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April 10, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Draft Operating Curve Change Feasibility Analysis Phase 1 Report

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). On April 12, 2019, FERC issued its Study Plan Determination[1] (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans to incorporate FERC's modifications and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com. In the Final Study Plans, Alabama Power proposed a schedule for each study that included filing a voluntary Progress Update in October 2019 and October 2020. Alabama Power filed the first of two Progress Updates on October 31, 2019.[2]

Pursuant to the Commission's Integrated Licensing Process (ILP) and 18 CFR § 5.15(c), Alabama Power filed its Harris Project Initial Study Report (ISR) on April 10,2020. Concurrently, and consistent with FERC's April 12, 2019 SPD, Alabama Power is filing the Draft Operating Curve Change Feasibility Analysis Phase 1 Report (Draft Report) (Attachment 1). This filing also includes the stakeholder consultation for this study beginning May 2019 through March 2020 (Attachment 2). Stakeholders have until June 11, 2020 to submit their comments to Alabama Power on the Draft Report. Comments should be sent directly to harrisrelicensing@southernco.com.

Stakeholders may access the ISR, this Draft Report, and other study reports on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The ISR and study reports are also available on the Project relicensing website at https://harrisrelicensing.com.

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[1] Accession Number 20190412-3000

[2] Accession Number 20191030-5053

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment 1 – Draft Operating Curve Change Feasibility Analysis Phase 1 Report
Attachment 2 – Operating Curve Change Feasibility Analysis Consultation Record (May 2019-March 2020)

cc: Harris Stakeholder List

Attachment 1
Draft Operating Curve Change Feasibility Analysis Phase 1 Report

DRAFT
OPERATING CURVE CHANGE FEASIBILITY ANALYSIS PHASE 1 REPORT

R. L. HARRIS PROJECT

FERC NO. 2628

Prepared by:

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

APRIL 2020

DRAFT
OPERATING CURVE CHANGE
FEASIBILITY ANALYSIS PHASE 1 REPORT

R.L. HARRIS PROJECT
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R.L. HARRIS PROJECT
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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Hydroelectric Project (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission) (FERC Project No. 2628). The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources.

Harris Reservoir is maintained at or below the elevations specified by the Harris operating curve, except when storing floodwater. From May 1 through October 1, Harris Reservoir is maintained at or below elevation 793 feet msl, depending on inflow conditions. Between October 1 and December 1, the operating curve elevation drops to elevation 785 feet msl. The pool level remains at or below elevation 785 feet msl until April 1. From April 1 to May 1, the operating curve elevation rises to full pool at elevation 793 feet msl. During high flow conditions, USACE-approved flood control procedures in the Harris Water Control Manual (WCM) are implemented. During low flow conditions, the drought contingency curve (the red line in Figure 1-1) is intended to be used as one of several factors in evaluating reservoir operations consistent with approved drought plans.

Alabama Power is using the Integrated Licensing Process (ILP) to obtain a new license for the Harris Project from FERC. During stakeholder one-on-one meetings and at an October 19, 2017 Issue Identification Workshop, stakeholders requested that Alabama Power investigate changing the winter operating curve for the Harris Project. Stakeholders believe that a higher winter operating curve will enhance recreation opportunities on Harris Reservoir during the winter, or typical drawdown period. Based on this request, Alabama Power filed the Operating Curve Change Feasibility Analysis Study Plan to evaluate, in increments of 1 foot from 786 feet msl to 789 feet msl (i.e., 786, 787, 788, and 789 ft msl; collectively “winter pool alternatives” or “alternatives”), Alabama Power’s ability to increase the winter pool elevation and continue to meet Project purposes (Figure 1-1). Alabama Power has performed similar analyses at several of their hydroelectric projects as part of the FERC relicensing process.

Any changes to the Harris operating guide curve could have the potential to impact downstream communities and, therefore, downstream impacts must be identified in the analysis. Changes to the operating curve must be approved by FERC, with consultation by the USACE relating to flood control issues. The current license requires the Project to be operated in the interest of flood control based on agreement between USACE and Alabama Power, and the current operating guide curve and flood control operations are included in the USACE-issued WCM for the Harris Project. Changes to the operating curve and flood control operations would also require changes to the agreement between USACE and Alabama Power to make it consistent with the requirements in the new license. Those changes likely would involve extensive study by from the USACE.

Alabama Power performed extensive modeling and analysis of the hydrologic record and baseline information for the Project. Alabama Power developed this study report to describe the models and how they were developed and to present the Phase 1 results of the potential impacts of a winter operating curve change on hydropower generation, flood control, navigation, drought operations, Green Plan flows[1], and downstream release alternatives.

[1] See Section 4.2.1.1 for discussion of the Green Plan.

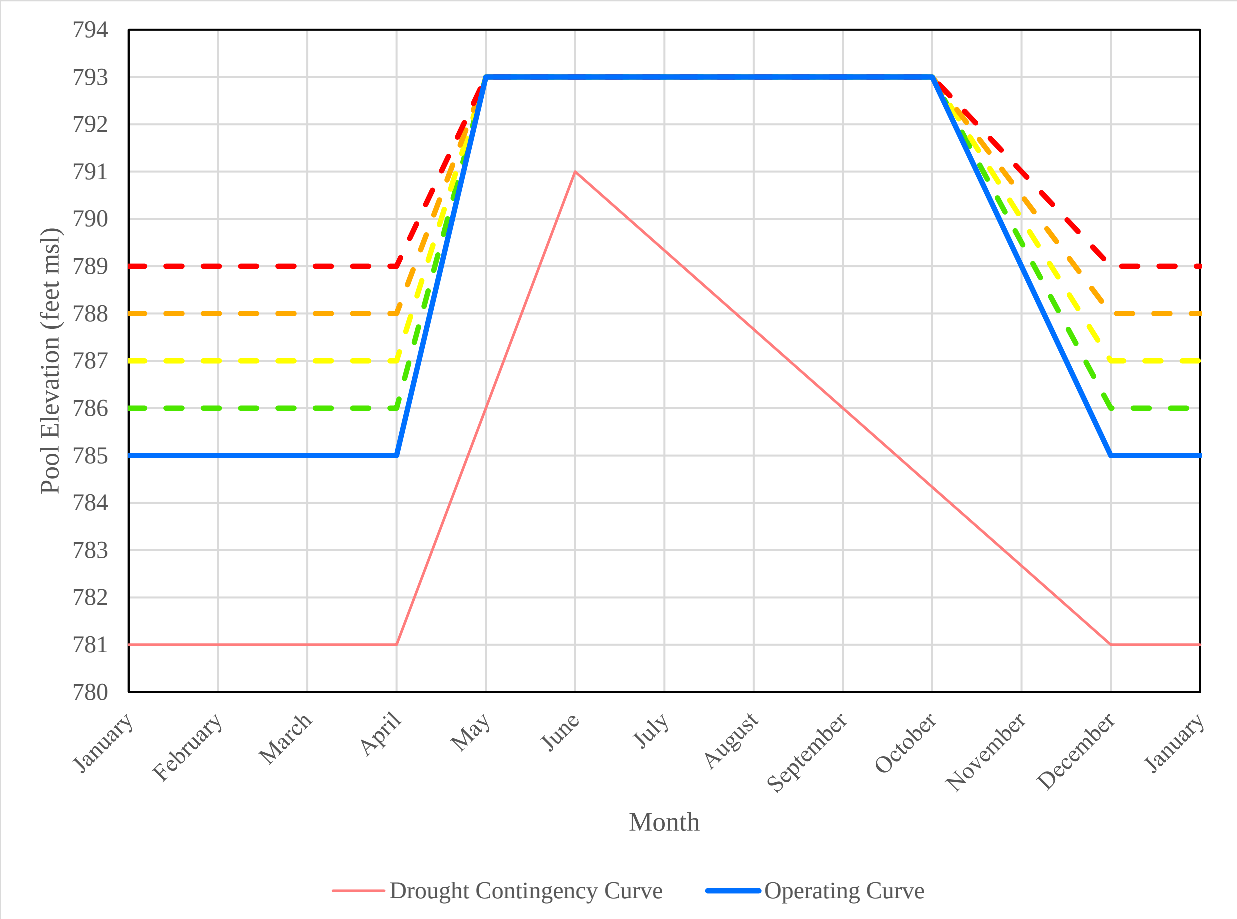

FIGURE 1–1 HARRIS OPERATING CURVE WITH PROPOSED 1-FOOT INCREMENTAL CHANGES

Section 2.0 of this report summarizes the geographic scope as identified in the study plan as well as describes the geographic area included in the various models used in the study. Section 3.0 then reviews the data and models, as well describes the methodology used to examine significant flood events and long-term operational impacts. Section 4.0 then discusses how the particular models for the study were developed, calibrated, and/or verified. Results of the analysis are presented in Section 5.0 and summarized in Section 6.0, which also discusses how the information in this report will inform next steps.

2.0 GEOGRAPHIC SCOPE AND MODEL BOUNDARIES

The FERC-approved geographic scope (i.e., the study area) of this study corresponds with the physical area and/or resources influenced by the proposed operational change, which may or may not be consistent with the Harris Project boundary. The geographic scope of analyses for each operational parameter and resource for Phase 1 is listed in Table 2-1. Section 2.1 describes the geographic areas included in the various models used in the study.

TABLE 2–1 SUMMARY OF OPERATIONAL PARAMETERS, RESOURCES, GEOGRAPHIC SCOPE AND RATIONALE

OPERATIONAL PARAMETER/RESOURCE	GEOGRAPHIC SCOPE	RATIONALE
Hydropower Generation	Alabama Power's Coosa and Tallapoosa Projects	Effects on hydropower generation would impact system-wide operations
Flood Control	Lake Harris and Harris Dam to Montgomery Water Works	Model parameters are set to evaluate flood operation effects to Montgomery Water Works
Navigation	ACT Basin	Model parameters are set to evaluate effects on the ACT Basin per the USACE Master Water Control Manual
Drought Operations	ACT Basin	Model parameters are set to evaluate effects on the ACT Basin per the USACE Master Water Control Manual
Green Plan Flows	Tallapoosa River downstream from Harris Dam through Horseshoe Bend	Operational influence of the Harris Project occurs from Harris Dam through Horseshoe Bend.
Downstream Release Alternatives	Tallapoosa River downstream from Harris Dam through Horseshoe Bend	Operational influence of the Harris Project occurs from Harris Dam through Horseshoe Bend.

2.1 MODEL BOUNDARIES

The following sections describe the Alabama-Coosa-Tallapoosa (ACT) river basin as used in the various models used in this study. The ACT network extends from Carters Dam and Allatoona Dam, both upstream of Alabama Power's hydroelectric projects on the Coosa River, and from Harris Dam, on the Tallapoosa River, to the tailwater of Claiborne Lock and Dam on the Alabama River. Regulation in the upper portion of the basin is provided by Carters and Allatoona Dams. The middle of the watershed is represented by eleven Alabama Power hydroelectric projects on the Coosa and Tallapoosa. The three additional federal projects on the Alabama River were also included where needed in the models.

2.1.1 TALLAPOOSA RIVER

2.1.1.1 HARRIS RESERVOIR

The Harris Reservoir extends up the Tallapoosa River 29 miles from Harris Dam, which is located at River Mile (RM) 136.7 of the Tallapoosa River, with an arm also extending up the Little Tallapoosa River. There are no other major impoundments upstream of Harris Dam. There are two operating United States Geological Survey (USGS) gages upstream of Harris Dam. The Heflin gage (No. 02412000; located approximately 26 miles upstream of Harris Dam) has sixty-eight years of discharge and stage data. The Newell gage (No. 02413300; located 35.5 river miles upstream of the confluence of the Little Tallapoosa and Tallapoosa Rivers) has forty-five years of daily average discharge and stage data. Harris Reservoir receives inflows from approximately 1,454 square miles of drainage.

2.1.1.2 HARRIS DAM TO MARTIN POOL

The Tallapoosa River below Harris Dam (RM 136.7[2]) is an upper basin type stream with steep slopes and narrow floodplains that include rapids. It also contains two currently operating USGS gage sites, the Wadley (No. 02414500; RM 122.79) and Horseshoe Bend (No. 02414715; RM 93.7) gages. The Wadley gage has ninety-seven years of daily flow and stage data and Horseshoe Bend has thirty-five years of daily flow and stage data. The stream channel is characterized by rock outcrops and a few sand bars. The stream is crossed by four highway bridges and two railroad bridges. The most populated community along this reach of the Tallapoosa River is the City of Wadley at RM 122.97. This free-flowing reach of the Tallapoosa River ends at the Martin Dam Project (FERC No. 349) reservoir near RM 88.0.

2.1.1.3 MARTIN RESERVOIR

The Martin Reservoir ranges from RM 88 to the Martin Dam at RM 60. The primary purpose of Martin Dam is hydropower generation. The Martin Reservoir receives inflows from the

[2] River miles in this report are consistent with the georeferenced locations in the models used for the study. This resulted in slightly different river mile values than were referenced in the Harris PAD, which were based on USACE stream mileage tables.

Tallapoosa River, representing 2,131 square miles of drainage, and local inflows from an additional 853 square miles of tributaries that flow directly into the lake.

2.1.1.4 YATES AND THURLOW RESERVOIRS

The Yates and Thurlow Project (FERC No. 2407) Dams impound the Tallapoosa River from RM 60 to RM 49.7, with the Yates pool backing up to the toe of Martin Dam. Thurlow Dam is the most downstream dam on the Tallapoosa River. These dams are located at the base of the fall line of the Tallapoosa basin. These reservoirs provide very minimal storage and simply generate power from releases at Martin Dam along with local inflows and are operated at constant levels, except during major floods. During some periods, the local inflows to these lakes are sufficient to satisfy downstream minimum flow requirements. Yates Reservoir receives inflows from approximately 3293 square miles of drainage and Thurlow Reservoir receives inflows from approximately 3308 square miles of drainage.

2.1.1.5 LOWER TALLAPOOSA RIVER

The reach of river below Thurlow Dam is a free-flowing system that enters the alluvial plain with widening floodplains and much flatter slopes. This reach of the Tallapoosa River contains approximately forty-nine miles of stream and is crossed by at least three major road bridges. Alabama Highway 229 crosses at RM 39.8; a county road bridge crosses the river at RM 18.5; and U.S. Highway 231 crosses the river at RM 9.8 and is a four-lane highway. Three USGS gage sites have data on this reach. The Tallassee (RM 47.98) gage (No. 02418500) is approximately one mile downstream of Thurlow Dam. The Milstead gage (No. 02419500) is located on the Alabama Highway 229 Bridge (RM 39.8), and the most downstream gage on the Tallapoosa River is located at the Montgomery Water Works plant (No. 02419890) at RM 12.9. A major pipeline crosses the river at RM 48.99 and the reach from the tailwaters of Thurlow to just below the pipeline remains relatively steep. The entire Tallapoosa River basin is approximately 4,687 square miles.

2.1.2 ALABAMA AND COOSA RIVERS

The Tallapoosa and Coosa Rivers merge near Montgomery to form the Alabama River. Drainage area of the Coosa, at its mouth, is approximately 10,161 square miles and the Tallapoosa is 4,675 square miles at its mouth. Therefore, the Coosa River has the greatest influence on the total flows in the Alabama River with 68 percent of the drainage area. Flows from the Coosa enter the Alabama River from two sources, Jordan and Bouldin Dams. Jordan Dam was constructed on the mainstem of the Coosa River and Bouldin Dam is a diversion lake with hydroelectric power facilities that simply draw flows from Jordan Reservoir. Jordan Dam is 19 miles upstream of the confluence of the Coosa and Tallapoosa rivers. The Alabama River flows from Montgomery west to converge with the Tombigbee River forming the Mobile River. The USACE's Robert F. Henry Lock and Dam on the Alabama River at RM 245.4, is located approximately 69 miles downstream of the confluence of the Tallapoosa and Coosa Rivers. Two USGS gages are located on the Alabama River in this 69-mile reach. These gages are identified as the "near Montgomery gage" (No. 02420000) at RM 287.7 and the "Montgomery gage" (No. 02419988) at RM 296.9.

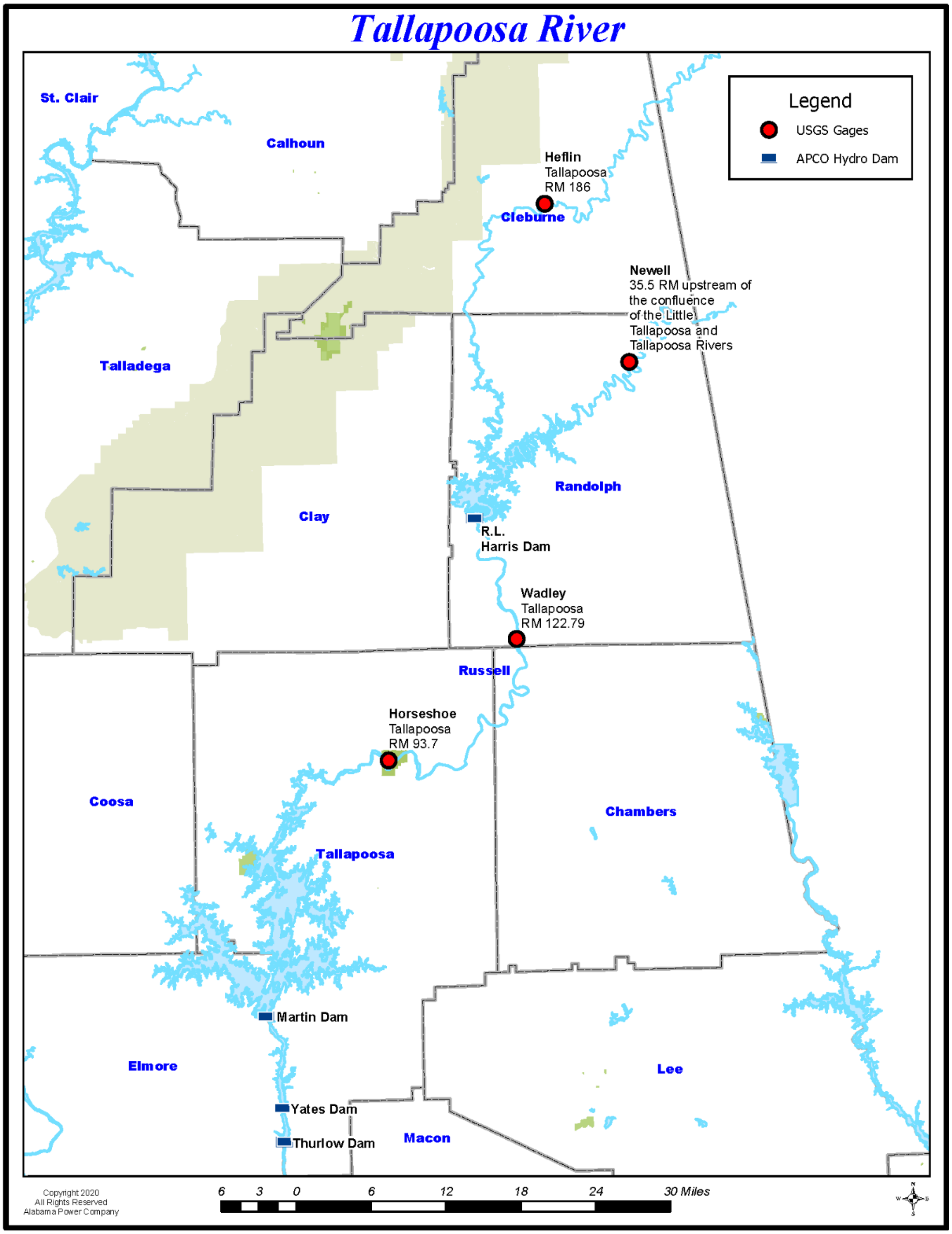

FIGURE 2–1 TALLAPOOSA RIVER MAP

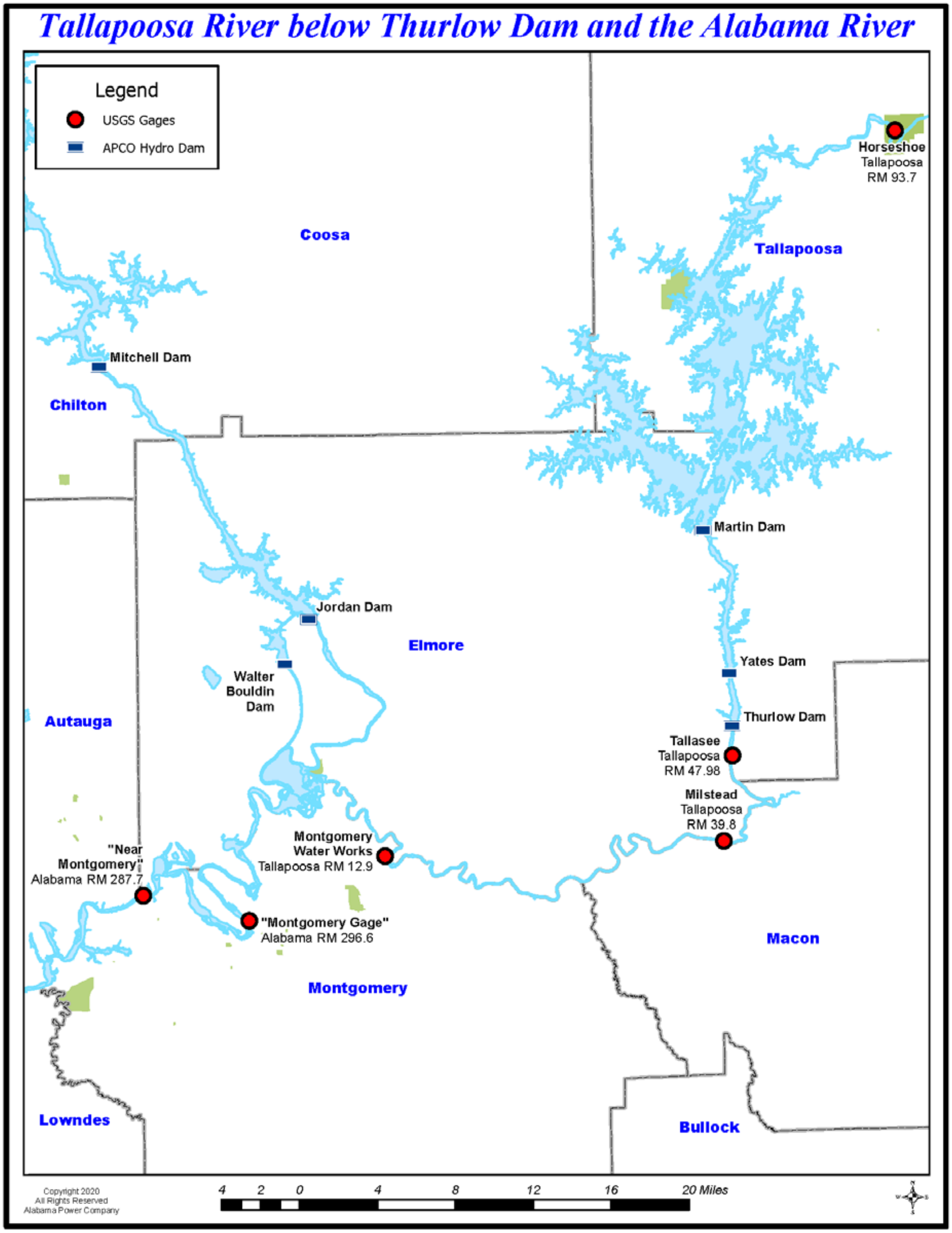

FIGURE 2–2 MAP OF THE TALLAPOOSA RIVER BELOW THURLOW DAM AND THE ALABAMA RIVER

3.0 MODEL SUMMARY

3.1 Overview

Study methods included using existing data (hydrologic record and baseline information) in order to develop the appropriate simulation models to evaluate, in increments of 1 foot from 786 feet msl to 789 feet msl, Alabama Power's ability to increase the winter pool elevation and continue to meet Project purposes. The simulation models developed as part of this study provide the tools needed to identify impacts to operational parameters and resources.

