1,568	33,767	79,025	0.51
2018	196	278	32,200	1,505	34,179	79,989	0.78
2019	188	311	32,631	1,445	34,575	80,916	1.06
2020	181	350	33,054	1,387	34,971	81,843	1.35
2021	173	395	33,467	1,331	35,367	82,769	1.65
2022	166	443	33,875	1,278	35,762	83,695	1.95
2023	160	492	34,279	1,227	36,158	84,621	2.25
2024	153	538	34,653	1,178	36,522	85,473	2.53
2025	147	586	35,023	1,131	36,886	86,325	2.81
2026	141	631	35,373	1,086	37,231	87,132	3.08
2027	136	678	35,719	1,042	37,576	87,938	3.35
2028	130	727	36,062	1,000	37,920	88,744	3.61
2029	125	777	36,402	960	38,264	89,550	3.88
2030	120	829	36,738	922	38,609	90,356	4.15
2031	115	870	37,037	885	38,907	91,055	4.38
2032	111	956	37,289	850	39,206	91,753	4.72
2033	106	1,086	37,496	816	39,504	92,452	5.18
2034	102	1,258	37,659	783	39,803	93,150	5.73
2035	98	1,471	37,780	752	40,101	93,848	6.39
2036	94	1,710	37,834	722	40,360	94,456	7.11
2037	90	1,988	37,849	693	40,620	95,063	7.93
2038	87	2,303	37,825	665	40,879	95,670	8.83
2039	83	2,655	37,762	639	41,139	96,277	9.83
2040	80	3,042	37,663	613	41,398	96,883	10.92
2041	77	3,449	37,513	588	41,627	97,420	12.05
2042	121	3,841	37,329	565	41,856	97,956	13.36
2043	211	4,221	37,110	542	42,085	98,491	14.83
2044	346	4,587	36,860	521	42,314	99,027	16.47
2045	524	4,941	36,577	500	42,542	99,562	18.27
2046	743	5,276	36,258	480	42,757	100,064	20.19
2047	1,002	5,600	35,909	461	42,971	100,566	22.27
2048	1,300	5,913	35,530	442	43,186	101,067	24.48
2049	1,637	6,215	35,123	425	43,400	101,569	26.84
2050	2,010	6,508	34,689	408	43,614	102,070	29.34

DSS Model - Plumbing Code Fixture Replacement Savings
Bartow County

Demand Projections

Review Plumbing Code Breakdown

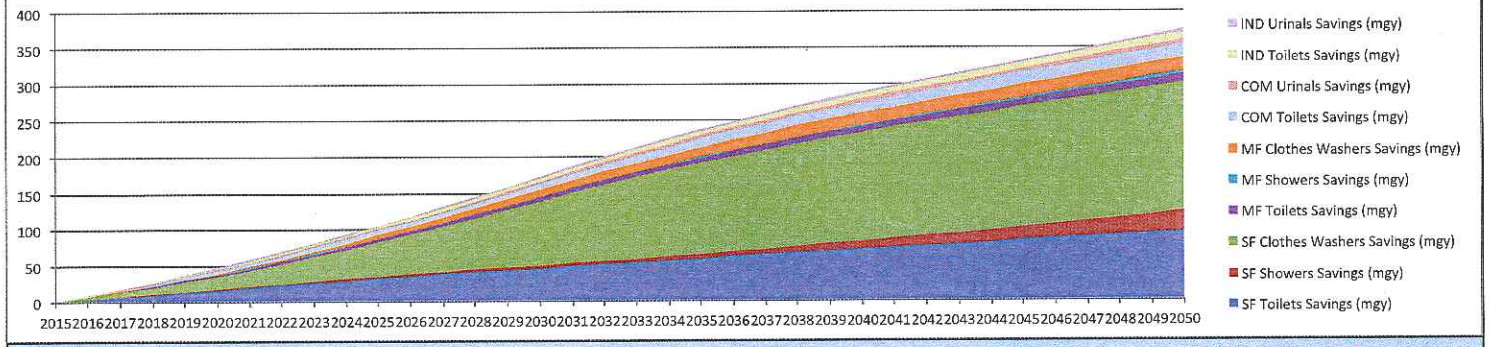
Bartow County

Previous Step | Demand Breakdown | Plumbing Code | Fixture Count | Code Check | Review Graphs | Next Step

Note: The total savings shown below will only add up to the difference between the baseline demand projections and the demand projections with plumbing code if you multiply it by the NRW percentage

Review Plumbing Code Breakdown

Scenario: Scenario OPB



Year	SF Toilets Savings (mgy)	SF Showers Savings (mgy)	SF Clothes Washers Savings (mgy)	MF Toilets Savings (mgy)	MF Showers Savings (mgy)	MF Clothes Washers Savings (mgy)	COM Toilets Savings (mgy)	COM Urinals Savings (mgy)	IND Toilets Savings (mgy)	IND Urinals Savings (mgy)	Total Savings (mgy)
2015	0	0	0	0	0	0	0	0	0	0	0
2016	4	0	3	0	0	0	1	0	0	0	9
2017	7	1	6	1	0	1	2	1	1	0	18
2018	10	1	10	1	0	1	2	1	1	0	28
2019	14	1	14	2	0	2	3	1	1	1	37
2020	17	1	18	2	0	2	3	1	2	1	47
2021	20	2	23	2	0	3	4	1	2	1	58
2022	24	2	28	3	0	3	4	2	2	1	69
2023	27	2	34	3	0	4	5	2	3	1	81
2024	30	3	40	4	0	5	6	2	3	1	93
2025	33	3	47	4	0	5	6	2	3	1	105
2026	36	3	55	4	0	6	7	2	3	1	118
2027	39	3	62	5	0	7	7	3	4	1	131
2028	41	4	71	5	0	8	8	3	4	1	144
2029	44	4	79	5	1	9	8	3	4	2	158
2030	47	4	88	6	1	10	9	3	4	2	173
2031	50	4	97	6	1	11	9	3	5	2	187
2032	52	5	105	6	1	12	10	4	5	2	201
2033	55	5	113	6	1	13	10	4	5	2	213
2034	57	6	120	7	1	13	11	4	5	2	226
2035	60	6	126	7	1	14	11	4	6	2	238
2036	62	7	132	7	1	15	12	4	6	2	248
2037	65	8	137	8	1	15	12	4	6	2	259
2038	67	9	142	8	1	16	13	5	6	2	269