Alabama Power used the following data and models to conduct the feasibility analysis of the operating curve study at Lake Harris.

Data

1) Alabama-Coosa-Tallapoosa (ACT) unimpaired flow database – this database was developed by the USACE with input and data from other stakeholders in the ACT comprehensive study, including both the states of Georgia and Alabama, Alabama Power, and others. These data include average daily flows from 1939 – 2011[3] with regulation influences removed. This dataset was utilized in Hydrologic Engineering Center's Reservoir System Simulation (HEC-ResSim). An unsmoothed version of this dataset for 1939-2005 was utilized in the HEC-Flood Frequency Analysis (HEC-FFA).
2) Other data – Other data sources include USGS, USACE, and Alabama Power records.

Models

1) HEC-Flood Frequency Analysis (HEC-FFA) – This USACE model conforms with Technical Bulletin #17B in determining flood flow frequency. This model was used to determine the statistical frequency of flooding for one, three, and five-day flow volumes.

   Note that the Study Plan stated that HEC-Statistical Software Package (HEC-SSP) is the USACE's newest version of the Flood Frequency Analysis and, therefore, would be used to determine the statistical frequency of flooding on a monthly basis. HEC-SSP combines the capabilities of HEC-FFA with other HEC software, allowing for further statistical analysis of the data. The procedures used for analyzing the flow frequency (Bulletin #17B) did not change with the development of HEC-SSP. There has been no update to the inputs used in the HEC-FFA study of the Tallapoosa River; therefore, it was not necessary to use HEC-SSP for the purposes of this study.
2) HEC-River Analysis System (HEC-RAS) – This model was used in the flood study portion of evaluating the operating curve. It routes flows in the unsteady state[4] along the river.

[3] Although when developing the study plan Alabama Power anticipated the dataset to include the years 1939-2016, the unimpaired dataset provided by the USACE includes 1939-2011.
[4] In hydraulic modeling, simulations run in the unsteady state consider the variance of flow with respect to time.

3) HEC-ResSim – This model looked at operational changes at the Harris Project in conjunction with operating curve changes on a daily timestep. It was used to focus on the hourly flood study operations. This model, in conjunction with the HEC-RAS model, shows impacts, if applicable, to the Martin Dam Project operations.
4) HEC-Data Storage System and Viewer (HEC-DSSVue) – This is the USACE's Data Storage System, which is designed to efficiently store and retrieve scientific data that is typically sequential. Data in HEC-DSS database files can be graphed, tabulated, edited, and manipulated with HEC-DSSVue. This program was used to display some of the output of the other HEC models.
5) Alabama Power Hydro Energy (HydroBudget) Model – This model is a proprietary model that was used to evaluate the net economic gains or losses that could result from proposed operating curve changes at the Harris Project.

The models, assumptions, and their ability to address the study questions were presented to HAT 1 on September 20, 2018 and September 11, 2019.

3.2 SIGNIFICANT FLOOD EVENT IMPACT MODELING METHODOLOGY

Significant flood event impact models evaluate the ability of the system or facility to manage a significant flood. Alabama Power used two models to analyze these impacts: HEC-RAS and HEC-ResSim. In support of these two models, the HEC-FFA software analysis package was used to develop frequency data.

Standard hydrologic methods for deriving the 100-year flood apply to unregulated streams; however, the Tallapoosa River has been regulated during the entire period of hydrologic record. Special hydrologic methods are normally required to filter out the influence of the regulation; however, the Mobile District of USACE had previously developed a database for daily unregulated flows on the Tallapoosa River. This database was used as input into the HEC-FFA software package to determine the statistical frequency of historical flood events on the Tallapoosa River. The HEC-FFA program only provided 1, 3, and 5-day average peak flows and did not define the hydrograph shape. The 5-day average peak flow approximates the volume of runoff received by a storm. A flood that occurred during March 1990 was very near a 100-year return storm; therefore, the March 1990 flood inflows into Harris Reservoir were used as a representative hydrograph and were scaled to the peaks of 100-year flow and volume from the FFA analysis. Scaling a historical event provided realistic consideration of the peak timing and representative shape of the 100-year event.

Impacts to flooding were evaluated by comparing current and alternative starting elevations as a 100-year flood at Harris Dam passed through the system. Screening of an alternative's ability to manage significant flood events was accomplished by subjecting each alternative to a representative flood over Lake Harris with a 1 percent recurrence probability. Model time steps were set to ensure a stable simulation and provide reasonable detailed results. HEC-RAS, version 5.0.7, was employed in the unsteady mode to simulate the movement of each hydrograph released from Harris Dam, combined with downstream intervening flows, to Martin Dam, and from Thurlow Dam to the Jones Bluff Lock & Dam on the Alabama River. Topographic data for the model was extracted from existing data sources. This included channel and floodplain cross-sections, Light Detection and Ranging (LiDAR) survey data and USGS topographic quad sheets (reference Section 4.1.3 below).

3.3 LONG-TERM OPERATIONAL IMPACT MODELING METHODOLOGY

Long term operational impacts address the management of storage and power generation, as well as frequency, magnitude, and duration of spill events and downstream release requirements over the period of record. Models used for these analyses included HEC-ResSim and Alabama Power's HydroBudget.

The HEC-ResSim model was employed to simulate the operation of the Harris Dam over the period of record. Simulations with the proposed operating curve changes were compared to the current operating curve. In order to evaluate impacts of modifying the operating curve on downstream navigation and environmental flows, flow duration relationships were generated.

Any change in the operating curve at Harris Dam has the potential to impact power generation at Alabama Power's projects on the Coosa and Tallapoosa Rivers, as the system is operated as a whole. Alabama Power utilized its proprietary HydroBudget model to evaluate net economic impacts to hydropower generation resulting from the proposed operating curve changes.

4.0 MODEL & DESIGN FLOOD DEVELOPMENT

The respective models summarized in Section 3.0 were developed to analyze the ability of the system or facility to manage significant floods and long-term operational impacts. This section discusses how the models were developed, calibrated, and/or verified.

4.1 DATA SOURCES AND DESCRIPTIONS

4.1.1 HYDROLOGIC DATA

Hydrologic data was collected in the form of stream flow historic records at established gage sites. This included Alabama Power's records of releases from its dams, the ACT unimpaired flow data, and USGS published flow records at its established gage sites. Due to the extensive stream gage data, determination of runoff hydrographs from rainfall records was not necessary. For long term evaluations, average daily flows primarily from the ACT unimpaired flow data were utilized; and, for short term evaluations, hourly flows were used. Records at some gage sites only contained average daily flows. Hourly flows were interpolated at these sites by combining the average daily flows with the estimated instantaneous peak values.

4.1.2 HYDRAULIC DATA

Hydraulic data consisted of stream gage historical stage records, highwater marks during flood events, spillway and gage ratings at the dams, and gate operation schedules for the respective structures. Seasonal reservoir levels for Harris and Martin were represented by the published flood control guide curves.

4.1.3 TOPOGRAPHIC AND GEOMETRIC DATA

Channel geometry of the streams used in the HEC-RAS model was represented by surveys of channel cross sections at selected sites. Bathymetry data from RM 136.7 to RM 123.0 was collected by survey during two different field efforts in 1999 and 2003. The 1999 surveying effort was completed by Sublett Surveying, LLC and extended from RM 136.7 to RM 130. The 2003 surveying effort was completed by Alabama Power and extended from approximately RM 130 to RM 123. Trutta Environmental Solutions collected bathymetry data for the reach of the Tallapoosa between Wadley and the Martin reservoir in 2019 using two different survey methods. In areas with sufficient depth for boating, a Global Positional System (GPS)/Global Navigation Satellite System (GNSS) rover antenna (Trimble R10) mounted above an 200 kHz echosounder (CEE-LINE, CEE Hydrosystems) was mounted to a kayak and used to collect river bottom elevations at 1-second intervals as the surveyor paddled in a path across the river channel perpendicular to the flow. In areas where there was insufficient depth for boating, the GPS/GNSS rover antenna was mounted on a 2-meter survey rod and river bottom elevations were collected manually at approximately 10-foot intervals in a path across the river channel perpendicular to the flow. The average horizontal and vertical accuracy of these survey data was 0.08 feet and 0.15 feet, respectively. A total of 120 bathymetric cross sections between Wadley and the Martin reservoir were surveyed. Additionally, in January 2006, Alabama Power contracted Lasermap Image Plus to collect LiDAR and imagery for the reach of the Tallapoosa River from just below Tallassee to the Montgomery Water Works, and, in 2018, contracted EagleView to collect LiDAR and imagery for the Tallapoosa River downstream from Harris Dam through Horseshoe Bend.

In HEC-RAS, cross sections were drawn along the river at each location where a bathymetric cross section was collected. The data from the bathymetric cross section was imported into the model for each cross section, and LiDAR data was used for areas outside of the stream channel. Combining both datasets provided accurate representations of the terrain for the entire cross section. Dimensions of the four highway bridges spanning the Tallapoosa River between Harris Dam and Martin Reservoir were obtained from engineering drawings from the Alabama Department of Transportation. Drawings for a railroad bridge located at RM 120.9 were not available; thus, its dimensions were estimated using aerial photos and LiDAR data.

4.1.4 Flood Frequency Analysis Database (HEC-FFA)

In the 1990's, the ACT/ACF Comprehensive Water Resources Study team, led by the USACE Mobile District, developed a database of unimpaired average daily flows for gage points along the major rivers in the ACT River Basin. This database has been updated on several occasions and covered a period from 1939 through 2005, which was when the Alabama Power FFA study was completed. This database provided an excellent source of flow data for flood frequency analysis, since standard methods to develop flow frequencies (as defined by Bulletin #17B) are designed for natural flows and do not address regulated flows.

The 1997 ACT/ACF Comprehensive Water Resources Study Report defined unimpaired flows as: ". . . *historically observed flows adjusted for human influence by accounting for the construction of surface water reservoirs and for withdrawals and returns to serve municipal, industrial, thermal power, and agricultural water uses*". The study attempted to remove augmentation to river flows induced by human activities. The purpose of developing this database was for input to reservoir system models to assist in evaluations of issues and actions for the ACT/ACF Comprehensive Study. Missing records and data gaps were estimated by transposing nearby records, and routing coefficients were developed for each river reach. The Comprehensive Study was primarily concerned with dry or drought conditions, so the data set was smoothed in order to mitigate negative low flows that were generated during the process. However, this also dampened peak flow conditions. Since the flood frequency analysis is concerned with peak flows, the smoothing algorithm had to be reversed. Alabama Power and the USACE Mobile District modified the DSSMATH macros that were developed to smooth the unimpaired flows to reverse the smoothing, thus, creating a new database with the peak values unsmoothed. The resulting database is referred to as the "unimpaired-unsmoothed" database.

4.1.5 FREQUENCY ANALYSIS OF ANNUAL PEAKS

The flood event most commonly used to evaluate the impacts of a major flood is an event with a return period of 100 years or a 1 percent probability of recurrence. The 100-year event is used by Federal Emergency Management Agency (FEMA) for floodplain regulations and insurance determinations; therefore, it has significant legal and regulatory applications. Using the unimpaired-unsmoothed database, Alabama Power determined flows for the 10, 25, 50, 100, 250, and 500-year events for eight gages along the Tallapoosa River. Flows for these return periods were determined for 1, 3, and 5-day average flows. Bulletin #17B, "Guidelines for Determining Flood Flow Frequency, March 1982" and the USACE's Engineering Manual, "Hydrologic Frequency Analysis, EM 1110-2-1415, March 1993" were employed in these determinations. Also, the 1992 version of the USACE's computer software package, HEC-FFA was used in determining flow frequencies. The 1979 and 1990 flood events were compared to the results of the frequency analysis at each gage point. A report, Tallapoosa River Basin Flood Frequency Analysis, summarizing the results was published in November 2005 and is attached to this report as Appendix B for further reference. This report was reviewed by the USGS and the USACE, Mobile District. Table 4-1 reflects the results generated by the study for the Harris Dam.

TABLE 4–1 FREQUENCY FLOWS FOR HARRIS DAM

Average Flow	10% 10-yr	4% 25-yr	2% 50-yr	1% 100-yr	0.25% 250-yr	0.05% 500-yr	Apr 1979	March 1990
1-day	41,600	50,100	56,200	61,900	69,200	74,500	59,002	46,604
3-days	32,000	38,900	44,000	48,900	55,200	59,900	44,607	42,456
5-days	25,600	31,100	35,100	39,000	44,000	47,800	34,646	34,845

4.2 HEC-RESSIM DAILY MODEL

The ACT HEC-ResSim model was initially developed in conjunction with USACE to replace the HEC-5 model of the basin. To calibrate the HEC-ResSim model, the HEC office and Mobile District entered conditions from 1977, 1995, and 2006 in both HEC-ResSim and HEC-5. Adjustments were made to the model and network until the ResSim model was able to reproduce the HEC-5 results. Working with the Mobile District and HEC office, a reservoir network was developed that contained current physical and operational rules for each project in the ACT basin. The ACT reservoir network, described in Section 2.0, was further refined during the recent WCM update process. Version 3.4.1 of HEC-ResSim was used to simulate the current operations, providing a baseline condition in the model.

The ACT unimpaired flow database was used for flow data from 1939 through 2011[5]. These data include inflow and diversions for junctions in the network, along with evaporation for each reservoir. A daily time step was used in the model, which limits some operational flexibility when compared to an hourly model but allows for many alternatives to be evaluated over a long simulation period.

Harris Dam is modeled in HEC-ResSim with both a minimum requirement and a maximum constraint at the downstream gage at Wadley. This maximum limit can be exceeded when Harris Reservoir is in flood control operations and follows the induced surcharge function. There is also a minimum release requirement based on the flow at the upstream gage of Heflin. A power generation rule applies during normal and flood operations. The project is operated in tandem

[5] Although when developing the study plan Alabama Power anticipated the dataset to include the years 1939-2016, the unimpaired dataset provided by the USACE includes 1939-2011.

with the downstream reservoir, Martin, for minimum flow operations when the pool is not being operated for flood control.

4.2.1 OPERATIONAL FEATURES

4.2.1.1 MINIMUM FLOW OPERATIONS

The reservoir network defined by the Mobile District and Alabama Power includes the current operations for all the reservoirs in the basin as best captured by a daily model. Downstream flow requirements were included in the network. To meet these requirements, the storage projects on each river act as a system. On the Tallapoosa River, Harris and Martin work in tandem to provide the Thurlow minimum flow requirement. On the Coosa River, Logan Martin, in tandem with Weiss and H. Neely Henry developments, operates through the run-of-river reservoirs to meet the flow requirement at Jordan Dam. For each of these river systems, the projects release water based on maintaining an approximately equal percentage of available storage at each project. The downstream flow requirement does include the intervening flows between the storage project discharge and the flow requirement location so that reservoir releases may be less than the measured minimum flow.

The minimum flow requirement at Thurlow is included in the model as an operational rule at Martin, which Harris also supports by operating in tandem with Martin. This is because Yates and Thurlow are entered as flow-through projects with no operational rules, that is, the flow that enters the project also exits. The flow rule is programmed to allow a cutback during drought conditions. Depending on the month and drought intensity, the minimum flow requirement ranges from 1200 cfs to 350 cfs. Flows at the Tallassee gage were found to meet or exceed 350 cfs for the entire period of record.

There are two minimum flow requirements modeled at Harris Dam - a minimum flow of 45 cfs at Wadley and a release based on the previous day’s Heflin flow, representing the Green Plan. The downstream minimum flow at Wadley is met with a with a flow rule of 45 cfs measured at Wadley throughout the entire year. The Green Plan is represented by a daily minimum release requirement from Harris Dam based on the previous day’s flow at the Heflin gage. The required release ranges from 85 cfs, when Heflin flows are less than 50 cfs, to 1,067 cfs, when Heflin flows are 900 cfs or higher. The Green Plan does include provisions for cutbacks in releases during periods of drought.

4.2.1.2 DROUGHT OPERATIONS

The Alabama-ACT Drought Response Operations Plan (ADROP) provides for three incremental drought intensity level responses based on the severity of drought conditions in the basin. The drought intensity level (DIL), ranging from 0 to 3, is based on three triggers – basin inflow, state line flows, and composite storage.

- The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Allatoona Lake and Carters Lake.
- A low state line flow trigger occurs when the Mayo's Bar USGS gage (Gage No. 02397000) measures a flow below the monthly historical 7Q10 flow.
- Low composite conservation storage occurs when the Alabama Power projects' composite conservation storage is less than or equal to the storage available within the drought contingency curves for the Alabama Power reservoirs.

These thresholds are evaluated on the 1st and 15th of every month in the model. The DIL increases as more of the drought indicator thresholds (or triggers) are met. The ADROP matrix defines monthly minimum flow requirements for the Coosa, Tallapoosa, and Alabama Rivers as function of DIL and time of year. Such flow requirements are modeled as daily averages. The storage volumes in the Alabama Power Coosa and Tallapoosa projects are balanced to support this release. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period.

4.2.1.3 NAVIGATION OPERATIONS

Navigation operations in HEC-ResSim are based on basin inflows and the historical average storage usage from Alabama Power projects during a given month. Releases are made from Alabama Power projects on the Coosa and Tallapoosa Rivers, along with local inflow, in order to provide the navigation flows in the model. Basin inflow targets are designed to provide channel depths of 9.0 ft and 7.5 ft in the Alabama River below the Claiborne Lock and Dam. If a 9.0 ft channel cannot be made available due to inflows, a 7.5 ft channel is attempted, which would allow light loaded barges to move through the system. If basin inflows do not support a 7.5 ft channel, navigation releases are suspended. During drought operations, releases to support navigation would be discontinued until the DIL is equal to zero.

4.2.1.4 Flood Control Operations

The USACE-approved flood control procedures in the Harris WCM are incorporated into the daily HEC-ResSim model. The flood control zone is defined as the area below the top of the dam and above the operating curve, ranging from 785 ft to 793 ft depending on the date. The elevation 790 ft serves as a transition elevation for flood control operations. When the reservoir elevation is above the operating curve and below 790 ft, Harris is operated to keep the Wadley gage at or below a stage of 13.0 ft, with a maximum release of 13,000 cfs. If the pool elevation exceeds 790 ft and the operating curve, releases are 16,000 cfs or greater if determined by induced surcharge curves. The 45 cfs minimum flow at the Wadley site and power operations are included in the flood control operating zone.

4.2.1.5 Spillway Operations

The spillway at Harris is included in the HEC-ResSim model to capture releases from the project that exceed the turbine capacity. With the Harris flood control procedures and spillway characteristics in the daily model, spill frequency and duration can be determined. Although there is a slight underestimation of the frequency of spill (0.5 percent difference), HEC-ResSim satisfactorily models the flood control operations at Harris.

4.2.1.6 Hydropower Operations

A power guide factor was used in the HEC-ResSim model to simulate the existing generation at Harris. The power guide factor relates plant factors to the percentage of power storage remaining in the reservoir. The factors represent the hours of generation per day as a function of the remaining power storage. With full power storage available, Harris is programmed to generate 3.84 hours per day. The power guide factor creates a zone for utilizing hydropower and is comparable to the zone between the existing operating guide curve and the drought curve. Generation is employed after all flow requirements have been met.

4.3 HEC-RESSIM HOURLY MODEL

An hourly model was necessary to evaluate the flood impacts resulting from the proposed operational changes. The operating rules in the daily HEC-ResSim model were adapted for an hourly timestep. The geographic scope of the HEC-ResSim network for the purposes of the hourly model were limited to the area on the Tallapoosa River from Harris Dam downstream to the upstream end of Martin Reservoir. The physical characteristics of the watershed and projects were maintained through both daily and hourly networks in HEC-ResSim.

4.3.1 OPERATIONAL FEATURES

To model flood operations at Harris and to capture Martin discharges downstream, the daily HEC-ResSim model was simulated with an hourly timestep. The induced surcharge curves and flood control operations for Wadley were transferred to the hourly model, but it was necessary to alter or remove some operating rules to model the design storm.

- The Green Plan operations were removed. Minimum releases do not influence flood operations during a flood study, allowing for this rule to be excluded. The minimum flow of 45 cfs at Wadley remained in the model but was operationally insignificant in evaluating the proposed guide curve changes.
- The Martin Tandem rules were excluded from the flood study. Balancing the storage in the projects is not applicable when evaluating flood control operating rules.
- Releases specifically for generation at Harris and Martin were omitted from the operations used to analyze the proposed guide curves.
- Drought and navigation rules at Martin were not included in the model. Neither condition should influence releases when studying flood operations.

4.3.2 CALIBRATION

Alabama Power carved out a portion of the daily HEC-ResSim model to create an hourly HEC-ResSim model for this study. The daily model was developed and calibrated by the USACE. In order to calibrate the hourly model, the May 2013 flood was used to see how well the model replicated the historical event. As shown in Figure 4-1, the model reproduces the May 2013 flood very well. The modeled Harris outflow hydrograph, peak discharge, and pool elevation in the model echo the historical data. This analysis supports that the model reflects the flood control rules accurately.

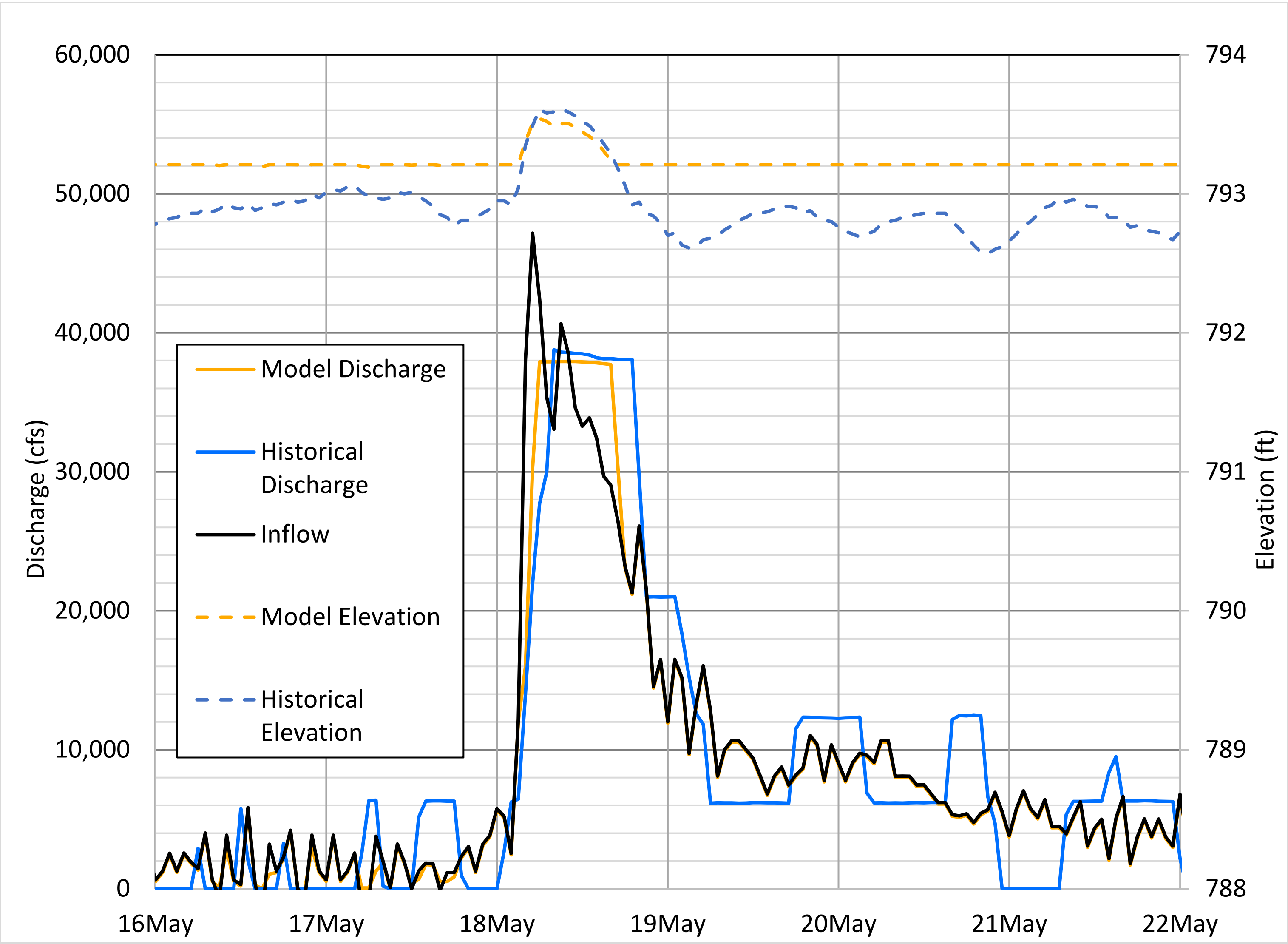

FIGURE 4–1 HARRIS RESERVOIR HOURLY RESSIM CALIBRATION – MAY 2013

4.4 DESIGN FLOOD

Evaluation of the Harris Dam and Reservoir's ability to manage a large flood was based on a flood event that equals a 100-year return period (1 percent probability of recurrence) over the Lake Harris area. This event is referred to as a "Design Flood" in that it represents a critical and large flood event at Harris Dam, which is used to compare the proposed changes to the current operations at the dam. The 100-year flood is used by others, such as FEMA, to define floodplain limits and to set development and control limits for communities. However, standard methods that produce the 100-year event are generally only determined with peak flows and do not consider hydrograph shape and volume. The hydrograph shape and volume have the greatest influence on the ability of the dam to manage the flood event. Therefore, the March 1990 inflow hydrograph to Harris Lake was scaled to produce average daily values that closely matched the 1, 3, and 5-day average flows for the 1 percent recurrence values produced in the Flood Frequency Analysis of the unimpaired data set. These values are daily average values but, together, closely represent the volume and shape of the inflow hydrograph. Each 1 percent FFA value was positioned over the March 1990 hydrograph such that its duration enclosed the hourly flow values that produced the corresponding value from the March 1990 event.

Initially, the hourly flows were scaled by ratio to bring them up to represent the 1 percent values to achieve the appropriate volume in the hydrograph. Table 4-2 below presents the final results and the final hydrograph is shown in Figure 4-2. Harris Dam operations consider the stages at Wadley gage, which is located approximately 13 miles downstream of the Dam. Therefore, 1 percent recurrence intervening flows (local inflows) between the Harris Dam and Wadley had to be included in the analysis. The intervening flow hydrograph for the Harris-Wadley reach was developed by extracting the 1990 Harris outflows from the 1990 Wadley gage flows. The hourly values had to be reduced to 3-hour running average values to get a smooth hydrograph and negative values were set as zero. Then the remaining values were adjusted to preserve the net volume of flow over the hydrograph period. The 1 percent recurrence volume, for the intervening flows between Harris and Wadley, was determined by subtracting the Harris 5-day FFA volume from the Wadley 5-day FFA volume. Then the Harris-Wadley 1990 intervening flows were scaled to produce the 1 percent recurrence hydrograph. Table 4-3 presents the results and Figure 4-3 presents the final hydrograph for the intervening Harris-Wadley flows.

TABLE 4–2 HYDROGRAPH RESULTS FOR 100-YR DESIGN FLOOD FOR HARRIS DAM

AVERAGE FLOW (days)	SCALE FACTOR	1990 FLOOD (cfs)	1% FFA (cfs)	DESIGN FLOOD (cfs)
1-day	1.20	51,531	61,900	61,961
3-days	1.28	38,170	48,900	47,489
5-days	1.21	32,110	39,000	39,702

TABLE 4–3 HYDROGRAPH RESULTS FOR 100-YR DESIGN FLOOD INTERVENING FLOWS FOR HARRIS-WADLEY REACH

AVERAGE FLOW (days)	SCALE FACTOR	1990 FLOOD (cfs)	1% FFA (cfs)	DESIGN FLOOD (cfs)
1-day	0.6513	32,858	21,400	21,400
3-days	0.6613	18,889	12,500	12,332
5-days	0.6477	14,358	9,300	9,358

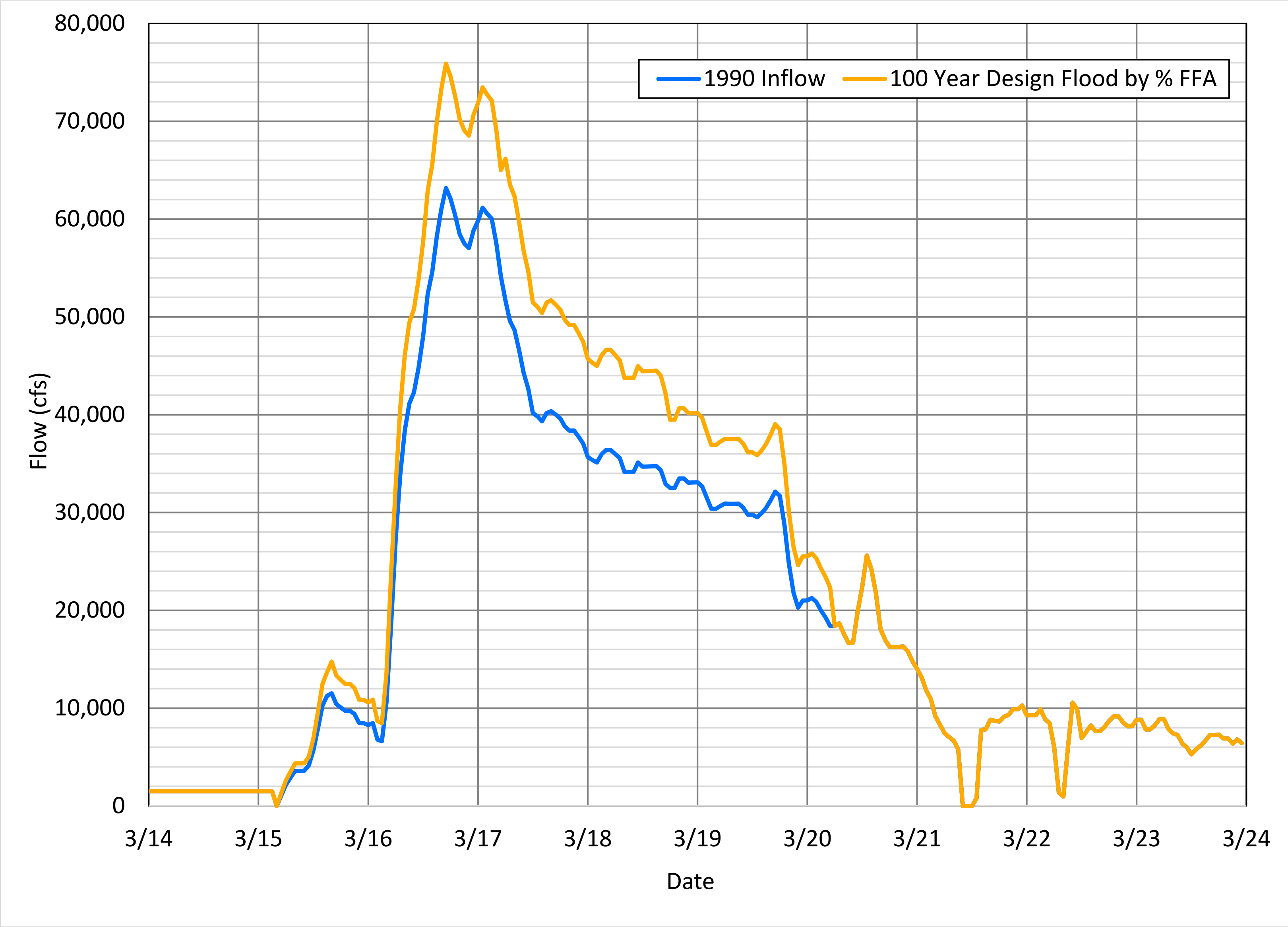

FIGURE 4–2 INFLOWS AT HARRIS RESERVOIR FOR 100 YEAR DESIGN FLOOD FOR HARRIS DAM

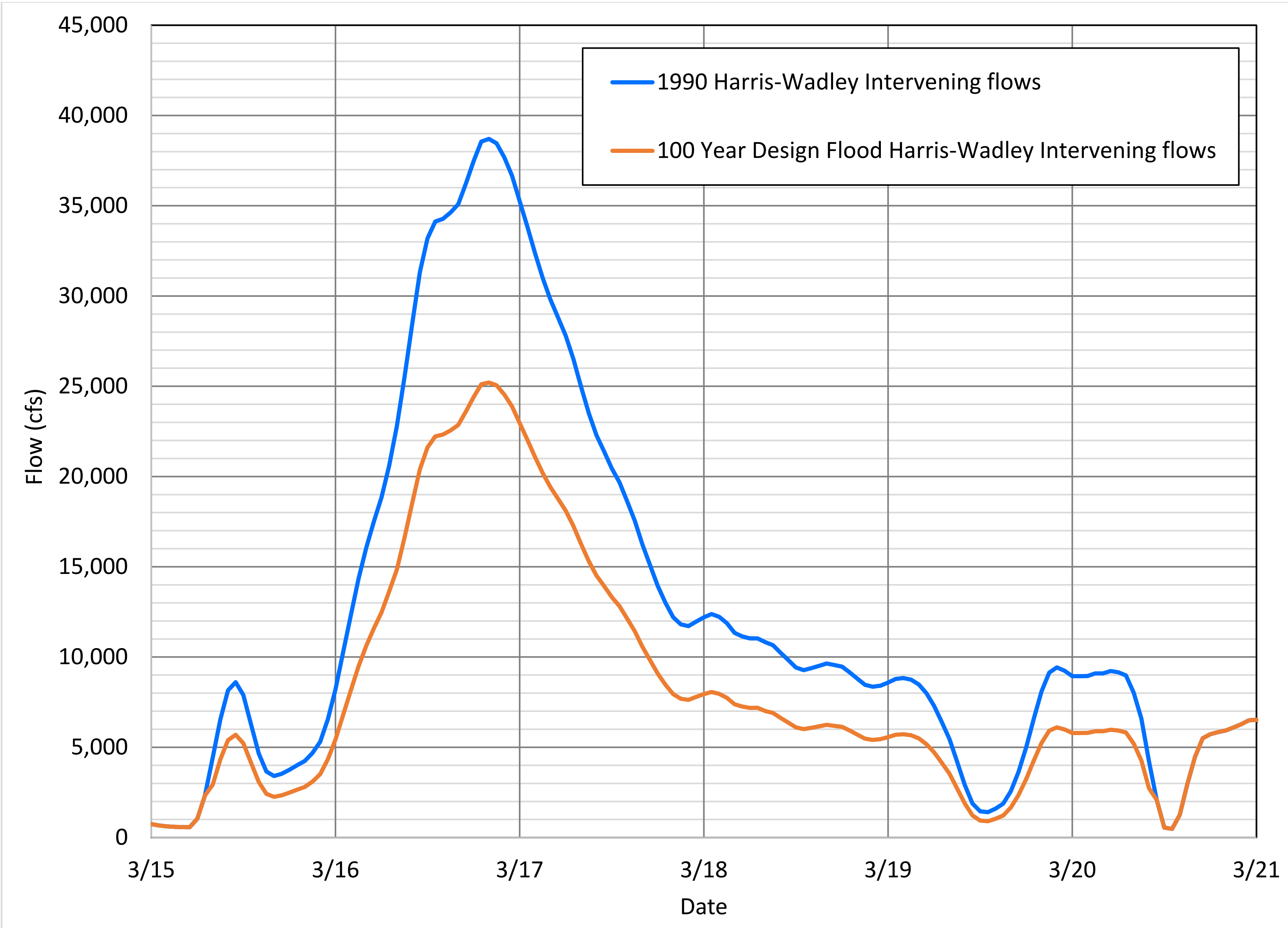

FIGURE 4–3 INTERVENING FLOWS AT WADLEY FOR 100 YEAR DESIGN FLOOD FOR HARRIS DAM

Once the hourly ResSim model was calibrated, it was then used to route the design flood through Harris Dam. The resulting discharge hydrographs, shown in Figure 4-4, were then used as the upstream boundary to the Harris-Martin HEC-RAS model for routing the 100-year design storm centered over Harris downstream for each of the alternatives.

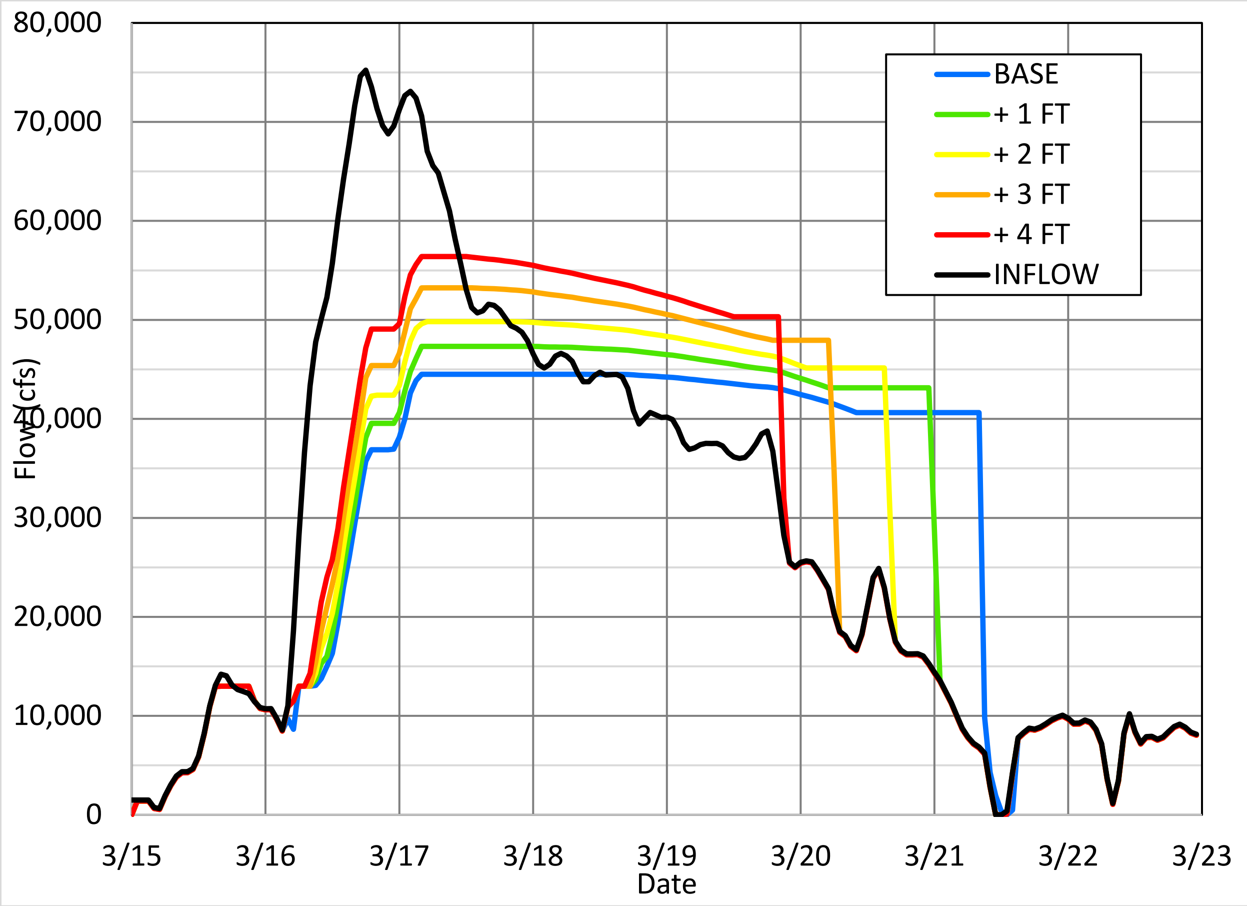

FIGURE 4–4 HARRIS RESERVOIR HOURLY RESSIM MODEL -WINTER POOL EVALUATION

4.5 HARRIS-MARTIN HEC-RAS MODEL

The USACE HEC-RAS software was used to develop a hydraulic model of the Tallapoosa River from immediately downstream of Harris Dam (RM 136.7) to Martin Dam (RM 60). The model was originally developed in February 2017. The model was developed with previous versions of HEC-RAS, including at a minimum, version 5.0.4. Further revisions to the model were made in 2019 using the most recent version of the software, v5.0.7.

4.5.1 HEC-RAS Model Geometry

The 2017 model was comprised of 306 1-dimensional (1D) cross sections and 6 storage areas. The storage areas were those that can backwater during flood conditions, allowing for out-of-river storage of flood waters. In the HEC-RAS model software, storage areas are represented by stage-storage relationships. The 1D cross sections included the bathymetric data collected in 1999 and 2003 for RM 136.7 to RM 123.0; however, all other cross section bathymetry downstream of RM 123.0 only had an estimated thalweg elevation and an assumed trapezoidal or triangular shape. All cross sections' overbank areas out of the river had elevation data based on coarse USGS digital elevation model (DEM) raster data.

The 2019 model geometry incorporated the recently acquired terrain data. As discussed in Section 4.1.3, Trutta collected bathymetry data in 2019 from RM 123.0 to RM 88.0, which, in addition to the 1999 and 2003 data, provided bathymetry from the tailwater of Harris Dam (RM 136.7) to the beginning of the Martin Pool (RM 88.0). The original cross sections between RM 123.0 and RM 88.0 were removed and replaced with new cross sections placed at each of the locations where bathymetric cross sections were surveyed in 2019. The cross sections located between RM 136.7 and RM 123.0 had bathymetric data from the previous surveys and were not removed. However, the overbank areas outside of the river channel were resampled using the LiDAR data collected in 2006 to replace the less detailed USGS DEM data for all cross sections. Artificial cross sections were interpolated between the surveyed cross sections as needed to provide adequate model stability. When cross sections were interpolated, the bathymetric data within the banks of the channel was retained but the overbank terrain was updated to match the actual overbank terrain under the interpolated cross section. This was done because the bathymetry between the surveyed cross sections was unknown and interpolating between known data was a reasonable assumption, but the overland data was available from the LiDAR and did not need to be interpolated. The final geometry with all the newly surveyed and interpolated cross sections included a total of 436 cross sections.

In addition to the changes to the cross sections, two of the storage areas located between RM 136.7 and RM 88.0 were replaced with 2-dimensional (2D) mesh areas and additional 2D mesh areas were added in areas that can backwater during floods. The 2D mesh areas perform the same function as the storage areas, which is to allow for flood waters to be stored outside of the main river during floods. However, unlike storage areas, 2D meshes are composed of many cells in a connected grid with attribute data obtained from the terrain data underlying the cells. Because the storage areas are represented by stage-storage relationships, any water contained within a storage area can immediately flow back into the river no matter how large the storage area is. Unlike storage areas, the model computes the flow into and out of each cell in each 2D mesh as the river rises and falls, and water flowing into the mesh takes time to travel out of the mesh back into the river, which more accurately simulates flood routing. Due to the improved resolution of the LiDAR data that was available, the total number of offline storage where 2D meshes were used between RM 136.7 and RM 88 was 25. The 4 remaining storage areas included in the geometry are located downstream of RM 88.0 where LiDAR data was not available.

The model includes 4 highway bridges and 1 railroad bridge spanning the Tallapoosa River. Data for the 4 highway bridges was obtained from drawings provided to Alabama Power by the Alabama Department of Transportation. Data for the railroad bridge was obtained by examining aerial imagery and the LiDAR data.