DSS Model - Plumbing Code Fixture Replacement Savings

Bartow County

Year	SF Toilets Savings (mgy)	SF Showers Savings (mgy)	SF Clothes Washers Savings (mgy)	MF Toilets Savings (mgy)	MF Showers Savings (mgy)	MF Clothes Washers Savings (mgy)	COM Toilets Savings (mgy)	COM Urinals Savings (mgy)	IND Toilets Savings (mgy)	IND Urinals Savings (mgy)	Total Savings (mgy)
2015	0	0	0	0	0	0	0	0	0	0	0
2016	4	0	3	0	0	0	1	0	0	0	9
2017	7	1	6	1	0	1	2	1	1	0	18
2018	10	1	10	1	0	1	2	1	1	0	28
2019	14	1	14	2	0	2	3	1	1	1	37
2020	17	1	18	2	0	2	3	1	2	1	47
2021	20	2	23	2	0	3	4	1	2	1	58
2022	24	2	28	3	0	3	4	2	2	1	69
2023	27	2	34	3	0	4	5	2	3	1	81
2024	30	3	40	4	0	5	6	2	3	1	93
2025	33	3	47	4	0	5	6	2	3	1	105
2026	36	3	55	4	0	6	7	2	3	1	118
2027	39	3	62	5	0	7	7	3	4	1	131
2028	41	4	71	5	0	8	8	3	4	1	144
2029	44	4	79	5	1	9	8	3	4	2	158
2030	47	4	88	6	1	10	9	3	4	2	173
2031	50	4	97	6	1	11	9	3	5	2	187
2032	52	5	105	6	1	12	10	4	5	2	201
2033	55	5	113	6	1	13	10	4	5	2	213
2034	57	6	120	7	1	13	11	4	5	2	226
2035	60	6	126	7	1	14	11	4	6	2	238
2036	62	7	132	7	1	15	12	4	6	2	248
2037	65	8	137	8	1	15	12	4	6	2	259
2038	67	9	142	8	1	16	13	5	6	2	269
2039	70	10	146	8	1	16	13	5	7	3	279
2040	72	11	150	8	1	17	14	5	7	3	288
2041	74	12	154	9	1	17	14	5	7	3	297
2042	77	13	158	9	2	18	15	5	7	3	306
2043	79	15	161	9	2	18	15	6	8	3	315
2044	81	16	164	10	2	18	16	6	8	3	324
2045	84	18	166	10	2	19	16	6	8	3	332
2046	86	20	169	10	2	19	17	6	8	3	341
2047	88	22	171	10	3	19	17	6	9	3	349
2048	91	24	174	11	3	19	18	6	9	3	358
2049	93	27	176	11	3	20	18	7	9	3	366
2050	95	29	178	11	3	20	18	7	9	4	375

MADDAUS WATER MANAGEMENT INC.

Demand Projections

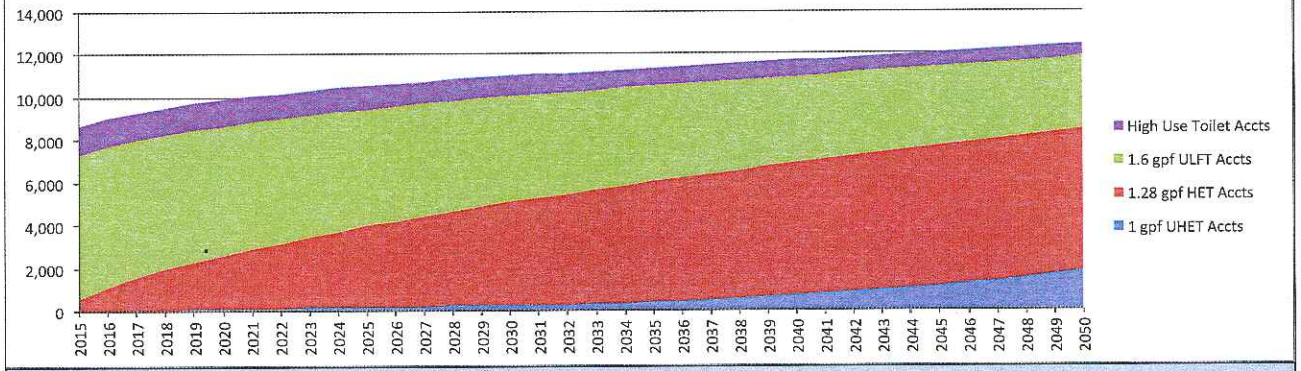
Review Fixture Counts

COBB COUNTY WATER SYSTEM

Previous Step | Demand Breakdown | Plumbing Code | Fixture Count | Code Check | Review Graphs | Next Step

Review Fixture Counts

Scenario: Scenario OPB Fixture Model: MF Clothes Washers



Year	1 gpf UHET Accts	1.28 gpf HET Accts	1.6 gpf ULFT Accts	High Use Toilet Accts	Total COM Accts	COM Population	Annual Savings (mgy)
2015	0	595	6,723	1,364	8,682	496,180	0.00
2016	18	1,100	6,589	1,330	9,037	516,460	20.40
2017	38	1,534	6,457	1,296	9,325	532,937	38.23
2018	57	1,899	6,328	1,264	9,548	545,667	53.50
2019	77	2,227	6,201	1,232	9,737	556,481	67.38
2020	96	2,526	6,077	1,202	9,901	565,865	80.20
2021	117	2,809	5,956	1,172	10,054	574,581	92.46
2022	136	3,071	5,837	1,142	10,186	582,140	103.80
2023	155	3,327	5,720	1,114	10,316	589,562	114.92
2024	173	3,568	5,606	1,086	10,433	596,237	125.40
2025	191	3,802	5,493	1,059	10,545	602,674	135.60
2026	207	4,019	5,384	1,032	10,642	608,193	145.03
2027	222	4,231	5,276	1,006	10,735	613,549	154.24
2028	239	4,440	5,170	981	10,830	618,965	163.38
2029	254	4,638	5,067	957	10,915	623,829	172.01
2030	267	4,826	4,966	933	10,992	628,192	180.18
2031	279	5,008	4,866	910	11,064	632,308	188.07
2032	299	5,180	4,769	887	11,135	636,371	195.91
2033	327	5,344	4,674	865	11,210	640,644	203.90
2034	361	5,499	4,580	843	11,283	644,867	211.85
2035	404	5,646	4,489	822	11,360	649,249	219.91
2036	450	5,777	4,399	801	11,427	653,060	227.56
2037	503	5,899	4,311	781	11,494	656,886	235.21

DSS Model - Plumbing Code Fixture Replacement Count
Cobb County

Year	1 gpf UHET Accts	1.28 gpf HET Accts	1.6 gpf ULFT Accts	High Use Toilet Accts	Total COM Accts	COM Population	Annual Savings (mgy)
2015	0	595	6,723	1,364	8,682	496,180	0.00
2016	18	1,100	6,589	1,330	9,037	516,460	20.40
2017	38	1,534	6,457	1,296	9,325	532,937	38.23
2018	57	1,899	6,328	1,264	9,548	545,667	53.50
2019	77	2,227	6,201	1,232	9,737	556,481	67.38
2020	96	2,526	6,077	1,202	9,901	565,865	80.20
2021	117	2,809	5,956	1,172	10,054	574,581	92.46
2022	136	3,071	5,837	1,142	10,186	582,140	103.80
2023	155	3,327	5,720	1,114	10,316	589,562	114.92
2024	173	3,568	5,606	1,086	10,433	596,237	125.40
2025	191	3,802	5,493	1,059	10,545	602,674	135.60
2026	207	4,019	5,384	1,032	10,642	608,193	145.03
2027	222	4,231	5,276	1,006	10,735	613,549	154.24
2028	239	4,440	5,170	981	10,830	618,965	163.38
2029	254	4,638	5,067	957	10,915	623,829	172.01
2030	267	4,826	4,966	933	10,992	628,192	180.18
2031	279	5,008	4,866	910	11,064	632,308	188.07
2032	299	5,180	4,769	887	11,135	636,371	195.91
2033	327	5,344	4,674	865	11,210	640,644	203.90
2034	361	5,499	4,580	843	11,283	644,867	211.85
2035	404	5,646	4,489	822	11,360	649,249	219.91
2036	450	5,777	4,399	801	11,427	653,060	227.56
2037	503	5,899	4,311	781	11,494	656,886	235.21
2038	562	6,012	4,225	762	11,560	660,681	242.84
2039	627	6,115	4,140	743	11,625	664,377	250.40
2040	702	6,215	4,057	724	11,698	668,561	258.34
2041	778	6,299	3,976	706	11,759	672,064	265.75
2042	862	6,377	3,897	688	11,824	675,770	273.33
2043	954	6,448	3,819	671	11,892	679,637	281.03
2044	1,054	6,512	3,742	654	11,963	683,709	288.91
2045	1,162	6,569	3,667	638	12,037	687,910	296.90
2046	1,275	6,616	3,594	622	12,107	691,948	304.78
2047	1,395	6,657	3,522	607	12,180	696,128	312.78
2048	1,522	6,690	3,452	591	12,254	700,362	320.83
2049	1,657	6,715	3,383	577	12,332	704,769	329.05
2050	1,800	6,734	3,315	562	12,411	709,297	337.38

MADDAUS WATER MANAGEMENT INC.

Demand Projections

Review Plumbing Code Breakdown

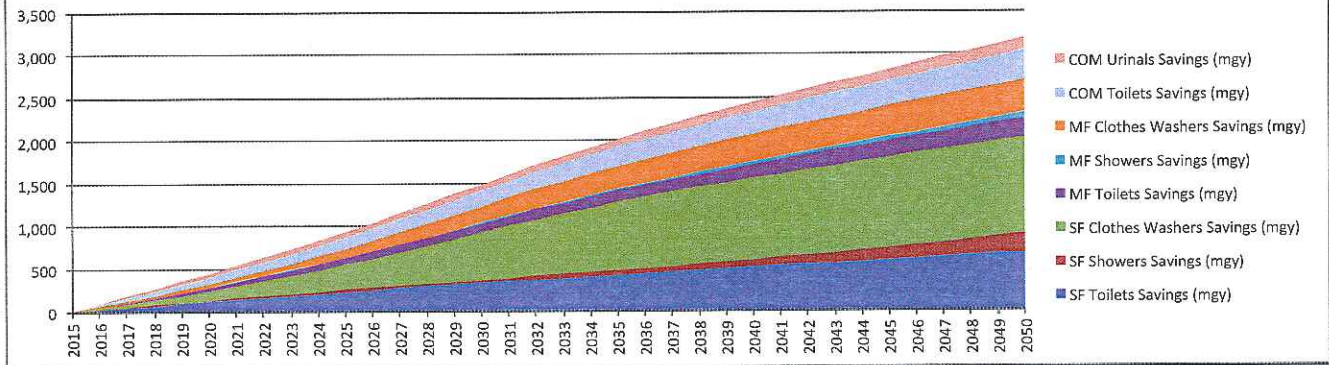
COBB COUNTY WATER SYSTEM

Previous Step | Demand Breakdown | Plumbing Code | Fixture Count | Code Check | Review Graphs | Next Step

Note: The total savings shown below will only add up to the difference between the baseline demand projections and the demand projections with plumbing code if you multiply it by the NRW