4.5.2 HEC-RAS Model Calibration

Historical flow and stage data were available from the two USGS streamflow gages between the Harris Dam and start of the Martin Pool; the gage at Wadley (RM 122.79) and the gage at Horseshoe Bend (RM 93.7). Stage-discharge rating curves for the gages were obtained from the USGS website for comparison with the model results. An unsteady state rating curve flow plan was created in the HEC-RAS model that increased flow in the river from 2,000 cfs up to approximately 80,000 cfs, which provided stage data for flows in that range at the two USGS gage locations. Model calibration was completed by adjusting the Manning’s roughness values in the channel and overbanks until the model matched the historical data as closely as possible over the range of flows modeled, and flow roughness factors were used to adjust the selected Manning’s values in the river with flow, since roughness typically decreases as flow increases. The HEC-RAS model results of flow versus stage at the USGS gage locations for the calibration are plotted against the historical flow versus stage data of the gages and shown in Figures 4-5 and 4-6.

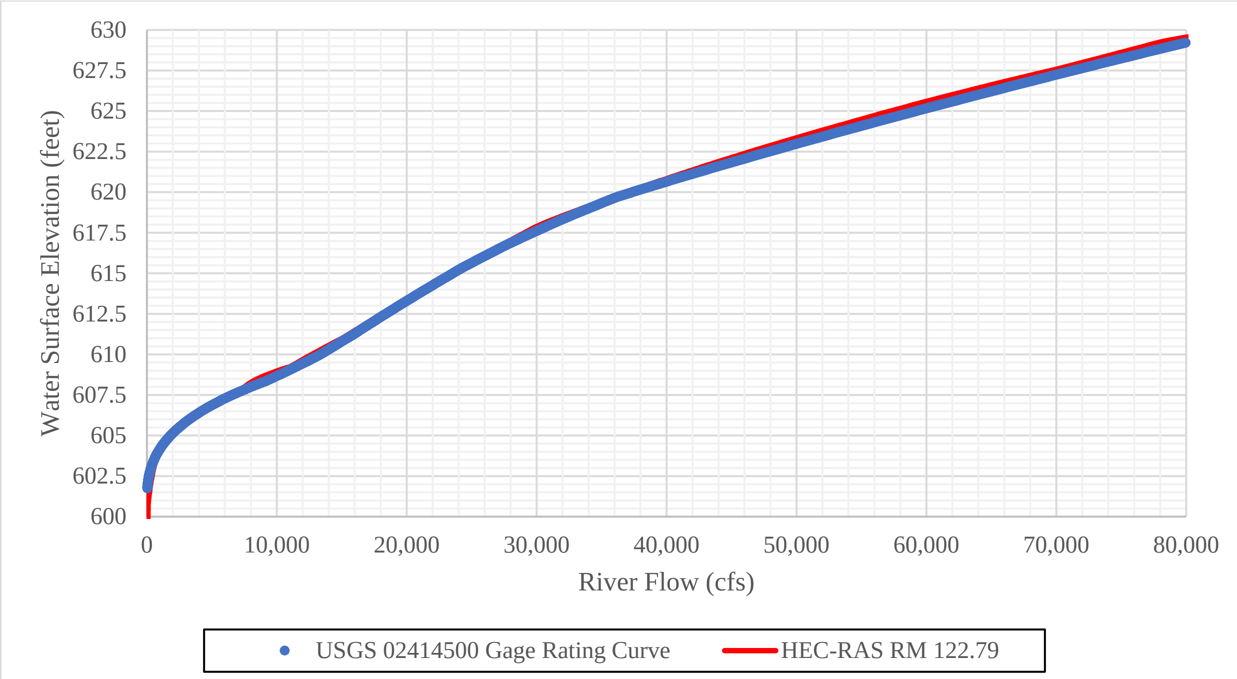

FIGURE 4–5 HARRIS-MARTIN HEC-RAS MODEL RESULTS VERSUS USGS WADLEY GAGE NO. 02414500

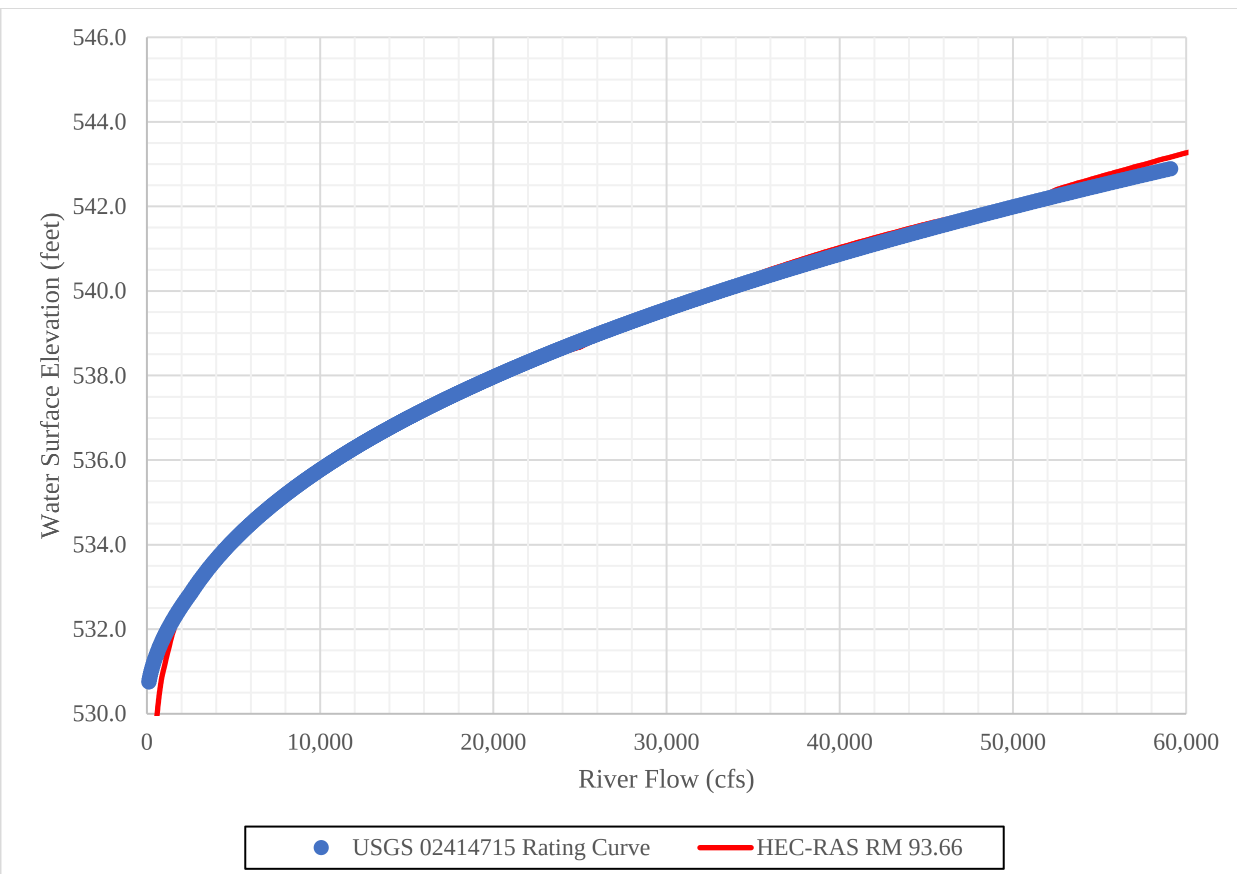

FIGURE 4–6 HARRIS-MARTIN HEC-RAS MODEL RESULTS VERSUS USGS HORSESHOE BEND GAGE NO. 02414715

Figure 4–5 and Figure 4–6 show that the model matches closely with the historical data over the range of flows. At both gaged locations, there is some slight deviation between the model and the historical data at lower flows (approximately less than 2,000 cfs). However, the model is well calibrated to the available data for flood flow modeling.

4.5.3 DESIGN FLOOD

The Harris Dam outflow hydrographs derived from the HEC-ResSim modeling described in Section 4.4 were used to develop 5 unsteady flows plans in the HEC-RAS model. The model evaluated downstream impacts due to outflow from Harris Dam associated with different winter pool elevations, including the baseline condition elevation 785 feet msl and proposed elevations 786 feet msl to 789 feet msl (786, 787, 788, and 789 feet msl). The unsteady flow plans also included lateral inflows to the Tallapoosa River between the Harris Dam and start of the Martin Pool. The intervening flow hydrograph at Wadley described in Section 4.4 and shown in Figure 4–3 was added as a uniform lateral inflow to the model between RM 136.6 and RM 122.97. A second lateral inflow was added to the model downstream of Harris Dam to account for the inflow to the river between Wadley and the Horseshoe Bend gage. Hourly data was not available at the Horseshoe Bend gage for the March 1990 event. Thus, the daily average flow at both gages was compared and the ratio of the flow at Horseshoe Bend to flow at Wadley was determined. A comparison of the daily average flow hydrographs for the March 1990 event from both gages showed a similar shape (Figure 4–7). The hourly hydrograph for the Wadley intervening flow was adjusted by multiplying each hourly ordinate of the hydrograph by a ratio of the Horseshoe Bend to Wadley gages. The data was then adjusted to subtract out the flow from the Wadley gage so that the lateral inflow was only equal to the flow intervening between the two gages. The hydrograph was included as a uniform lateral inflow between RM 122.97 and RM 93.66. Figure 4-8 shows all five Harris outflow hydrographs as well as the two intervening flow hydrographs for the downstream river.

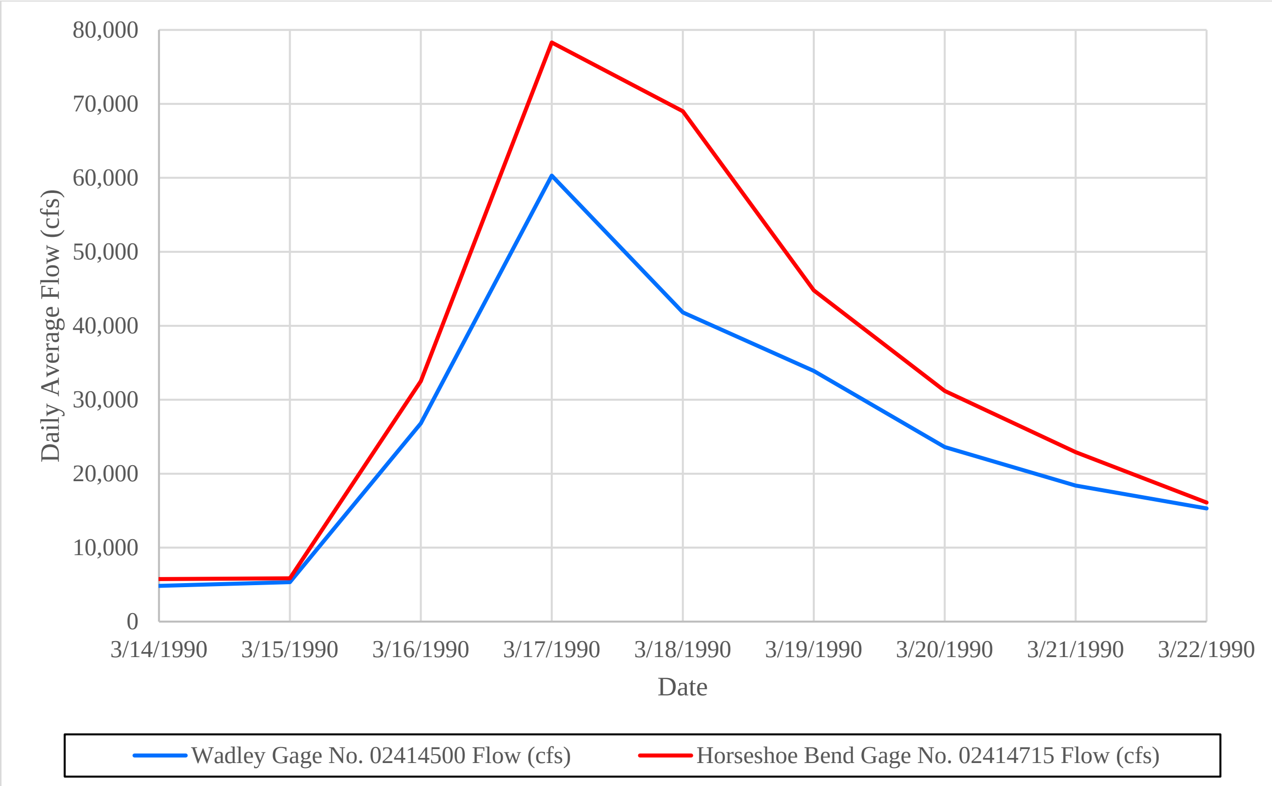

FIGURE 4–7 DAILY AVERAGE FLOW AT WADLEY AND HORSESHOE BEND USGS GAGES

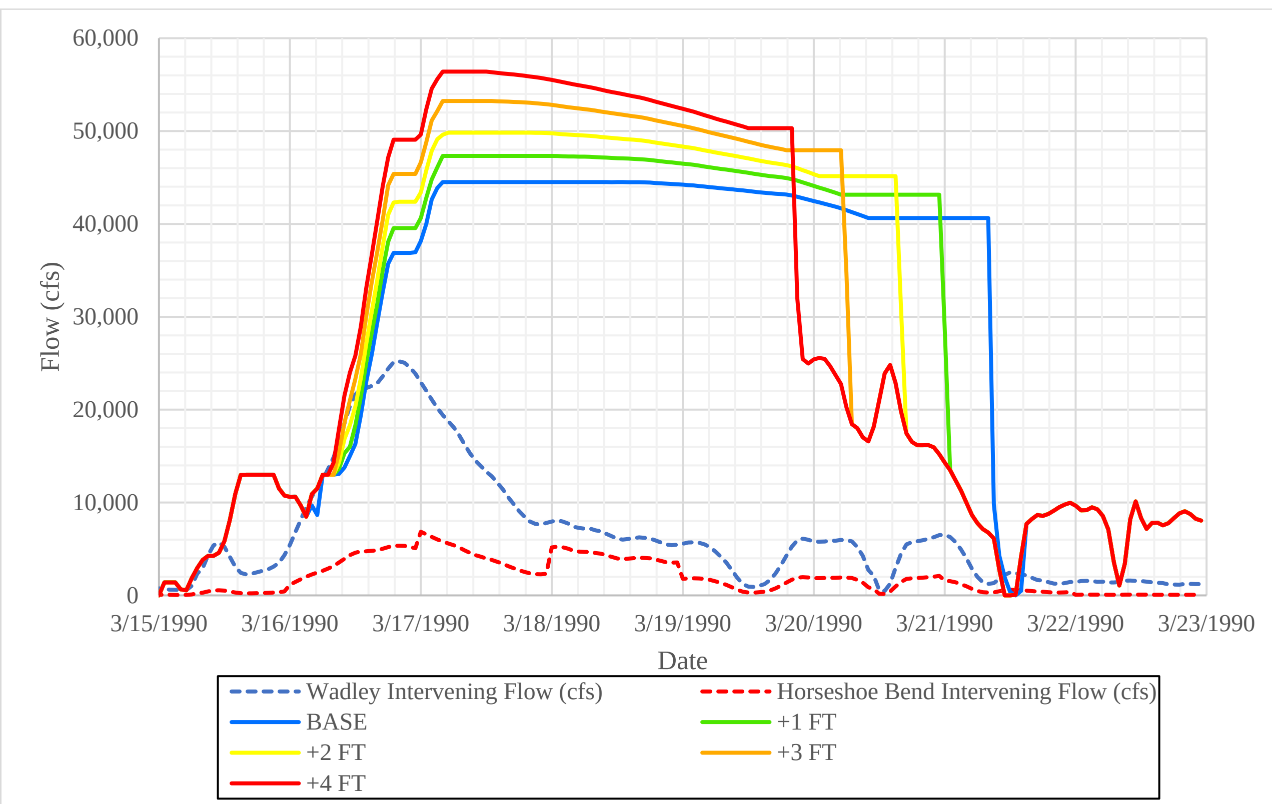

FIGURE 4–8 UNSTEADY FLOW PLAN HYDROGRAPHS

4.5.4 MODEL LOGIC AND OPERATION

All simulations were computed using the unsteady flow analysis in the HEC-RAS model. The simulation modeled 8 days of real time based on the duration of the March 1990 event (March 15 through March 22). The computational timestep was 20 seconds, which provided model stability and accuracy. Data was output from the model at an hourly timestep, and polygon shapefiles showing the maximum extent of inundation under each scenario were saved for use in later GIS analysis.

4.5.5 MODEL BOUNDARY AND INITIAL CONDITIONS

The upstream model boundary is located at RM 136.7, immediately downstream from the Harris Dam, and is an inflow hydrograph from the HEC-ResSim model for all simulations. The initial flow in the river was set to 2,000 cfs to ensure a stable initial computational solution. All 2D mesh areas did not have any storage volume initially, however, the 4 storage areas that are located in the Martin pool between RM 88.0 and RM 60 required an initial storage and were set to elevation 490.5 feet msl to match the downstream stage hydrograph. Two uniformly distributed lateral inflow hydrographs were included as described in Section 4.5.3. The downstream model boundary of the model is located at RM 60.8. For all simulations, a constant stage hydrograph equal to elevation 490.5 feet msl was used, which is the normal operating elevation in the Martin Pool.

4.6 YATES AND THURLOW

Yates Dam is located only 7.9 miles downstream of Martin Dam. The Yates Pool forms the tailwater of Martin Dam. Yates Dam is operated at a constant pool except when large floods pass, at which time the pool rises only enough to pass the flood wave. Similarly, Thurlow Dam is located at RM 49.7, which is only 3 miles downstream of Yates and it is also operated at a constant pool. Yates and Thurlow pools have very limited storage and; therefore, do not provide appreciable attenuation of the flood wave as it passes through the two reservoirs. The Martin-centered design storm outflow hydrographs at Martin and Thurlow were compared to verify the finding that Yates and Thurlow do not appreciably change a major flood hydrograph as it passes through the system. The peak outflow at Thurlow was 19.8 percent higher than the peak released at Martin but the net volume in the hydrograph increased less than 5 percent. A simple HEC-

RAS model of Yates indicated that the peak flow of the hydrograph as it passes through is not modified significantly and that the difference reflected in the 1990 flood peaks was the result of local or intervening inflow peaking at the same time as the Martin releases. Peak discharge at Martin for the May 2003 flood was 8 percent higher than the Thurlow release with net volume increase very near 5 percent. The volume increases reflect local or intervening inflows. Time of the peak flow at Martin varied from 2 to 4 hours before the peak at Thurlow. Therefore, Martin outflow hydrographs were transferred downstream of Thurlow, excluding Yates and Thurlow from the HEC-RAS model.

4.7 LOWER TALLAPOOSA MODEL

The Alabama Power project routing model for Martin indicated that the proposed operational changes would change the peak flow and volume of the Martin discharge hydrograph for the design flood. To evaluate the downstream impacts of these changes, a HEC-RAS model was developed for the lower reach of the Tallapoosa River. In order to account for the influence of the floodplain storage, the model was set up to operate in the unsteady mode.

During previous work on the Tallapoosa River, a HEC-RAS model for the lower Tallapoosa River was developed. This model included the Tallapoosa River from RM 48.12 to its mouth, the Coosa River from RM 18.74, near the toe of Jordan Dam, to its mouth, and the Alabama River from the confluence of the Coosa and Tallapoosa to R. F. Henry Lock and Dam at RM 245.4. These reaches were included in the HEC-RAS model to provide boundary points that have known data and control. The model was upgraded during this study to include better geometric data and recalibrated for this analysis. The March 2009 event was the most recent significant event and was used to verify the calibration of the lower Tallapoosa HEC-RAS model. The peak release from Thurlow was only 33,100 cfs but was also centered over the reach of the Tallapoosa below Thurlow Dam. Montgomery Water Works experienced a peak flow around 47,000 cfs. Good hourly flow and stage data was available at Thurlow Dam, Milstead, and the Montgomery Water Works; however, it appeared that the flood flows out of the channel were not significant.

Thurlow Dam is located at RM 49.7; therefore, due to this data gap, there is a small reach (1.6 miles) of the Tallapoosa that was not included in the lower Tallapoosa HEC-RAS model. Total drainage above Thurlow Dam is estimated to be 3,308 square miles and the 1.6 miles represents less than 20 square miles local drainage. This indicates that the hydrograph would not be significantly altered as it passed through this reach but the total travel time from Martin to RM 48.12 would be approximately 4 hours.

4.8 HydroBudget Model

The HydroBudget Model is an analytical daily model for the determination of power production and its value by simulating actual reservoir operation. By using the HydroBudget model rather than actual generation records, Alabama Power has developed an accurate estimate of annual generation under existing conditions (baseline) to which alternatives can be compared. The model assumes that all dams are in place for the 1940-2018 period of record.

FERC has recognized the validity of this HydroBudget Model approach in estimating annual generation by accepting this method in the context of Alabama Power's relicensing of the Yates and Thurlow Project (P-2407) in the early 1990's. Alabama Power submitted the same method to evaluate the changes for the recent Martin Relicensing.

The parameters for the model include turbine discharge ratings and efficiencies, generator efficiencies, head loss, and operating guidelines. In addition, hourly power system marginal costs (lambdas) are used to calculate the most valuable use of inflows. There are no specific power requirements; therefore, when there is flow available the model will stay on the flood control guide curves. To meet flow targets downstream, Martin and Logan Martin, in tandem with the other Alabama Power storage projects, are operated as a system. This operation allows for a balanced contribution from the Tallapoosa and Coosa rivers.

5.0 RESULTS

5.1 HYDROPOWER GENERATION

Alabama Power's HydroBudget model was used to evaluate the energy produced and value related to each of the four winter pool alternatives. Each of the alternatives was evaluated to determine the economic impact to Alabama Power customers from a hydropower generation perspective using the 2018 system lambdas. Table 5-1 shows the average annual economic impact to hydropower generation for each alternative. While the greatest annual economic loss occurs in the + 4 foot (789 ft msl) winter pool alternative, this loss represents a relatively small decrease in hydropower generation for the Alabama Power hydroelectric system as a whole.

TABLE 5–1 AVERAGE ANNUAL IMPACT TO ALABAMA POWER'S HYDRO GENERATION FOR EACH ALTERNATIVE

Baseline (785 ft msl)	+ 1 foot	+ 2 feet	+ 3 feet	+ 4 feet
$0	$(19,400)	$(40,600)	$(52,100)	$(124,900)

5.2 FLOOD CONTROL

The operating curve alternatives were modeled to determine the impacts to the Harris reservoir elevation and downstream flows. The model outputs for all the alternatives were compared to the current operating curve.

5.2.1 HARRIS RESERVOIR ELEVATIONS

Over the period of record, 1939-2011, increasing the winter pool elevation for any of the 4 alternatives did not affect the amount of time the reservoir was at or above the full summer pool elevation of 793 ft msl. All alternatives exceeded 793.0 ft msl approximately 0.1 percent of the time. This is shown in the Stage Duration Frequency plot (Figure 5-1). However, the amount of time the reservoir elevation was above the operating curve for each alternative slightly decreased with each one-foot increase in the winter pool elevation. This is due to the pool reaching the operating curve sooner after a flood event with higher winter pool elevations. Figure 5-2 shows the average daily elevation for each alternative compared to the baseline daily average.

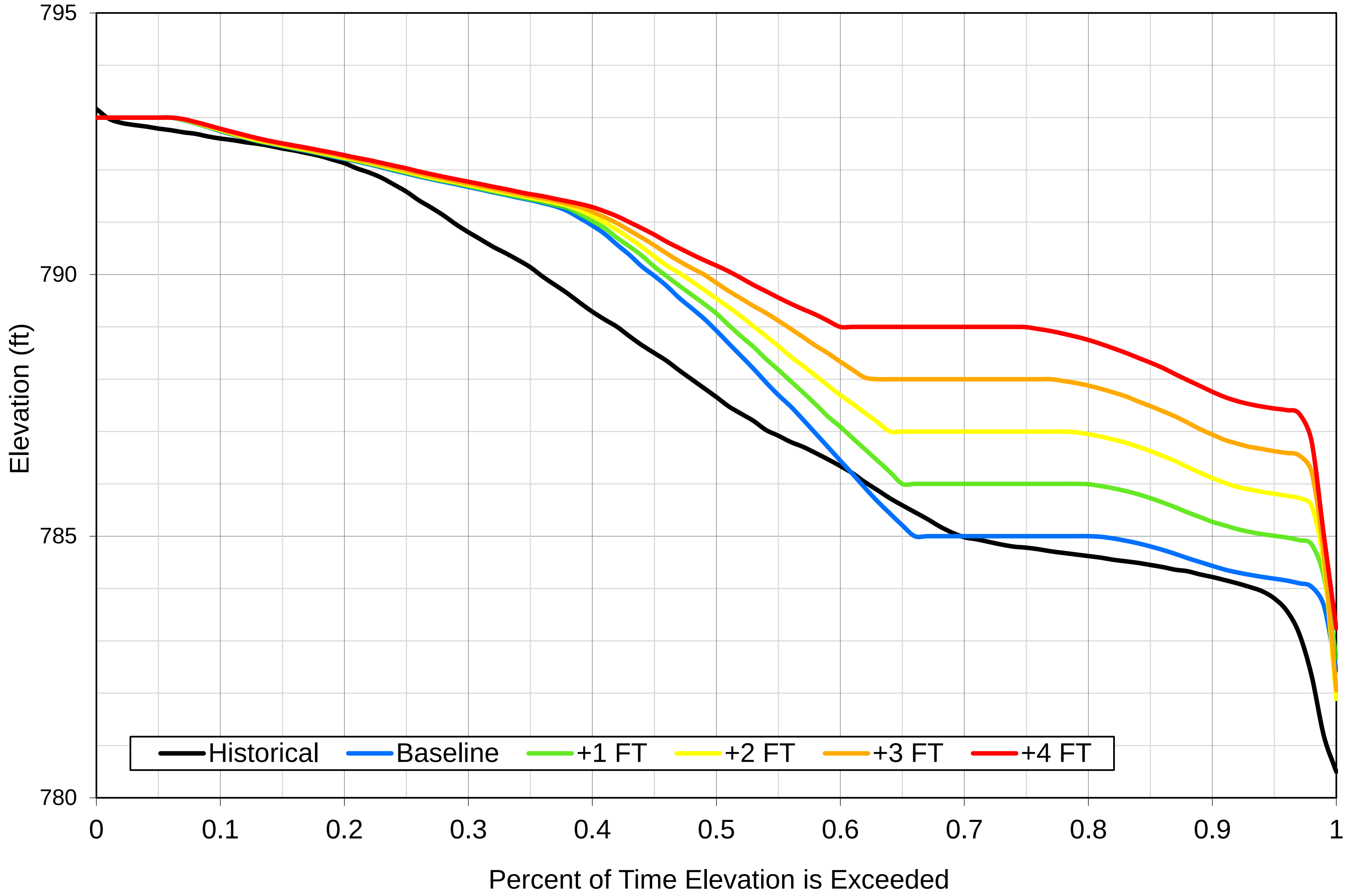

FIGURE 5–1 ANNUAL STAGE DURATION FREQUENCY CURVE FOR OPERATING CURVE ALTERNATIVES

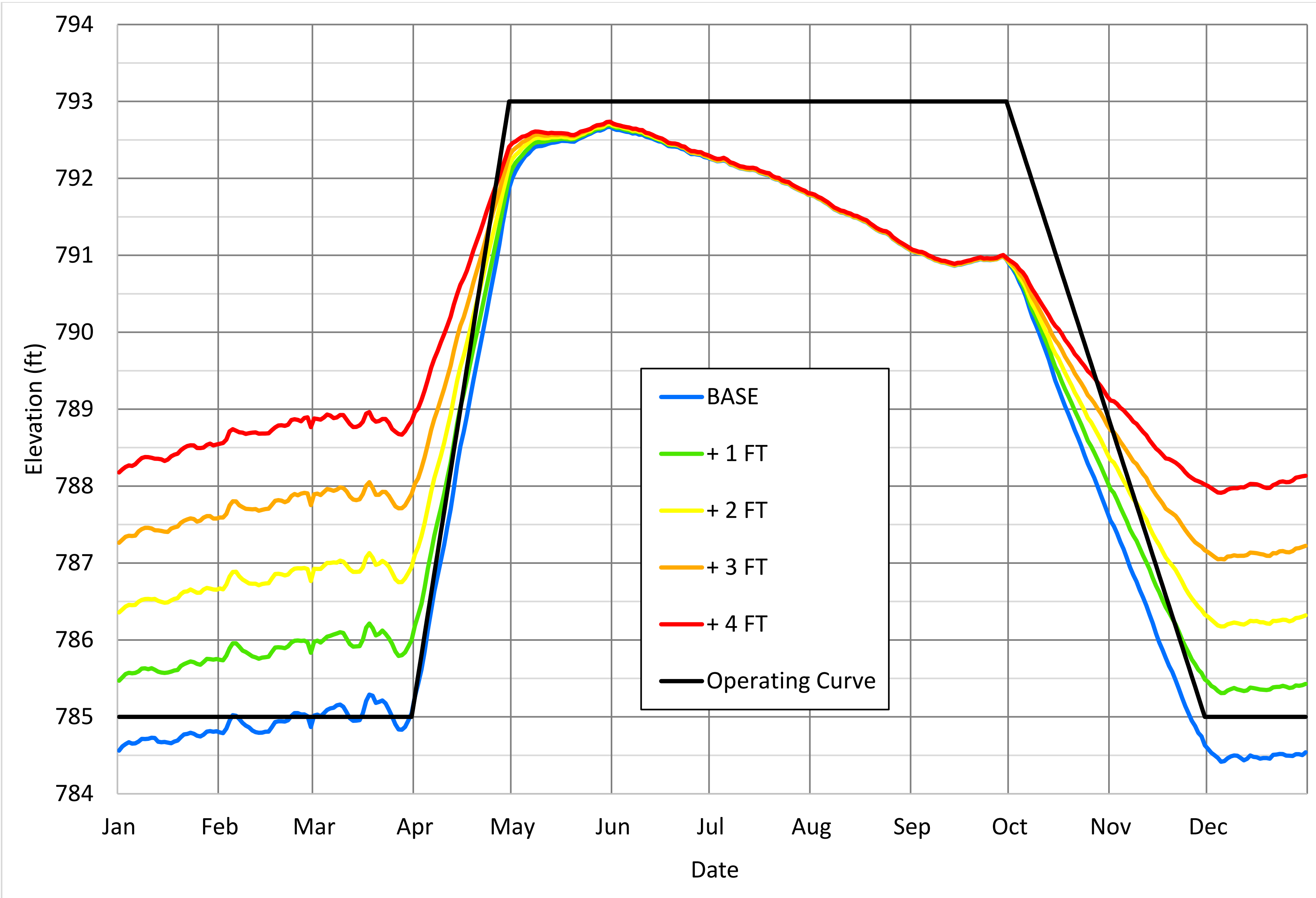

FIGURE 5–2 AVERAGE DAILY ELEVATIONS FOR OPERATING CURVE ALTERNATIVES

Evaluating the percent exceedance for the entire period of record can mask differences in elevations at the project during low flow years. Increasing the winter pool elevation can result in higher elevations during low flow years compared to the existing operating curve (i.e., baseline). Figure 5–3 shows how changing the winter pool elevation could have affected the peak elevation in 2006 through 2008, capturing two periods with historically low inflows. Figure 5–4 shows the elevations for each increasing winter pool alternative in 2000. Annual and monthly flow duration curves for the months a change in operations were reviewed are provided in Appendix C.

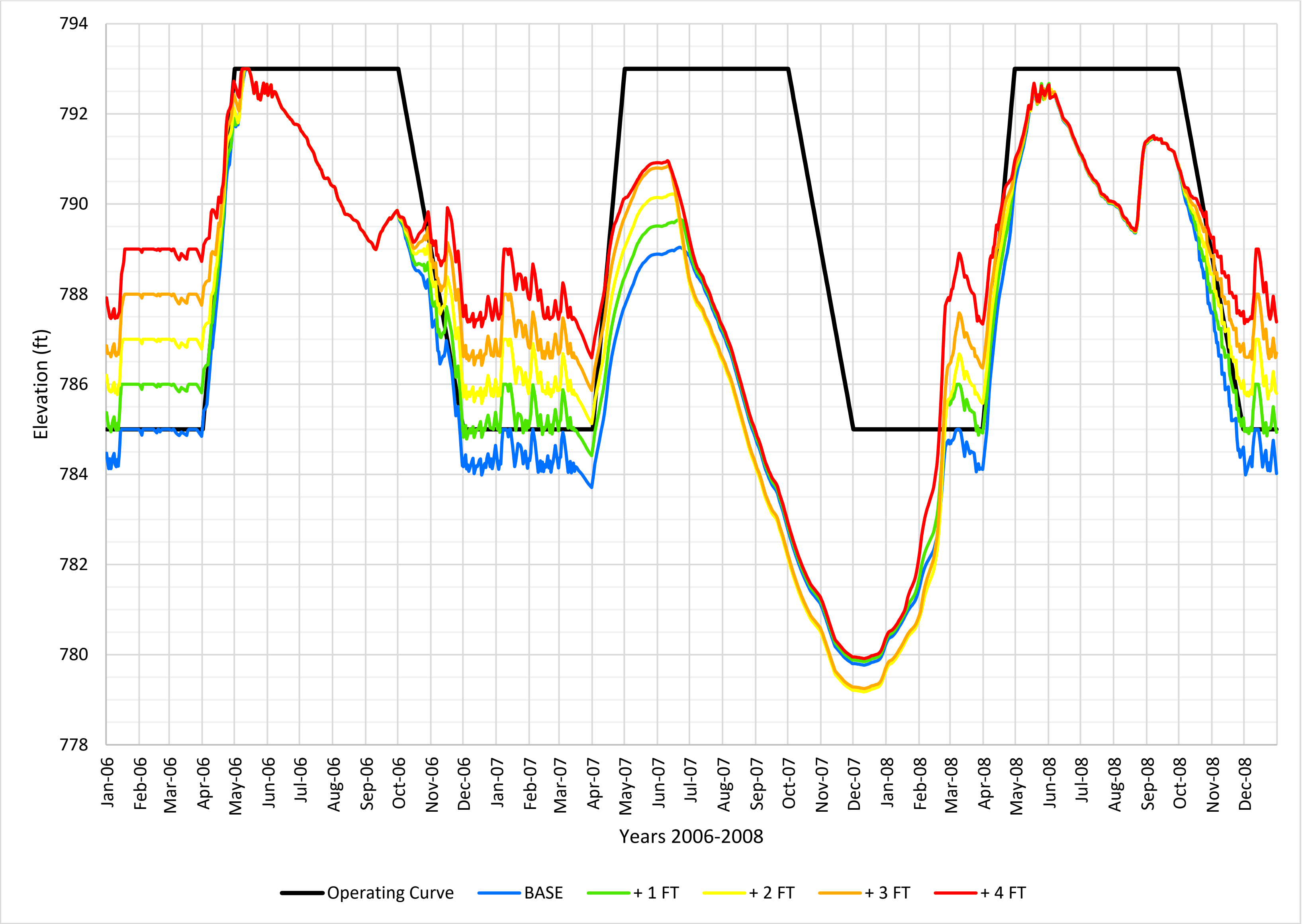

FIGURE 5–3 EFFECTS OF WINTER POOL INCREASES 2006-2008

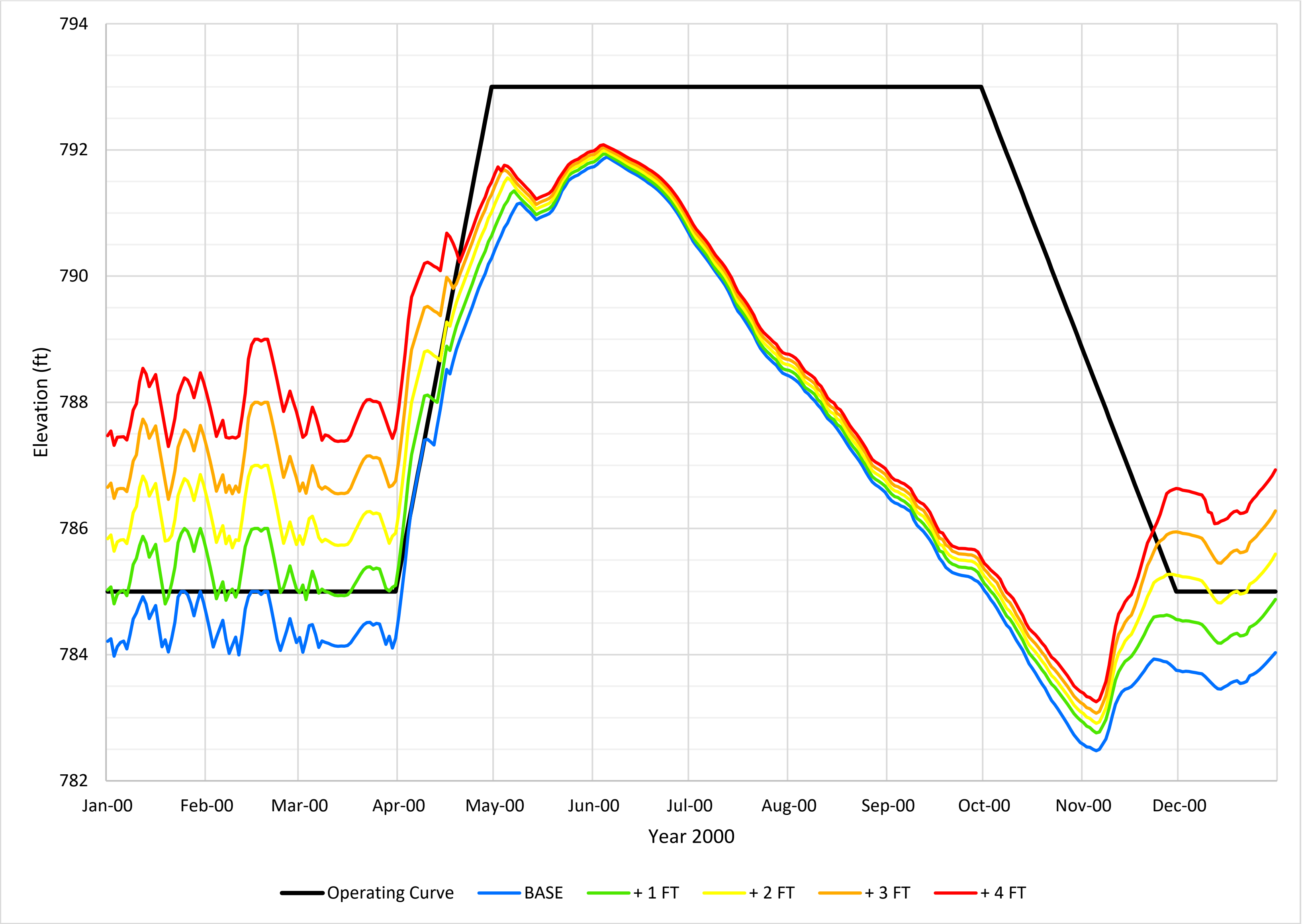

FIGURE 5–4 EFFECTS OF WINTER POOL INCREASES 2000

5.2.2 DOWNSTREAM EFFECTS OF 100 YEAR DESIGN FLOOD

The Harris 100-year design flood was routed through the hourly ResSim for each alternative and resulting outflow hydrographs were used as the upstream boundary condition in the Harris-Martin HEC-RAS model. Figure 5–5 shows the upstream boundary hydrographs for the alternatives. These simulations revealed the net upstream influence of the proposed operational changes.

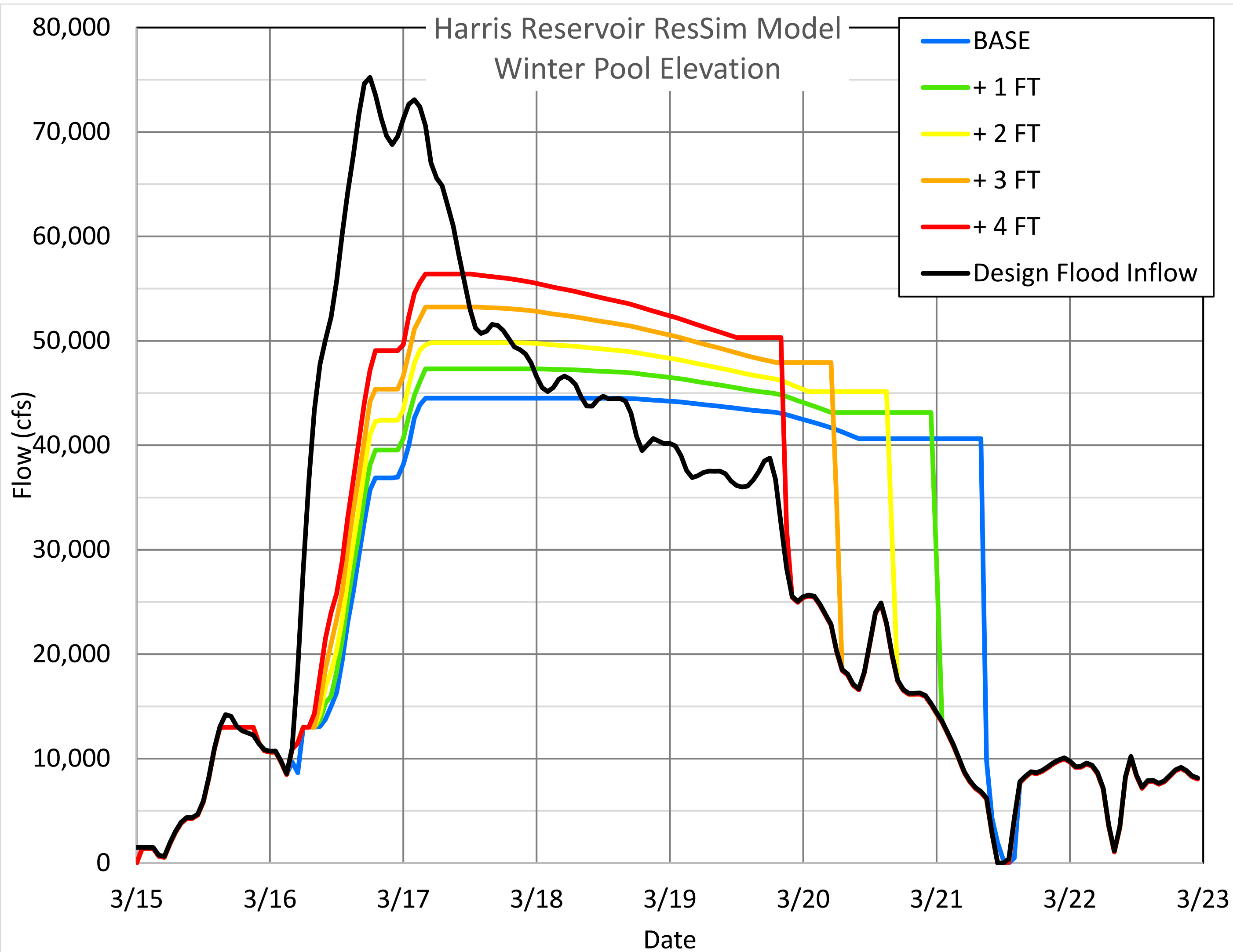

FIGURE 5–5 OUTFLOW HYDROGRAPHS FROM THE 100 YEAR DESIGN FLOOD ROUTED THROUGH THE HARRIS RESERVOIR RESSIM MODEL

Outflow hydrographs from baseline operations and the four winter pool increase alternatives were routed in the Harris-Martin HEC-RAS model. Results show that the higher the winter pool elevation, the greater the outflow from Harris Dam and subsequent flooding associated with the outflow. The effects of the increase in winter pool have been quantified in terms of increase in flooding area, increase in depth of flooding, and the increase in duration of flooding over baseline. Six locations downstream of the dam were selected for close analysis, and the differences in flooding at these six locations are described in the following sections. Figure 5–6 shows the location of the selected areas in relation to the Harris Dam.