Review Plumbing Code Breakdown

Scenario: Scenario QPB



Year	SF Toilets Savings (mgy)	SF Showers Savings (mgy)	SF Clothes Washers Savings (mgy)	MF Toilets Savings (mgy)	MF Showers Savings (mgy)	MF Clothes Washers Savings (mgy)	COM Toilets Savings (mgy)	COM Urinals Savings (mgy)	Total Savings (mgy)
2015	0	0	0	0	0	0	0	0	0
2016	25	2	17	8	1	6	20	9	88
2017	50	5	37	16	2	12	38	16	176
2018	74	7	60	24	3	20	53	23	264
2019	97	10	85	31	4	29	67	29	352
2020	121	12	113	39	5	38	80	34	441
2021	144	15	143	46	6	48	92	39	533
2022	167	17	177	54	6	59	104	44	628
2023	189	20	214	61	7	72	115	49	727
2024	211	22	254	68	8	86	125	53	827
2025	232	25	298	75	9	100	136	58	932
2026	252	27	344	81	10	116	145	62	1,037
2027	273	29	393	88	11	132	154	66	1,146
2028	293	31	444	94	12	150	163	70	1,257
2029	313	34	498	101	13	168	172	73	1,371
2030	333	36	555	107	13	187	180	77	1,487
2031	351	38	612	113	14	206	188	80	1,603
2032	370	41	665	119	15	224	196	83	1,713
2033	389	44	713	125	16	240	204	87	1,818
2034	407	49	757	131	18	255	212	90	1,919

DSS Model - Plumbing Code Fixture Replacement Savings
Cobb County

Year	SF Toilets Savings (mgy)	SF Showers Savings (mgy)	SF Clothes Washers Savings (mgy)	MF Toilets Savings (mgy)	MF Showers Savings (mgy)	MF Clothes Washers Savings (mgy)	COM Toilets Savings (mgy)	COM Urinals Savings (mgy)	Total Savings (mgy)
2015	0	0	0	0	0	0	0	0	0
2016	25	2	17	8	1	6	20	9	88
2017	50	5	37	16	2	12	38	16	176
2018	74	7	60	24	3	20	53	23	264
2019	97	10	85	31	4	29	67	29	352
2020	121	12	113	39	5	38	80	34	441
2021	144	15	143	46	6	48	92	39	533
2022	167	17	177	54	6	59	104	44	628
2023	189	20	214	61	7	72	115	49	727
2024	211	22	254	68	8	86	125	53	827
2025	232	25	298	75	9	100	136	58	932
2026	252	27	344	81	10	116	145	62	1,037
2027	273	29	393	88	11	132	154	66	1,146
2028	293	31	444	94	12	150	163	70	1,257
2029	313	34	498	101	13	168	172	73	1,371
2030	333	36	555	107	13	187	180	77	1,487
2031	351	38	612	113	14	206	188	80	1,603
2032	370	41	665	119	15	224	196	83	1,713
2033	389	44	713	125	16	240	204	87	1,818
2034	407	49	757	131	18	255	212	90	1,919
2035	426	54	798	137	19	268	220	94	2,016
2036	444	59	834	143	21	281	228	97	2,106
2037	462	65	868	148	23	292	235	100	2,194
2038	479	72	899	154	25	303	243	104	2,279
2039	497	79	928	160	28	312	250	107	2,361
2040	515	87	954	166	30	321	258	110	2,442
2041	532	95	978	171	33	329	266	113	2,518
2042	549	105	1,000	176	36	337	273	117	2,593
2043	566	115	1,021	182	40	344	281	120	2,669
2044	583	127	1,040	187	43	350	289	124	2,744
2045	601	140	1,058	193	48	356	297	127	2,819
2046	617	153	1,074	198	52	362	305	131	2,892
2047	634	168	1,090	203	57	367	313	134	2,965
2048	650	183	1,104	209	62	372	321	138	3,038
2049	667	200	1,117	214	67	376	329	141	3,112
2050	684	218	1,130	219	73	380	337	145	3,186

Attachment 5. Model Format for Reallocated Water Supply Storage Agreements (revised June 23, 2017)

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MODEL FORMAT FOR REALLOCATED
WATER SUPPLY STORAGE AGREEMENTS
AUGUST 30, 2007
Revised June 23, 2017

APPLICABILITY:
This is one of four types of agreements typically used for water supply storage at Corps lakes. Use this Reallocated Model for storage reallocated to municipal and industrial water supply from storage currently allocated to another project purpose (ie. flood control pool, conservation pool). This August 30, 2007 model replaces the January 1998 Part 1 Model Format referenced in ER 1105-2-100 paragraph E-58.a.(1).

Use the August 2007 Originally Authorized Model for water supply storage originally authorized as part of the project when constructed. For agreements pursuant to Section 6 of the Flood Control Act of 1944 (P.L. 78-534) regarding Surplus Water and Emergency Water Withdrawal Permit (referenced in ER 1105-2-100 paragraphs E-58.a. (2) and (3)), consult with the appropriate HQ RIT for guidance on drafting the agreement.

NOTES IMBEDDED IN THE MODEL TEXT:
*** Other appropriate terms may be used in lieu of User here and uniformly throughout the agreement.**
**** Use correct authorization citation (e.g., WRDA of 19___, Public Law ___-___).**
***** Language in [ ] brackets is to be used or deleted as appropriate.**
[DELETE ALL TEXT ABOVE THIS LINE]

WATER STORAGE AGREEMENT
BETWEEN THE DEPARTMENT OF THE ARMY
AND
_____

FOR
REALLOCATED WATER STORAGE SPACE IN _____

THIS AGREEMENT, entered into this ____ day of _____, 20___, by and between THE DEPARTMENT OF THE ARMY (hereinafter called the "Government") represented by the District Engineer executing this agreement, and ___[NAME OF USER]_____ (hereinafter called the "User"*);

WITNESSETH THAT:

WHEREAS, the **_____ Act of l9 __ (Public Law __, __Congress), authorized the construction, operation, and maintenance of the [Project]*** on [Waterway], [State], (hereinafter called the "Project"); and

WHEREAS, the User desires to enter into an agreement with the Government for the use of storage for municipal and industrial water supply added to the Project by reallocation, and for payment of the cost thereof in accordance with the provisions of the Water Supply Act of 1958, as amended (43 U.S.C. 390b-f); and

WHEREAS, the User as shown in Exhibit "A", attached to and made a part of this agreement, is empowered to enter into an agreement with the Government and is vested with all necessary powers of accomplishment of the purposes of this agreement [including those required by Section 221 of the Flood Control Act of 1970 (42 U.S.C. 1962d-5d) (as amended)].