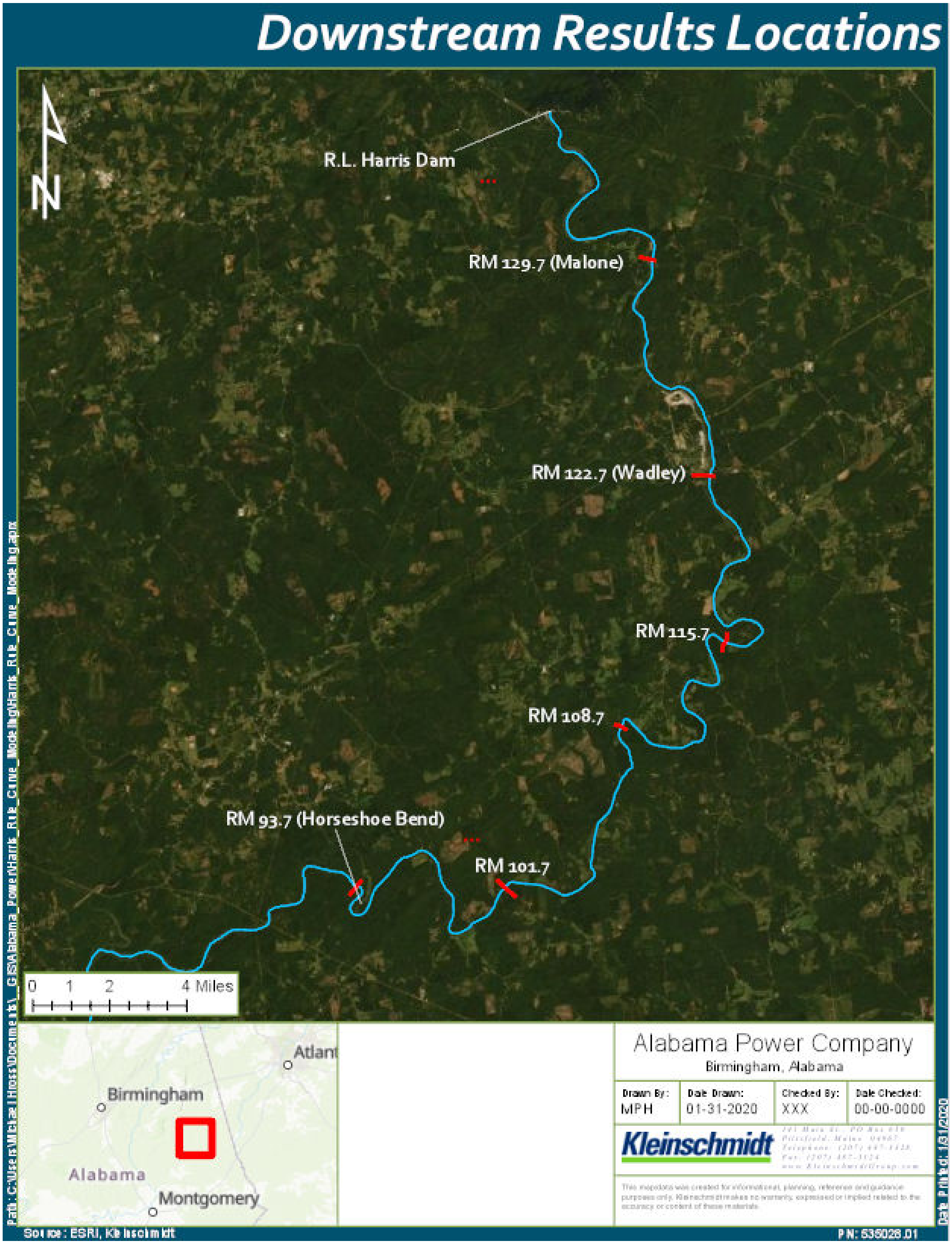

FIGURE 5–6 LOCATION OF SELECTED AREAS TO ILLUSTRATE RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

5.2.2.1 INCREASES IN INUNDATED AREAS

The extent of flooding downstream of Harris Dam increases as the winter pool elevation increases. Generally, the banks of the Tallapoosa River downstream of Harris are steep, which helps to confine the flood flows even during the highest operating curve change simulations. Where flooding is most often exacerbated are areas where tributaries are flowing into the Tallapoosa River. Often these tributaries are associated with low lying floodplains on either side, and these areas are affected the greatest. Figures 5-7 through 5-12 show inundation boundaries for the baseline and four winter pool increase alternatives run using the HEC-RAS model.

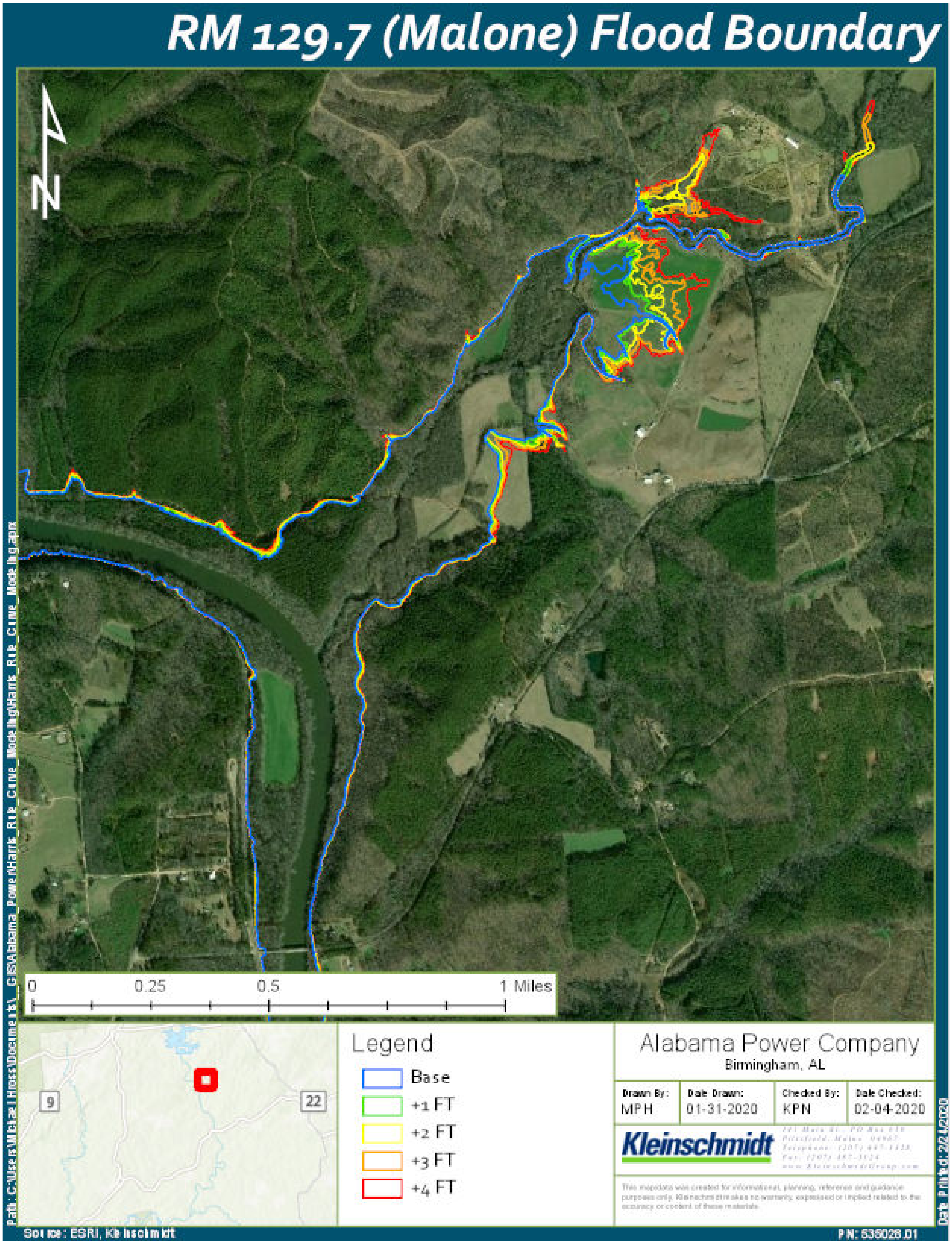

FIGURE 5–7 EXTENT OF FLOODING AT RM 129.7 (MALONE) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

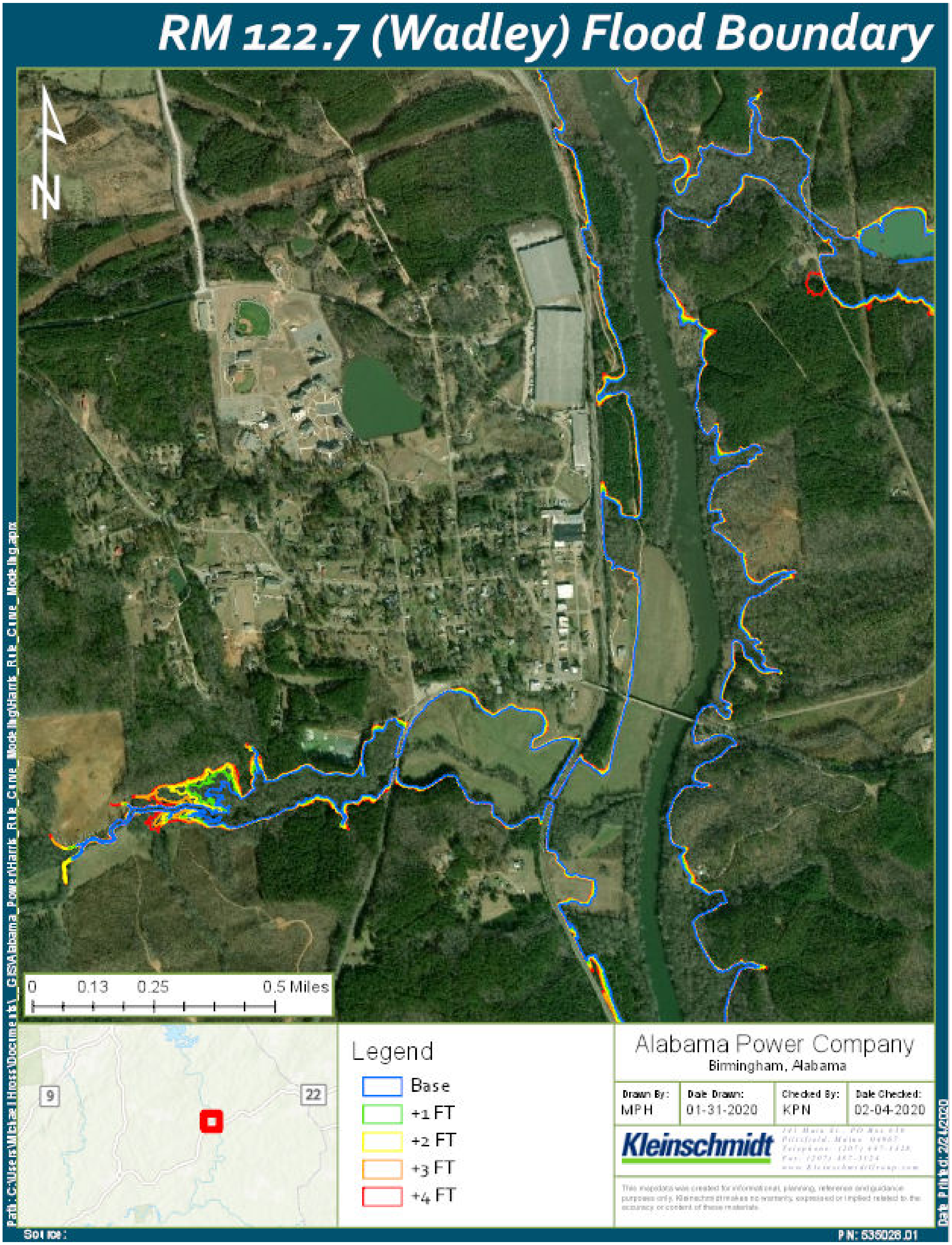

FIGURE 5–8 EXTENT OF FLOODING AT RM 122.7 (WADLEY) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

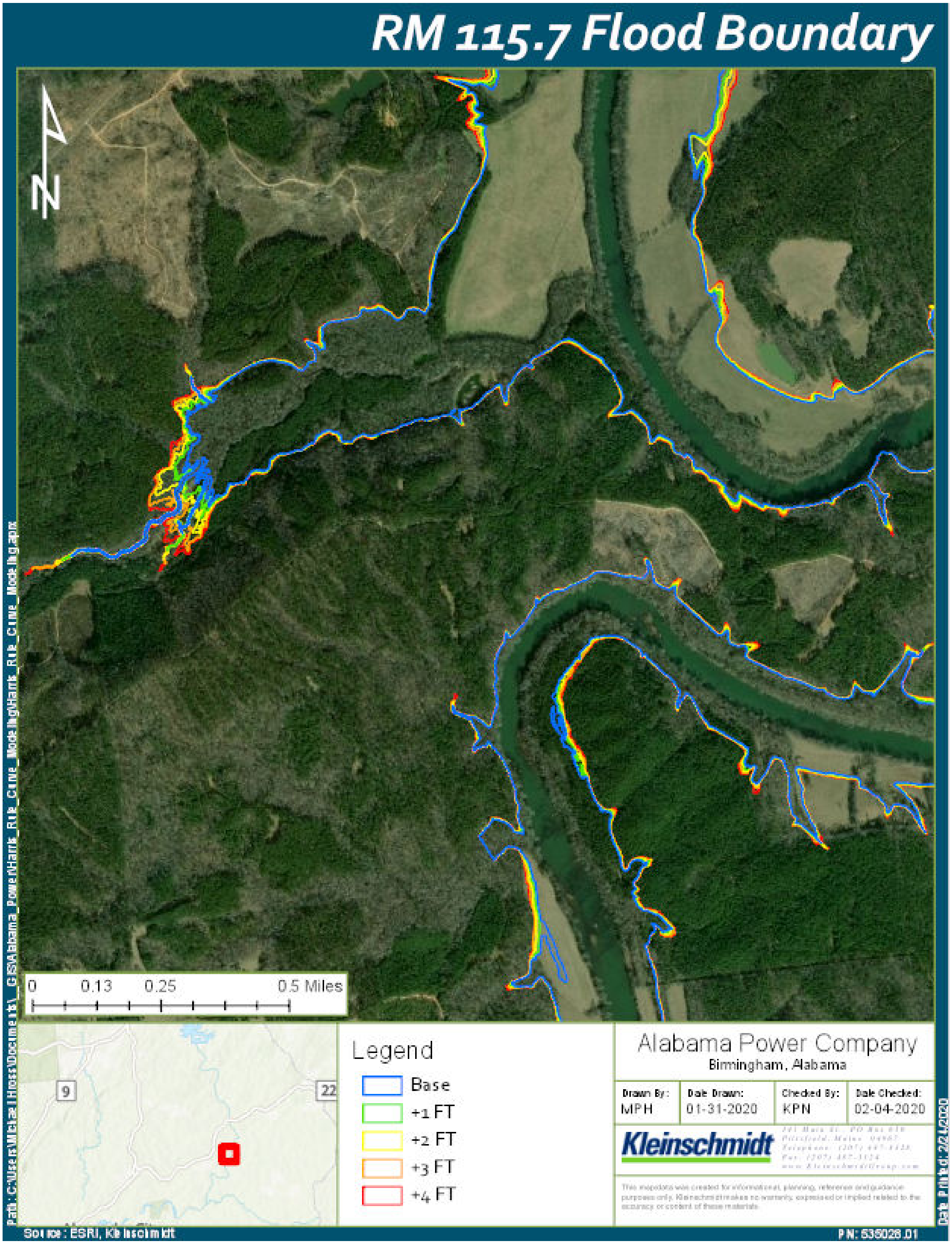

FIGURE 5–9 EXTENT OF FLOODING AT RM 115.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

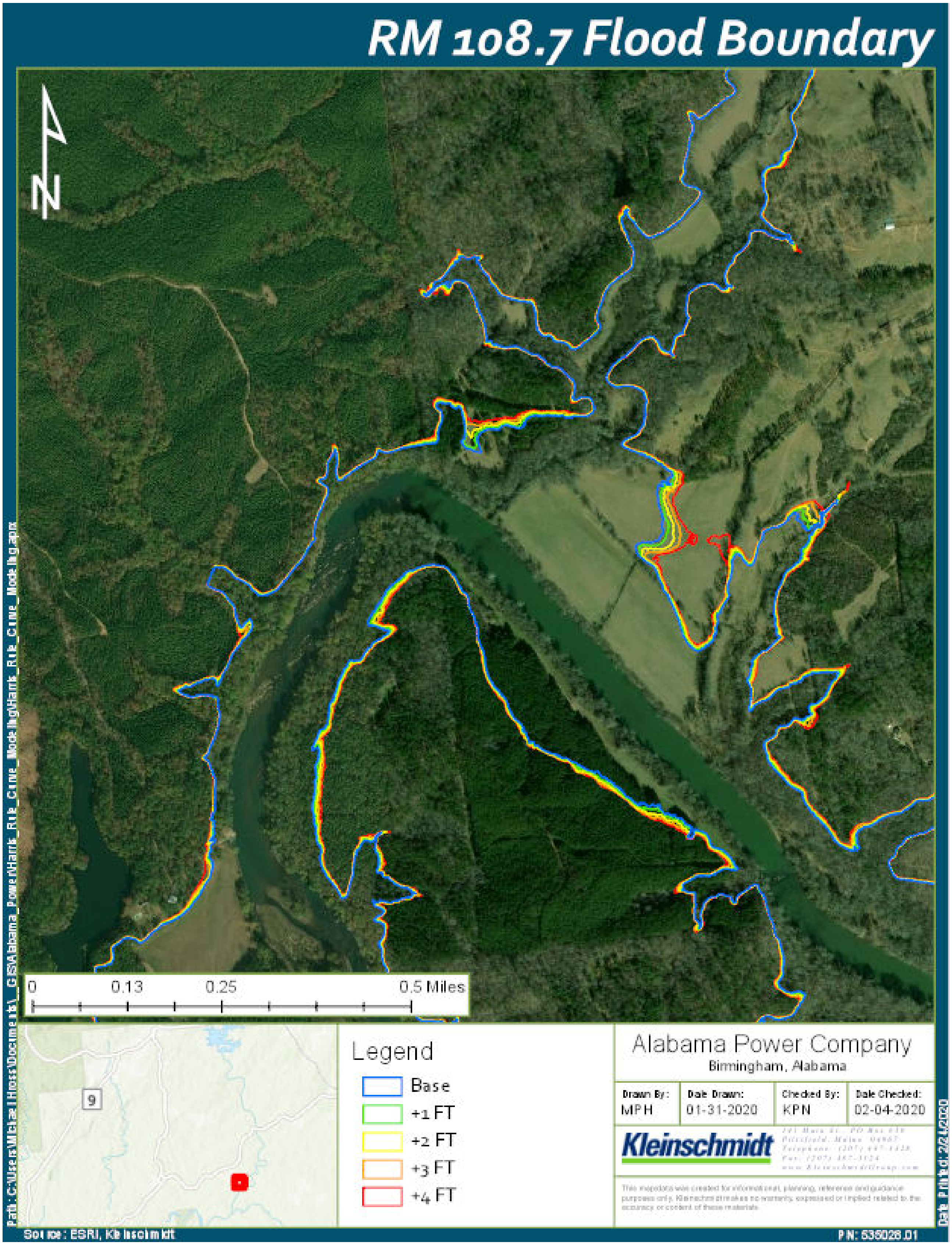

FIGURE 5–10 EXTENT OF FLOODING AT RM 108.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

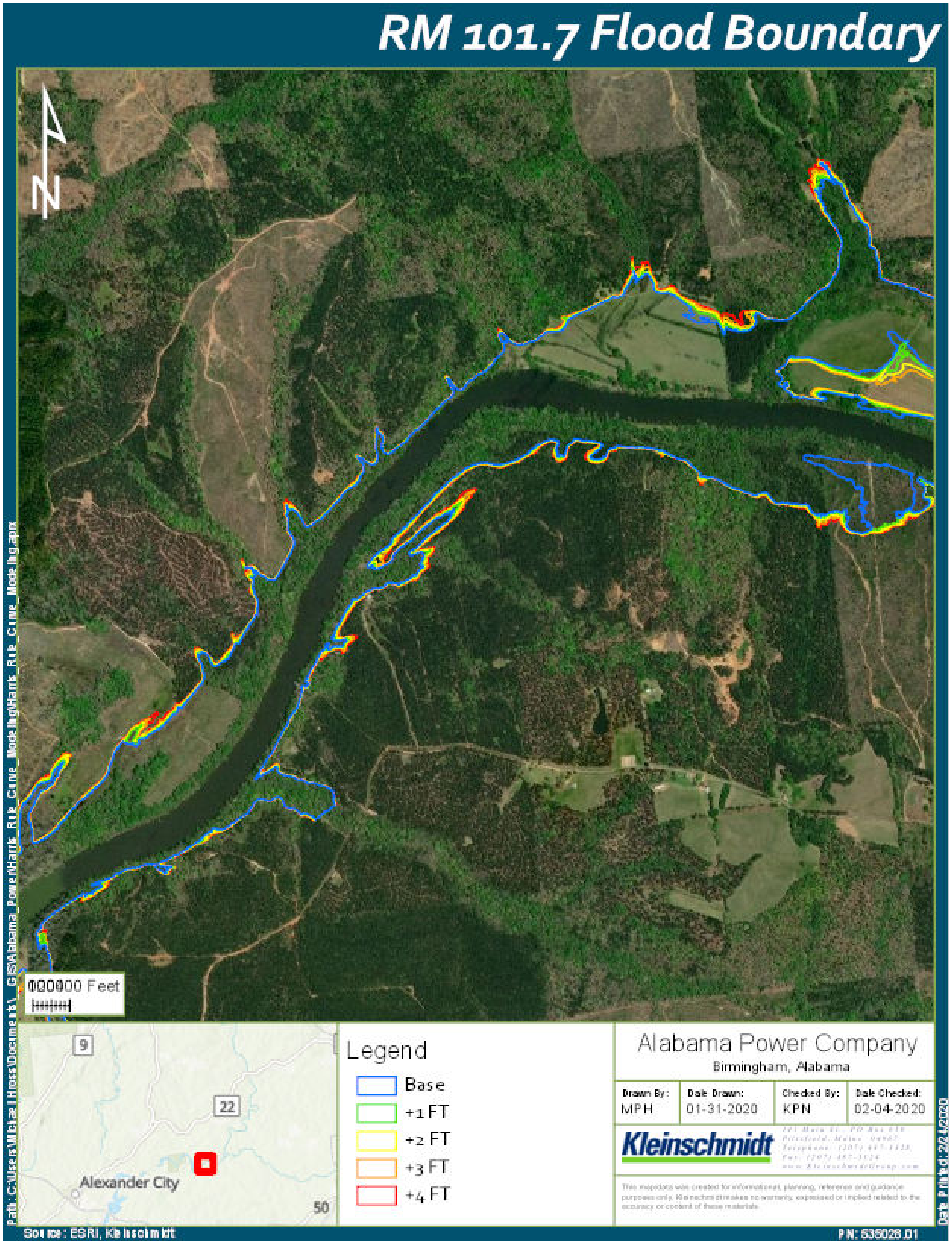

FIGURE 5–11 EXTENT OF FLOODING AT RM 101.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