NOW, THEREFORE, the Government and the User agree as follows:

ARTICLE 1 - Water Storage Space.

a. Project [Construction][Modification]. The Government, subject to the directions of Federal law and any limitations imposed thereby, [shall modify the Project] [has modified the Project] [shall modify the allocation of storage space in the Project] so as to include therein space for the storage of water by the User.

b. Rights of User.

(l). The User shall have the right to utilize an undivided ___ percent (estimated to contain acre-feet after adjustment for sediment deposits) of the usable conservation storage space in the Project (see column (5) of Exhibit B-1) between elevations ____ feet and ____ feet above National Geodetic Vertical Datum (NGVD), which is estimated to contain _____ acre-feet after adjustment for sediment deposits. The User's storage space is to be used to impound water for present demand or need for municipal and industrial water supply.

(2). The User shall have the right to withdraw water from the lake, or to request releases to be made by the Government through the outlet works of the Project, subject to the provisions of Article lc and to the extent the aforesaid storage space will provide; and shall have the right to construct all such works, plants, pipelines, and appurtenances as may be necessary and convenient for the purpose of diversion or withdrawals, subject to the approval of the District Engineer as to design and location. The grant of an easement for right-of-way, across, in and upon land of the Government at the Project shall be by a separate instrument in a form satisfactory to the Secretary of the Army, under the authority of and in accordance with the provisions of l0 U.S.C. 2668 and such other authorities as may be necessary. Subject to the conditions of such easement, the User shall have the right to use so much of the Project land as may reasonably be required in the exercise of the rights and privileges granted under this agreement.

c. Rights Reserved. The Government reserves the right to control and use all storage in the Project in accordance with authorized Project purposes. The Government further reserves the right to take such measures as may be necessary in the operation of the Project to preserve life and/or property, including the right not to make downstream releases during such periods of time as are deemed necessary, in its sole discretion, to inspect, maintain, or repair the Project.

d. Quality or Availability of Water. The User recognizes that this agreement provides storage space for raw water only. The Government makes no representations with respect to the quality or availability of water and assumes no responsibility therefor, or for the treatment of the water.

e. Sedimentation Surveys.

(1). Sedimentation surveys will be made by the District Engineer during the term of this agreement at intervals not to exceed fifteen (15) years unless the District Engineer determines that such surveys are unnecessary. When, in the opinion of the District Engineer, the findings of such survey indicate any Project purpose will be affected by unanticipated sedimentation distribution, there shall be an equitable redistribution of the sediment reserve storage space among the purposes served by the Project including municipal and industrial water supply. The total available remaining storage space in the Project will then be divided among the various Project features in the same ratio as was initially utilized. Adjusted pool elevations will be rounded to the nearest one-half foot. Such findings and the storage space allocated to municipal and industrial water supply shall be defined and described as an exhibit, which will be made a part of this agreement, and the water control manual will be modified accordingly.

(2). The Government assumes no responsibility for deviations from estimated rates of sedimentation, or the distribution thereof. Such deviations may cause unequal distribution of sediment reserve storage greater than estimated, and/or encroachment on the total storage at the Project.

[f. Dependable Yield Mitigation Storage. [Paragraph to be used if storage is being reallocated from flood control storage.] In addition to the (____) acre-feet of water supply storage space acquired by the User, the User will pay for an additional (___) acre-feet of dependable yield mitigation storage.]

ARTICLE 2 - Regulation of and Right to Use of Water. The regulation of the use of water withdrawn or released from the aforesaid storage space shall be the sole responsibility of the User. The User has the full responsibility to acquire in accordance with State laws and regulations, and, if necessary, to establish or defend, any and all water rights needed for utilization of the storage provided under this agreement. The Government shall not be responsible for diversions by others, nor will it become a party to any controversies involving the use of the storage space by the User except as such controversies may affect the operations of the Project by the Government.

ARTICLE 3 - Operation and Maintenance. The Government shall operate and maintain the Project and the User shall pay to the Government a share of the costs of such operation and maintenance as provided in Article 5c. The User shall be responsible for operation and maintenance of all installations and facilities which it may construct for the diversion or withdrawal of water, and shall bear all costs of construction, operation and maintenance of such installations and facilities.

ARTICLE 4 - Measurement of Withdrawals and Releases. The User agrees to furnish and install, without cost to the Government, suitable meters or measuring devices satisfactory to the District Engineer for the measurement of water which is withdrawn from the Project by any means other than through the Project outlet works. The User shall furnish to the Government monthly statements of all such withdrawals. Prior to the construction of any facilities for withdrawal of water from the Project, the User will obtain the District Engineer's approval of the design, location and installation of the facilities including the meters or measuring devices. Such devices shall be available for inspection by Government representatives at all reasonable times. Releases from the water supply storage space through the Project outlet works shall be made in accordance with written schedules furnished by the User and approved by the District Engineer

and shall be subject to Article lc. The measure of all such releases shall be by means of a rating curve of the outlet works, or by such other suitable means as may be agreed upon prior to use of the water supply storage space.

ARTICLE 5 - Payments. In consideration of the right to utilize the aforesaid storage space [and the water supply conduit] in the Project for municipal and industrial water supply purposes, the User shall pay the following sums to the Government:

a. First Cost of Storage.