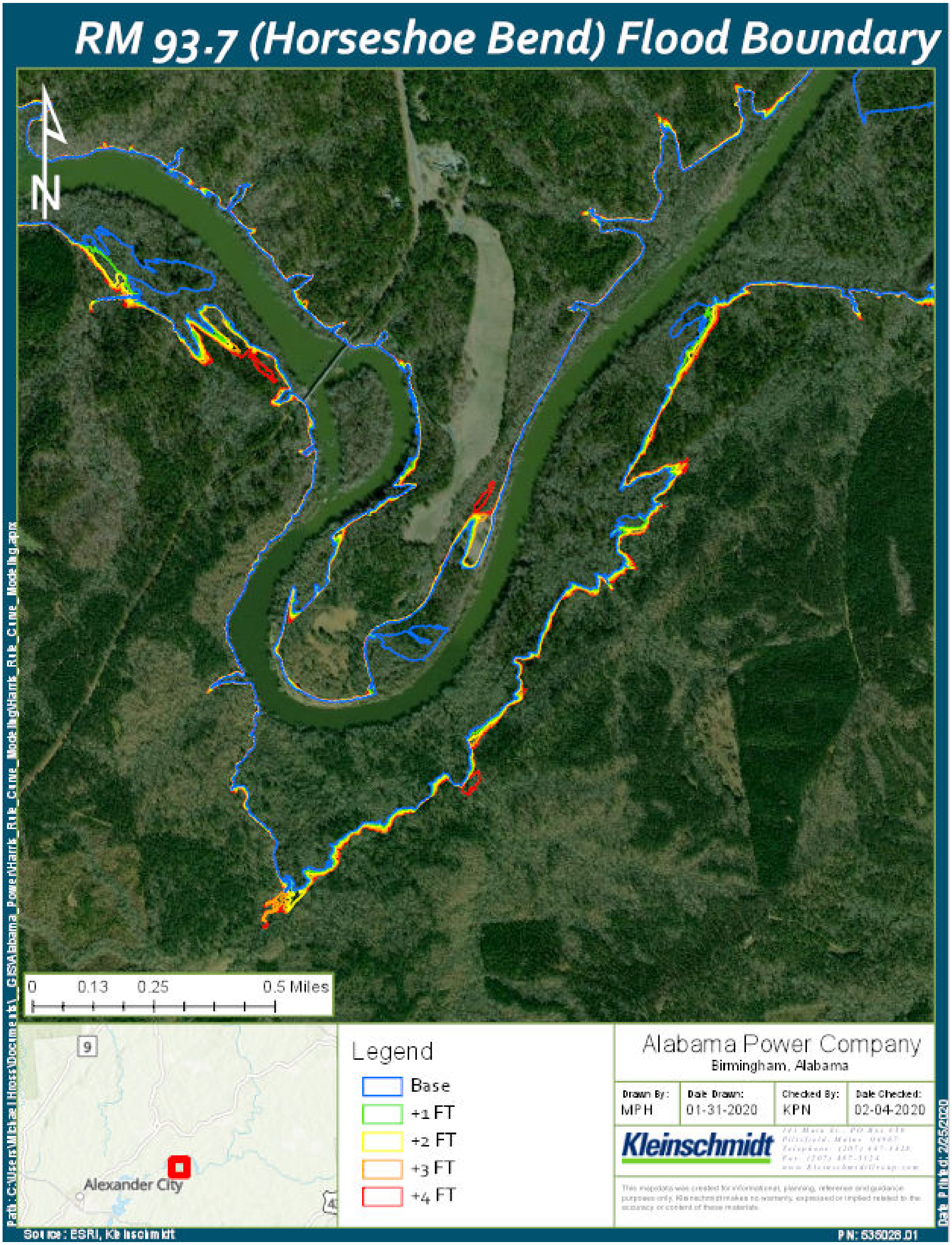

FIGURE 5–12 EXTENT OF FLOODING AT RM 93.7 (HORSESHOE BEND) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

5.2.2.2 INCREASES IN FLOOD DEPTH

The proposed increase in winter pool would not only result in an increase in the total area affected by flooding, but the depth of flooding would increase for the entire length of the Tallapoosa River between Harris Dam and Lake Martin. Table 5-2 shows the increase in the maximum water surface elevation that would occur at the 6 selected locations for the different winter pool increase scenarios.

TABLE 5–2 CHANGES IN MAXIMUM DOWNSTREAM WATER SURFACE ELEVATIONS RESULTING FROM CHANGE IN WINTER OPERATING CURVE

Location	Distance from Dam (miles)	Max Water Surface Rise (feet)			
		+ 1 foot	+ 2 feet	+ 3 feet	+ 4 feet
RM 129.7 (Malone, AL)	7	0.5	1.0	1.6	2.2
RM 122.7 (Wadley, AL)	14	0.5	1.1	1.7	2.4
RM 115.7	21	0.6	1.1	1.8	2.5
RM 108.7	28	0.5	1.0	1.6	2.2
RM 101.7	35	0.4	0.7	1.1	1.4
RM 93.7 (Horseshoe Bend)	43	0.3	0.7	1.0	1.4

Table 5–2 shows that a 1-foot increase in the winter pool elevation will raise the maximum flood elevation downstream of the dam by a minimum of 0.3 foot and raising the winter pool 4 feet would result in the maximum water surface increasing by more than 2 feet. As shown in the figures in Section 5.1.2.1, much of the flood water is confined to the area near the channel, but areas that were affected by flooding under the baseline/existing condition would see increased depth of flooding with any change in the winter pool elevation.

5.2.2.3 INCREASES IN FLOOD DURATION

The duration of flooding above baseline for each alternative was determined at multiple locations downstream of the Harris Dam. Table 5-3 below provides the results of the flood duration comparison and shows how long the stage in the river would exceed the baseline case maximum water surface elevation. A 1-foot increase in the winter pool elevation causes the maximum water surface elevation in the river downstream from the dam to exceed the baseline maximum water surface for a minimum of 12 hours. A 4-foot increase in the winter pool elevation causes the maximum water surface elevation in the river downstream from the dam to exceed the baseline maximum water surface for a minimum of 43 hours.

TABLE 5–3 CHANGES IN FLOOD DURATION RESULTING FROM CHANGE IN WINTER OPERATING CURVE

Location	Distance from Dam (miles)	Duration above Baseline Condition Max Elevation (hours)			
		+ 1 foot	+ 2 feet	+ 3 feet	+ 4 feet
RM 129.7 (Malone, AL)	7	15	43	61	67
RM 122.7 (Wadley, AL)	14	12	19	32	43
RM 115.7	21	13	21	34	46
RM 108.7	28	14	26	38	48
RM 101.7	35	17	27	40	48
RM 93.7 (Horseshoe Bend)	43	18	29	39	47

Stage hydrographs at the 6 selected locations downstream of the dam are provided in Figures 5-13 to 5-18, showing how the flood stage for the proposed increases in winter pool will compare to baseline.

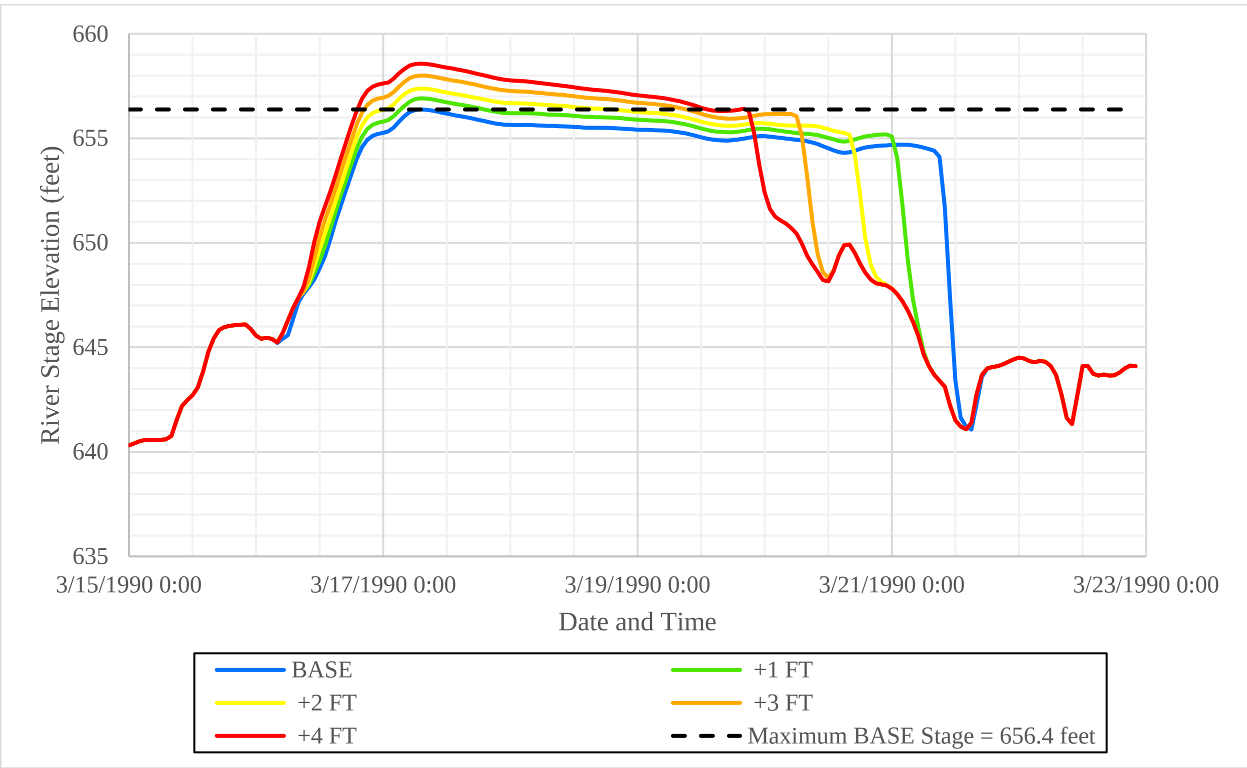

FIGURE 5–13 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 129.7 (MALONE) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

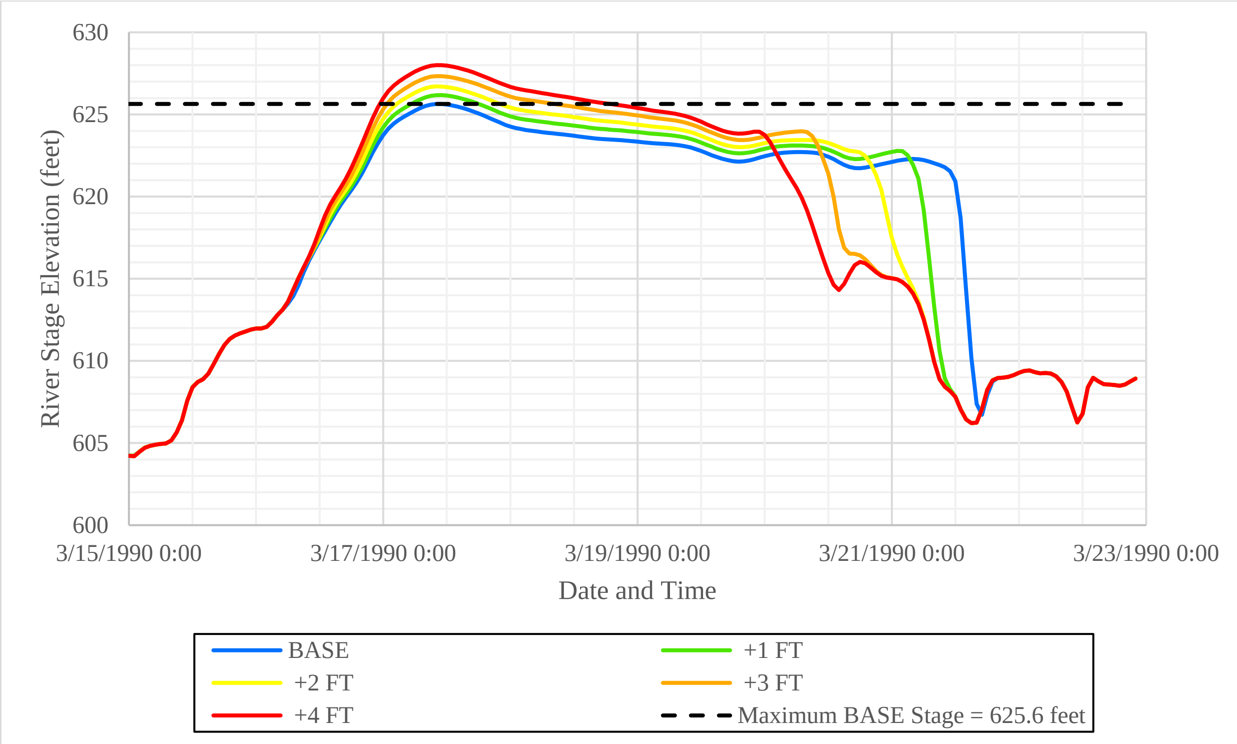

FIGURE 5–14 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 122.7 (WADLEY) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

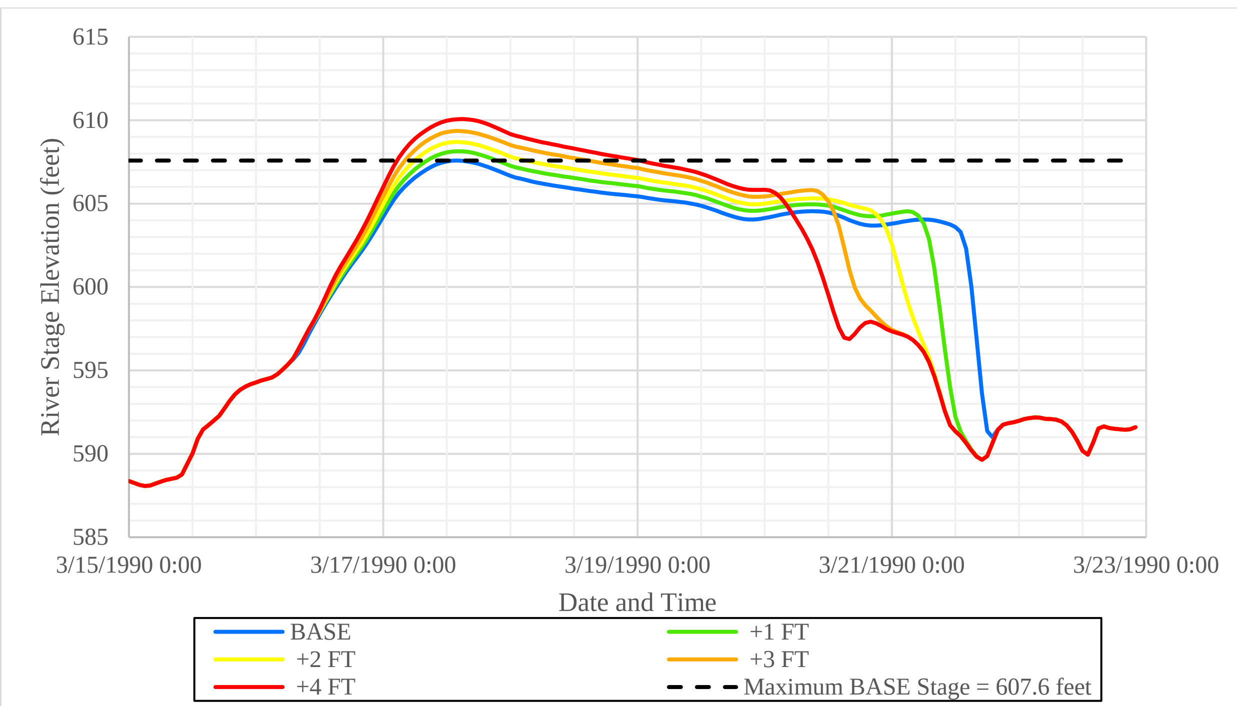

FIGURE 5–15 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 115.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

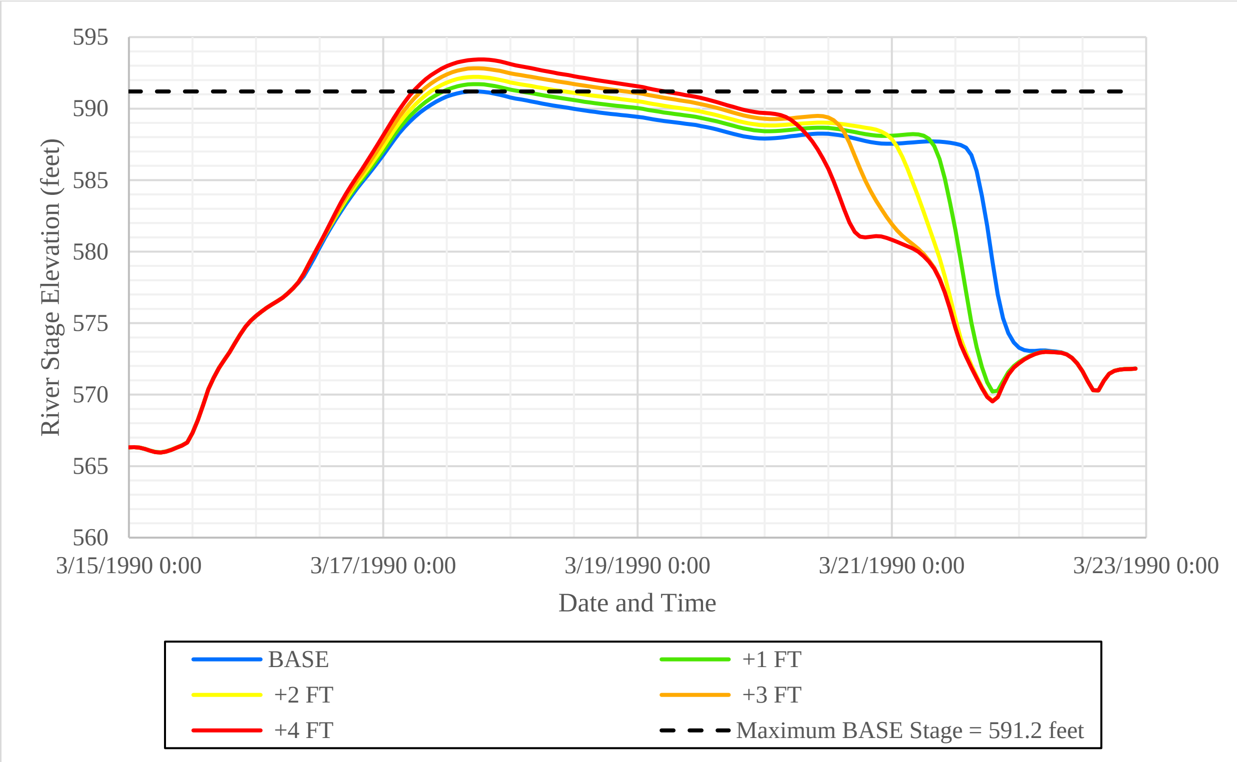

FIGURE 5–16 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 108.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

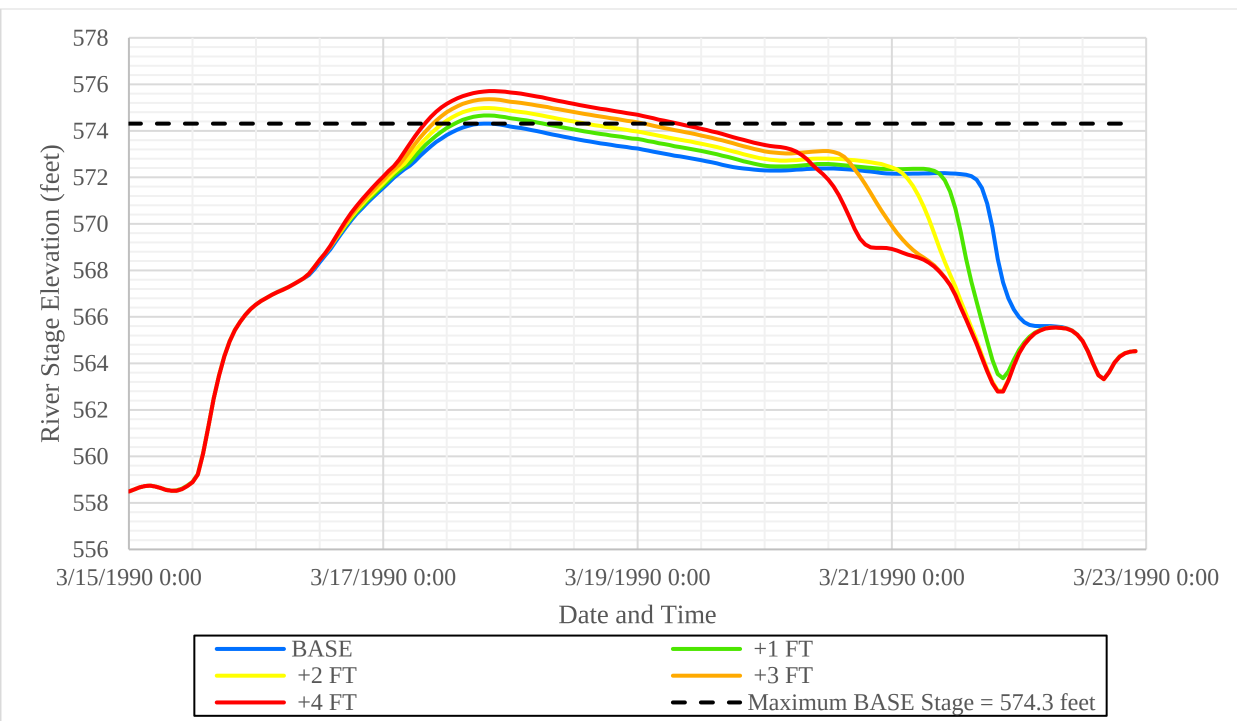

FIGURE 5–17 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 101.7 FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

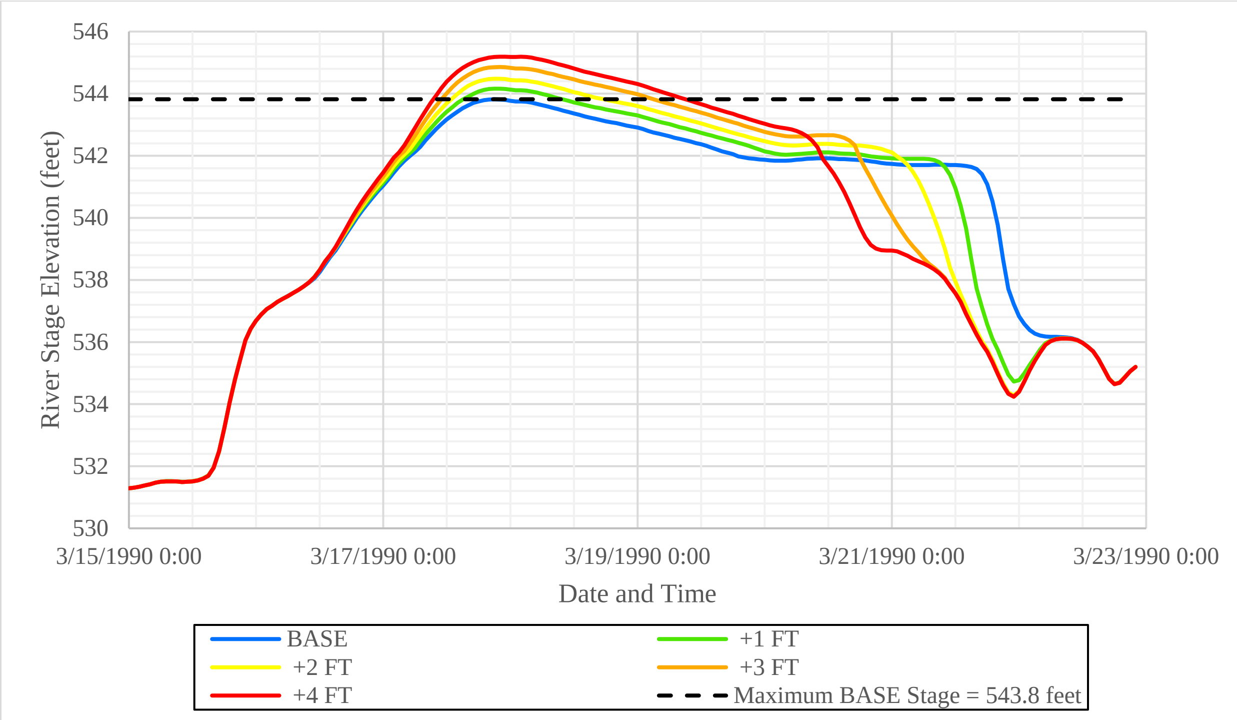

FIGURE 5–18 TALLAPOOSA RIVER STAGE HYDROGRAPHS AT RM 93.7 (HORSESHOE BEND) FROM RESULTS OF 100 YEAR DESIGN FLOOD IN HARRIS-MARTIN HEC-RAS MODEL

5.2.3 PERIOD OF RECORD SPILL ANALYSIS

While the HEC-ResSim model closely replicates the Harris flood control procedures, the ACT unimpaired flow data used for the inflows at the reservoir are averaged over five days. This level of averaging works well for simulations over long time periods but smooths out high inflows during flood events. In contrast, the HydroBudget model uses replicated historical daily flow as inflow data, which better represents inflows during flood events than the ACT unimpaired flow data. This results in the HydroBudget more accurately capturing the flood control releases, including those released through the turbines at plant capacity, as well as through the spillway. Therefore, in addition to evaluating impacts to hydropower generation, HydroBudget is a useful tool for evaluating the increased frequency and duration of flood control operations, including spill, resulting from a change in operations. It should be noted that while HydroBudget does a very good job of evaluating impacts to hydropower generation and a satisfactory job of predicting changes to spill with varying scenarios, HEC-ResSim is still very applicable to evaluating day to day operations.