(1). The User shall repay to the Government, at the times as hereinafter specified, the amounts stated below which, as shown in Exhibit B-II attached to and made a part of this agreement, constitute the entire actual amount of the first cost of storage allocated to the water storage right acquired by the User under this agreement. The amount of the cost is based on [revenues foregone] [benefits foregone] [replacement cost] [updated cost of storage] [provisions of Section 322 of Public Law 101-640] [(other as appropriate)]. The costs shown in Exhibit B are for (___) acre-feet of storage space. [Of this space (___) acre-feet are for the User and (___) acre-feet are for dependable yield mitigation storage.] The interest rate to be used for purposes of computing interest on the unpaid balance will be the yield rate adjusted at five-year intervals as determined by the Secretary of the Treasury on the basis set forth in Section 932 of the 1986 Water Resources Development Act. For this agreement, the starting interest rate shall be that rate in effect at the time the agreement is approved. For FY ___, such rate is ____ percent. Should the agreement not be signed in FY ___, the amounts due herein will be adjusted to reflect the application of the appropriate rate.

(2). The cost allocated to the storage space indicated in Article 1b(1) is currently estimated at $ on the basis of the costs presented in Exhibit B-II. These costs shall be repaid within the life of the Project in not to exceed 30 years from the date this agreement is executed by the Secretary of the Army or his duly authorized representative. The payments shall be in equal consecutive annual installments, adjusted at 5-year intervals as shown in Exhibit "C". The first payment shall be due and payable within 30 days after the User is notified by the District Engineer [that this agreement is executed] [that the project modification is completed and operational for water supply purposes]. Annual installments thereafter will be due and payable on the anniversary date of the date of notification. Except for the first payment, which will be applied solely to the retirement of principal, all installments shall include accrued interest on the unpaid balance at the rate provided above. The last annual installment shall be adjusted upward or downward when due to assure repayment of all of the first cost of storage allocated to the storage within 30 years from the above date.

[(3). [For use if the project is being modified to accommodate the reallocation action.] Project construction costs associated with the reallocation are currently estimated at $____, on the basis of the costs presented in Exhibit B-IV. These costs shall be repaid during the period of construction in the following manner. [Fill in as appropriate]. The last payment shall be adjusted upward or downward as appropriate to assure repayment of all the construction cost allocated to the Users storage right during the period of construction.]

b. Repair, Rehabilitation, and Replacement (RR&R) Costs. The User will be required to pay [_____percent of the cost of any RR&R of specific water supply facilities. In addition, the User will be required to pay]____ percent of the cost of joint-use RR&R of Project features. Payment of these costs shall be made either incrementally during construction or in lump sum (including interest during

construction) upon completion of construction.

c. Annual Operation and Maintenance (O&M) Expense.

The User will be required to pay [_____ percent of the annual O&M expense of specific water supply facilities. In addition, the User will be required to pay] ____ percent of the annual experienced joint-use O&M expense of the Project.

Payments for O&M expense are due and payable in advance on the date for payment of the first cost of storage as set forth in Article 5a(2) and shall be based on O&M expense for the Project in the Government fiscal year most recently ended. The amount of each annual payment will be the actual experienced O&M expense ([specific plus] allocated joint-use) for the preceding fiscal year or an estimate thereof when actual expense information is not available.

d. Prepayment. The User shall have the right at any time to prepay the indebtedness under this Article in whole or in part, with accrued interest thereon to the date of such prepayment.

e. Delinquent Payments. Any delinquent payment owed by the User shall be charged interest at the Current Value of Funds Rate as determined by the Secretary of the Treasury that is applicable on the date that the payment became delinquent, with such penalty charge and administrative fee as may be required by Federal law or regulation. This provision shall not be construed as giving the User a choice of either making payments when due or paying interest, nor shall it be construed as waiving any other rights of the Government, at law or in equity, which might result from any default by the User.

ARTICLE 6 - Duration of Agreement. This agreement shall become effective when signed by the Secretary of the Army or his duly authorized representative and shall continue in full force and effect for the life of the Project.

ARTICLE 7 - Permanent Rights to Storage. Upon completion of payments by the User, as provided in Article 5a herein, the User shall have a permanent right, under the provisions of the Act of 16 October 1963 (Public Law 88-140, 43 U.S.C. 390e), to the use of the water supply storage space in the Project as provided in Article 1, subject to the following:

a. The User shall continue payment of annual operation and maintenance costs allocated to water supply.

b. The User shall bear the costs allocated to water supply of any necessary reconstruction, rehabilitation, or replacement of Project features which may be required to continue satisfactory operation of the Project. The District Engineer will establish such costs and repayment arrangements shall be in writing in accordance with the terms and conditions set forth in Article 5b for reconstruction, rehabilitation, and replacement costs, and be made a part of this agreement.

c. Upon completion of payments by the User as provided in Article 5a, the District Engineer shall redetermine the storage space for municipal and industrial water supply in accordance with the provisions of Article 1e. Such redetermination of reservoir storage capacity may be further adjusted from time to time as the result of sedimentation resurveys to reflect actual rates of sedimentation and the exhibit revised to show the revised storage space allocated to municipal and industrial water supply.

d. The permanent rights of the User under this agreement shall be continued so long as the

Government continues to operate the Project. In the event the Government no longer operates the Project, such rights may be continued subject to the execution of a separate agreement or additional supplemental agreement providing for:

(1). Continued operation by the User of such part of the facility as is necessary for utilization of the water supply storage space allocated to it;

(2). Terms which will protect the public interest; and,

(3). Effective absolvement of the Government by the User from all liability in connection with such continued operation.

ARTICLE 8 - Release of Claims. [Project documents for certain projects require a specific hold and save harmless agreement from the water supply sponsor. In those cases, the project document language should be used]. The User shall hold and save the Government, including its officers, agents and employees harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as a result of the storage in the Project, or withdrawal or release of water from the Project, made or ordered by the User or as a result of the construction, operation, or maintenance of the water supply facilities and appurtenances thereto owned and operated by the User except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE 9 - Transfers and Assignments.

a. The User shall not transfer or assign this agreement nor any rights acquired thereunder, nor suballot said water supply storage space or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this agreement, without the approval of the Secretary of the Army, or his duly authorized representative provided that, unless contrary to the public interest, this restriction shall not be construed to apply to any water that may be obtained from the water supply storage space by the User and furnished to any third party or parties, nor any method of allocation thereof.

b. Regarding approval of assignments, references to restriction of assignments shall not apply to any transfer or assignment to the United States Department of Agriculture, Rural Economic Community Development (RECD), formerly Farmers Home Administration, or its successor agency, or nominee, given in connection with the pledging of this water storage agreement as security for any loans or arising out of the foreclosure or liquidation of said loans. The User will notify the Corps in writing 15 days prior to applying for a RECD loan. A copy of the final loan instrument will be furnished to the Corps for their record.

ARTICLE 10 - Officials Not to Benefit. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

ARTICLE 11 - Covenant Against Contingent Fees. The User warrants that no person or selling agency has been employed or retained to solicit or secure this agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the User for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this agreement

without liability or in its discretion to add to the price or consideration, or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 12 - Protective Covenant. [Should be deleted when not applicable]

a. In order to utilize the water storage space, the User must acquire a loan from _____. Pending approval of this loan, the Government shall reserve for the User _____ acre-feet of storage for municipal and industrial water supply purposes for a period of up to ____ months. For this privilege, the User shall pay the Government $1.00 per acre-foot of storage space per year for a total of $_____. The payment is not refundable and shall be due and payable within 30 days after the User is notified by the District Engineer that the agreement has been approved. Should the User be unable to secure said loan it shall notify the District Engineer of said failure and the agreement shall be considered terminated at that time.

b. In the event of any termination pursuant to this Article, the User shall, upon request of the District Engineer, promptly remove at User's own expense, any facilities constructed on Project land for water withdrawal and restore premises around the removed facilities to a condition satisfactory to the District Engineer.

ARTICLE 13 - Environmental Quality. During any construction, operation, and maintenance by User of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State, and local laws and regulations concerning environmental pollution. Particular attention should be given to:

a. Reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases, and of smoke from temporary heaters;

b. Reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation from erosion;

c. Minimization of noise levels;

d. On-site and off-site disposal of waste and spoil; and,

e. Prevention of landscape defacement and damage.

ARTICLE 14 - Federal and State Laws.

a. Compliance. In acting under its rights and obligations hereunder, the User agrees to comply with all applicable Federal and State laws and regulations, including but not limited to: 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)), and the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655).

b. Civil Rights Act. The User furnishes, as part of this agreement, an assurance (Exhibit D) that it will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 241, 42 U.S.C. 2000d, et seq.) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 195 of Title 32,

Code of Federal Regulations.

c. Regulatory Program. Any discharges of water or pollutants into a navigable stream or tributary thereof resulting from the User's facilities and operations undertaken under this agreement shall be performed only in accordance with applicable Federal, State, and local laws and regulations.

d. Lobbying Activities. The User furnishes, as part of this agreement, a certification (Exhibit E and if applicable, Standard Form-LLL "Disclosure of Lobbying Activities") that it will comply with Title 31 U.S.C. Section 1352 of the limitation on use of appropriated funds to influence certain Federal contracting and financial transactions (Public Law 101-121, October 23, 1989) and Federal Acquisition Regulation 52.203-12 issued pursuant thereto.

ARTICLE 15 - Definitions. [Delete those inappropriate]

a. First cost of storage. This is the cost assigned to the Users right to the storage space in the project. In this Agreement, the first cost of storage was developed by the [insert appropriate term, e.g. benefits foregone, updated cost of storage, etc.] method and is summarized in Exhibit B-II.

b. Interest Payments.

(1). Interest on the unpaid balance. When the Project cost is amortized, this is the interest on the unpaid balance (see Exhibit C). When payments are made in "lump sum," there is no amortization schedule and therefore, no "interest on the unpaid balance."

c. Specific costs. The costs of Project features normally serving only one particular Project purpose.

d. Joint-use costs. The costs of features used for any two or more Project purposes.

e. Annual operation and maintenance (O&M) expense. Annual expenses funded under the O&M, General account. These expenses include the day-to-day costs to operate and maintain the Project as well as O&M costs which are not capitalized.

f. Repair, rehabilitation and replacement (RR&R) costs. Costs funded in part under the Operation and Maintenance, General, or Construction, General accounts but not associated with first cost of storage. Such expenditures are for costly, infrequent work and are intended to ensure continued satisfactory operation of the Project. For the purposes of this agreement the term "reconstruction" used in Article 8 "Permanent Rights to Storage" shall be included in this definition of repair, rehabilitation and replacement; repayment of those costs shall be the same as described in Article 5b.

g. Fiscal Year. Refers to the Government's fiscal year. This year begins on 1 October and ends on 30 September.

h. Life of the Project. This is the physical life of the Project.

i. District Engineer. Refers to the District Engineer of the _____ District of the United States Army Corps of Engineers, or his/her successor or designee.

j. Dependable Yield Mitigation Storage. The use of the reallocated space for water supply storage diminishes the dependable yield of water to prior water supply users. To compensate for that loss, additional conservation storage, above and beyond the storage required by the new user, is provided and made available to the prior users. The new user pays for this space. The reallocated storage mitigation space becomes part of the total storage space jointly shared by all the water supply users.

IN WITNESS WHEREOF, the parties have executed this agreement as of the day and year first above written.

THE DEPARTMENT OF THE ARMY	[NAME OF USER]
_____	_____
[NAME]	[NAME]
Colonel, U.S. Army	[TITLE]
District Commander	
DATE:_____	DATE:_____

[Necessary approvals and countersignatures required by State and local law with respect to execution on behalf of the User must be ascertained by the District Engineer and his Counsel and added to the signature block.]

EXHIBIT A: CERTIFICATION

I _____, Attorney for the _____, have reviewed the foregoing agreement executed by _____, and as principal legal officer of/for the _____ certify that [I have considered the legal effect of Section 221 of the 1970 Flood Control Act (Public Law 9l-6ll) and find that] _____ is legally and financially capable of entering into the contractual obligations contained in the foregoing agreement and that, upon acceptance by the Department of the Army, it will be legally enforceable.

Given under my hand, this _____ day of _____20____.

_____

Attorney for the _____

EXHIBIT B: COST COMPUTATIONS

I - LAKE STORAGE

Feature (1)	Elevation (feet, NGCD) (2)		Usable Storage (acre-feet) 1/ (3)	Percent of	
				Usable Storage 2/ (4)	Conservation Storage 3/ (5)
Flood Control					
Conservation					100.00
Water Supply					
User					
Other Water Supply Users [list as appropriate]					
[DYMS to support User]					
Other Conservation Purposes [list as appropriate]					
Other Purposes [list as appropriate]					
Total Usable Storage				100.00	

Notes:
1/ Storage remaining after 100 years of sedimentation from the date the project is operational and does not include dead storage and/or storage set aside for hydropower head.
2/ Used to compute the Users cost (see Exhibits B-II and B-III).
3/ This percent is used to compute the Users storage space (see Article 1b(1)).

II - FIRST COST TO BE REPAID BY THE USER FOR THE REALLOCATED STORAGE SPACE

(Summarize how the costs to the User were derived, i.e., benefits foregone, revenues forgone, replacement cost, updated cost of storage, Section 322 of Public Law 101-640, or other as appropriate.)

EXHIBIT B: (Continued)

III - TOTAL ANNUAL COST TO USER
FOR THE REALLOCATED WATER SUPPLY STORAGE

Item	Type of Use	Computation	Cost
Interest and amortization	Total cost of storage space acquired by the User as determined in Exhibit B-II.	$_____ x _____ factor based on ___ payments, of which ___ payments are at interest rate of _____%.	$
Operation and maintenance 1/	Joint-use [estimated] [actual for FY__]	_____% 2/ x $_____	$
	[Specific water supply facilities [estimated] [actual for FY __]	[100% x $_____]	[$]
Repair, rehabilitation and replacement 3/	Joint-use	_____%2/ x $_____	$
	[Specific water supply facilities [estimated] [actual for FY__]	[100% x $_____]	[$]

Notes:
1/ Payment due and payable on the date specified in Article 5(a)(2).

2/ Percent of Users share of the Usable storage space in the project (column (4) of exhibit B-I).

3/ Repair, rehabilitation and replacement costs are payable only when incurred as specified in Article 5(b).

[IV- COST OF PROJECT MODIFICATIN ASSOCIATED
WITH THE REALLOCATION

(Summarize the construction and associated costs necessary to accommodate the reallocation. The method of cost repayment is to be included.)]

EXHIBIT C: AMORTIZATION SCHEDULE PRESENT DEMAND

(Example 1/)

TOTAL COST: $_____

NUMBER OF PAYMENTS: _____

INTEREST RATE, PERCENT 2/ _____%

Annual Payment Number	Amount of Payment ($)	Interest ($)	Allocated Cost ($)	Balance of Allocated Cost ($)
1				
2				
3				
.				
.				
.				
.				
30	3/			0

Notes:

1/ An amortization schedule is applicable to those projects which will be repaid over time in lieu of during construction.

2/ In accordance with Section 932 of the Water Resources Development Act of 1986, this interest rate will be adjusted at five year intervals throughout the repayment period. The rate is the yield rate as determined by the Secretary of the Treasury plus 1/8 %.

3/ The last payment will be adjusted upward or downward to assure all costs are repaid within 30 years of approval of the agreement.

EXHIBIT D: ASSURANCE OF COMPLIANCE

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF DEFENSE DIRECTIVE UNDER TITLE VI OF THE CIVIL RIGHTS ACT OF 1964, AS AMENDED; THE AGE DISCRIMINATION ACT OF 1975; AND THE REHABILITATION ACT OF 1973, AS AMENDED

The party executing this assurance, being the applicant recipient of Federal financial assistance under the instrument to which this assurance is attached; HEREBY AGREES THAT, as a part of its obligations under the aforesaid instrument, it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), as amended (42 U.S.C. 2000d), and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 195), issued as Department of Defense Directive 5500.11, pursuant to that title; The Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), to the end that in accordance with the aforementioned Title, Directive and Acts, no person in the United States shall on the ground of race, color, age, sex, religion, handicap or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant-Recipient receives Federal financial assistance from the Department of the Army and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this agreement.

If any personal property or real property, or interest therein, or structure thereon is provided or improved with the aid of Federal financial assistance extended to the applicant-recipient by the Department of the Army, or if such assistance is in the form of personal property or real property, or interest therein or structure thereon, then this assurance shall obligate the applicant-recipient or in the case of any transfer of such property, any transferee, for the period during which the property is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits, or for the period during which it retains ownership or possession of the property whichever is longer. In all other cases, this assurance shall obligate the applicant-recipient for the period during which the Federal financial assistance is extended to it by the Department of the Army. The Department of the Army representatives will be allowed to visit the recipient's facilities. They will inspect the facilities to ensure that there are no barriers to impede the handicap's accessibility in either programs or activities.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the applicant-recipient by the Department of the Army, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The applicant-recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the applicant-recipient, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the applicant.

Date _____

_____
(Applicant-Recipient)

By _____

Title _____

_____

_____
(Applicant-Recipient's Mailing Address)

EXHIBIT E: CERTIFICATION REGARDING LOBBYING

[____PROJECT NAME____]
[____NAME OF USER____]

1. The undersigned certifies, to the best of their knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress in connection with the water supply agreement for the [____NAME OF USER____], the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities", in accordance with its instructions. This form is available at http://contacts.gsa.gov/webforms.nsf.

c. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31 U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[NAME OF USER]

BY _____