Once it was determined that the HydroBudget model provides a baseline that closely replicates historical flood control operations, it was then used to determine the increase to frequency, magnitude, and duration of operations at turbine capacity and spill days for baseline and each alternative for the period of record. Figure 5-19 demonstrates the resulting change in magnitude and duration of releases due to each 1-ft increase in winter pool for the modeled 1990 spill event.

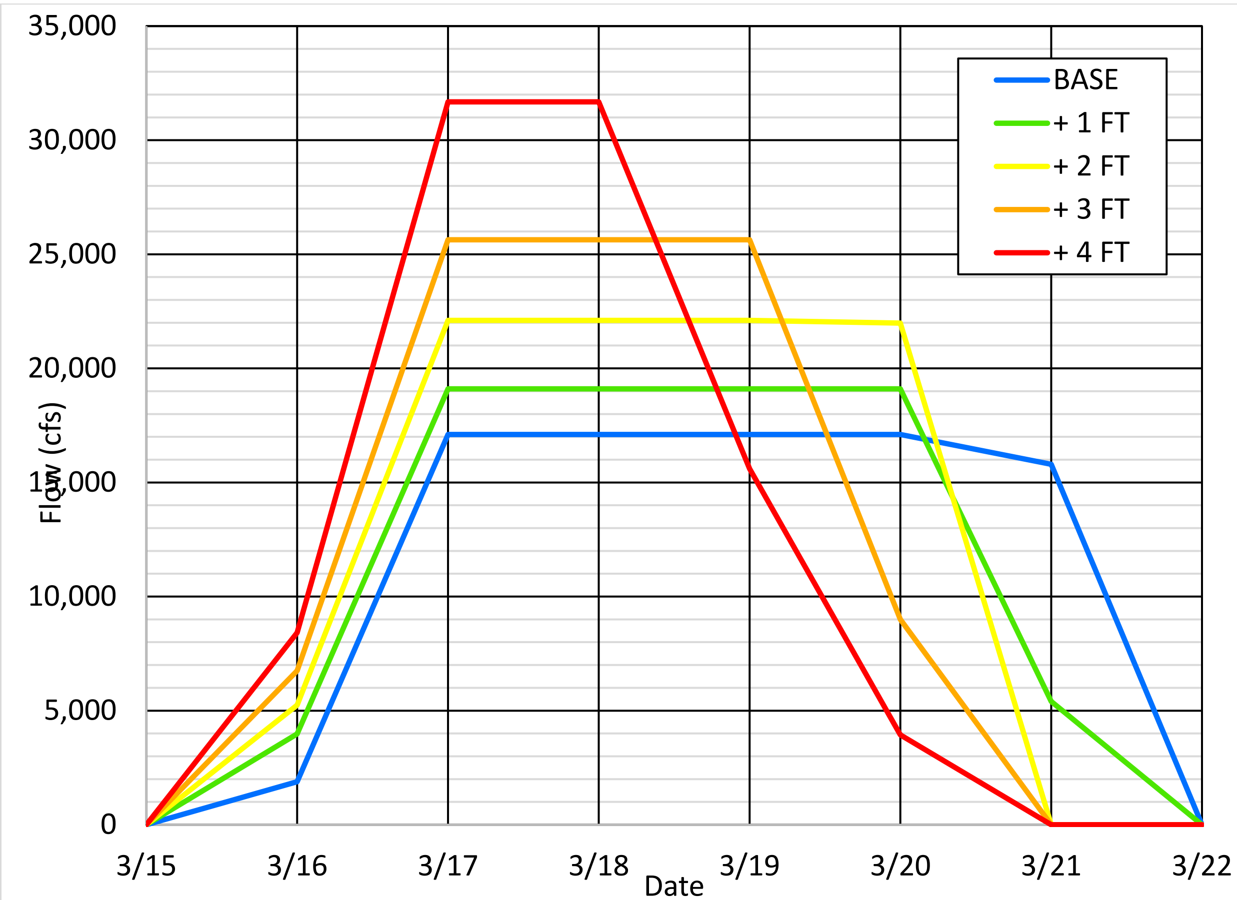

FIGURE 5–19 CHANGE IN MAGNITUDE AND DURATION OF RELEASE FOR MODELED 1990 SPILL EVENT

For the period of record included in the HydroBudget model (1940-2018), spill occurred at Harris 0.2 percent of the time under baseline operations. With each 1 ft increase in winter pool, the frequency of spill increases, as shown in Table 5-4. The frequency of spill with a 4 ft higher winter pool is approximately 0.2 percent higher, meaning that spill occurred at Harris approximately 0.4 percent of the time. Releases at plant capacity occurred from 0.7 percent to 1.0 percent of the time. A graphical representation of the additional days of spill and turbine capacity operations can be found in Figure 5-20 and Figure 5-21.

TABLE 5–4 PERCENTAGE OF TIME SPENT IN TURBINE CAPACITY AND SPILLWAY OPERATIONS FOR EACH ALTERNATIVE

ELEVATION	SPILLWAY OPERATIONS	TURBINE CAPACITY
Baseline (785 ft msl)	0.2%	0.7%
+ 1 foot	0.3%	0.7%
+ 2 feet	0.3%	0.8%
+ 3 feet	0.3%	0.8%
+ 4 feet	0.4%	1.0%

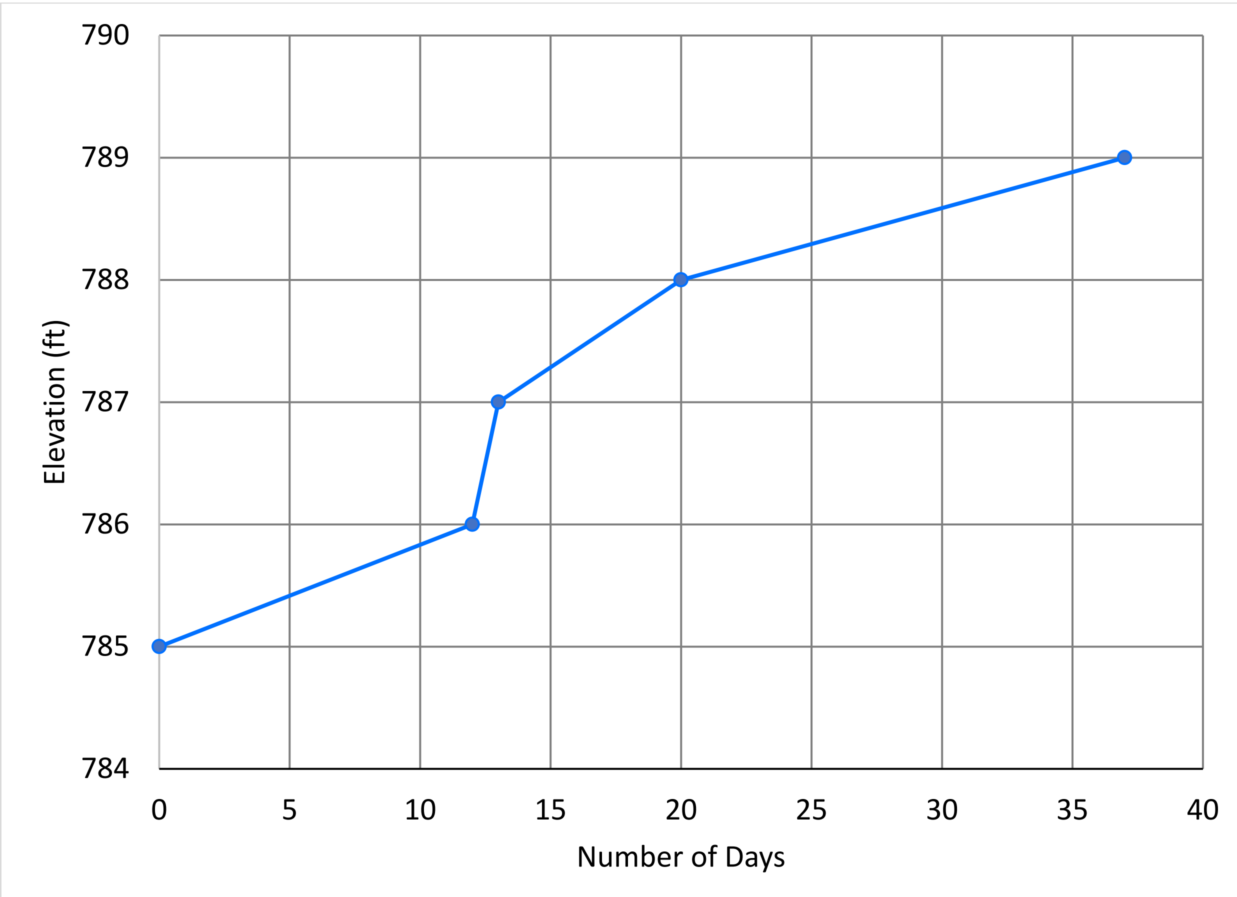

FIGURE 5–20 ADDITIONAL DAYS OF SPILL FOR EACH ALTERNATIVE AT HARRIS RESERVOIR

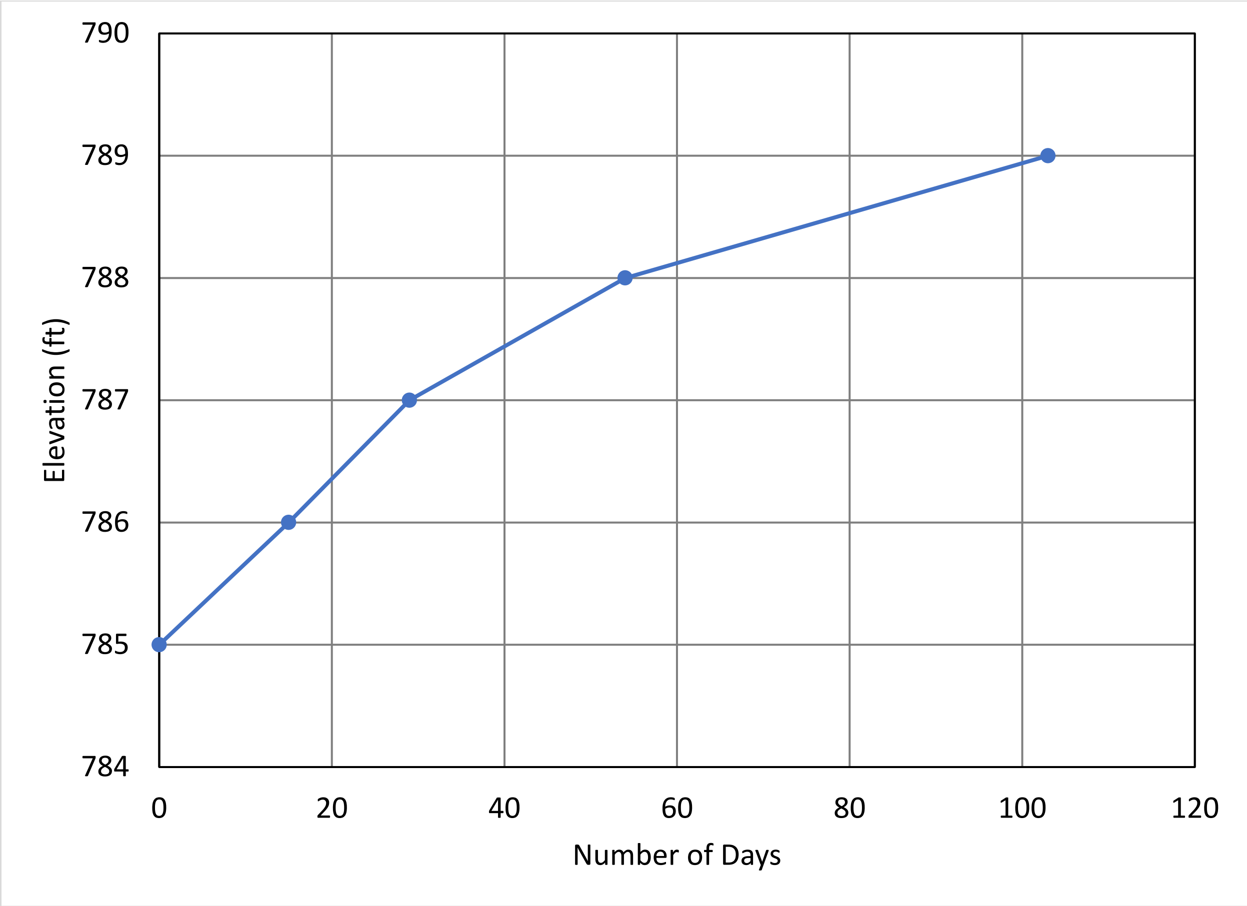

FIGURE 5–21 ADDITIONAL DAYS OF CAPACITY OPERATIONS FOR EACH ALTERNATIVE AT HARRIS RESERVOIR

5.3 NAVIGATION

Each of the alternatives were evaluated to determine impacts to navigation releases (Table 5-5) The number of days over the period of record that each alternative supported a navigation channel of 9 ft, 7.5 ft, or no navigation, were compared. No changes were found to the amount of time that navigation channel depth was provided under each alternative. Navigation levels are triggered by inflow for the ACT basin. The required basin inflow to support each navigation channel depth includes a volume historically contributed by the storage projects on the Coosa and Tallapoosa Rivers and USACE's assumptions for dredging the navigation channel in the Alabama River. Altering the winter pool elevation at Harris would not impact this trigger.

TABLE 5–5 WINTER POOL ALTERNATIVES AT HARRIS DAM AND NAVIGATION RELEASES

PERCENTAGE OF TIME IN EACH NAVIGATION LEVEL					
Navigation Channel Depth	**Baseline (785 ft msl)**	**+1 foot**	**+2 feet**	**+3 feet**	**+4 feet**
9.0 ft	73%	73%	73%	73%	73%
7.5 ft	6%	6%	6%	6%	6%
None	21%	21%	21%	21%	21%

5.4 DROUGHT OPERATIONS

Alabama Power evaluated how drought operations may be positively or adversely affected by increasing the winter pool at Harris. According to ADROP, DILs are triggered based on a combination of low basin inflows, low state-line flow, and basin-wide composite storage. For each alternative, there is no significant change in the percentage of time spent over the period of record in each DIL (Table 5–6). This is likely due to the minimal additional storage that may be afforded during the winter months with a higher Harris Reservoir winter pool.

TABLE 5–6 EVALUATION OF DROUGHT OPERATIONS AND WINTER POOL ALTERNATIVES

PERCENT OF TIME IN EACH DROUGHT INTENSITY LEVEL (DIL)					
DIL	**Baseline (785 ft msl)**	**+ 1 foot**	**+ 2 feet**	**+ 3 feet**	**+ 4 feet**
0	81%	81%	81%	81%	81%
1	13%	13%	13%	13%	14%
2	4%	4%	4%	4%	4%
3	1%	1%	1%	1%	1%

5.5 GREEN PLAN FLOWS

The Green Plan minimum releases from Harris were met or exceeded for the period of record for all alternatives. No changes were found in the ability to pass Green Plan flows from Harris Dam due to an increase in the winter pool. With the discharge target based on flows upstream of the reservoir at Heflin, the required releases were the same for all alternatives.

5.6 DOWNSTREAM RELEASE ALTERNATIVES

Alabama Power evaluated the impact of the various alternatives on the release alternatives included in the Downstream Release Alternatives Study Plan. This included the Pre-Green Plan alternative which includes only peaking operations and an alternative replacing the Green Plan flows with a continuous minimum flow of 150 cfs. The modified Green Plan alternative with an altered release pattern was not modeled because the details of this alternative have yet to be determined. Note that the model includes a cutback in releases from Harris for the continuous minimum flow when Heflin flows are less than 50 cfs, just as it does for Green Plan flows. Model results indicated that raising the winter operating curve would not affect Alabama Power's ability to return to Pre-Green Plan operations or to pass a continuous minimum flow of 150 cfs from Harris Dam due to an increase in the winter pool.

6.0 CONCLUSIONS

Alabama Power will use the information in this report and apply it to Phase 2 of the Operating Curve Change Feasibility Study Plan (Table 6–1). The Phase 1 modeling results combined with other environmental study analyses will result in a final recommendation from Alabama Power on any operating curve change at Harris.

The Phase 1 HEC-RAS modeling using the HEC-ResSim output indicates that a 1-foot increase in the winter pool elevation at the Harris Dam will result in increased area, depth, and duration of flooding at points downstream of Harris Dam. Due to the natural channel geometry, for long stretches of the Tallapoosa River there is not significantly more area affected by increases in the winter pool; however, there are increases in the areas affected by flooding where tributary streams with low lying floodplains enter the Tallapoosa River. The proposed operating curve changes not only increase inundation areas but also increase the depth of flooding. For areas affected under the baseline case, flooding is worse due to the increase in maximum flood levels (depth). Additionally, for the length of the river, the duration that the maximum baseline case flood elevations are equaled or exceeded are increased in places for more than 12 hours with a 1-foot increase in the operating curve and for more than 43 hours with a 4-foot increase in the operating curve.

TABLE 6–1 PHASE 2 RESOURCE IMPACTS ANALYSIS

RESOURCE	METHOD	
	Lake Harris	**Tallapoosa River Downstream of Harris Dam through Horseshoe Bend**
Water Quality	• Phase 1 results • Existing information • EFDC and HEC-ResSim	• Existing information • EFDC to evaluate potential effects on dissolved oxygen from unit discharge in the tailrace
Water Use	• Phase 1 results • Existing information - Water Quantity, Water Use, and Discharges Report	• Phase 1 results • Existing information - Water Quantity, Water Use, and Discharges Report
Erosion and Sedimentation (including invasive species)	• Phase 1 results • FERC-approved Erosion and Sedimentation Study • LIDAR, aerial imagery, historic photos, GIS • Quantitative and qualitative evaluation of areas most susceptible to increase in nuisance aquatic vegetation	• Phase 1 results • FERC-approved Erosion and Sedimentation Study • LIDAR, aerial imagery, historic photos, GIS
Aquatics	• Phase 1 results • Existing information on the Harris Reservoir fishery	• Phase 1 results • Other FERC approved studies as appropriate
Wildlife and Terrestrial Resources- including Threatened, and Endangered Species	• Phase 1 results • FERC-approved Threatened and Endangered Species Study • GIS	• Phase 1 results • FERC-approved Threatened and Endangered Species Study • GIS
Terrestrial Wetlands	• Existing reservoir wetland data • Phase 1 results • LIDAR, aerial imagery, expert opinions, and GIS	• Existing wetlands data • National Wetland Inventory maps • Phase 1 results • LIDAR, aerial imagery, expert opinions, and GIS
Recreation Resources	• Phase 1 results • FERC-approved Recreation Evaluation Study • LIDAR data	• Phase 1 results • FERC-approved Recreation Evaluation Study • LIDAR data
Cultural Resources	• Phase 1 results • LIDAR, aerial imagery, expert opinions, and GIS	• Phase 1 results • LIDAR, aerial imagery, expert opinions, and GIS

Appendix A

Acronyms and Abbreviations

Acronyms and Abbreviations

A

A&I	Agricultural and Industrial
ACFWRU	Alabama Cooperative Fish and Wildlife Research Unit
ACF	Apalachicola-Chattahoochee-Flint (River Basin)
ACT	Alabama-Coosa-Tallapoosa (River Basin)
ADCNR	Alabama Department of Conservation and Natural Resources
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
ADROP	Alabama-ACT Drought Response Operations Plan
AHC	Alabama Historical Commission
Alabama Power	Alabama Power Company
AMP	Adaptive Management Plan
ALNHP	Alabama Natural Heritage Program
APE	Area of Potential Effects
ARA	Alabama Rivers Alliance
ASSF	Alabama State Site File
ATV	All-Terrain Vehicle
AWIC	Alabama Water Improvement Commission
AWW	Alabama Water Watch

B

BA	Biological Assessment
B.A.S.S.	Bass Anglers Sportsmen Society
BCC	Birds of Conservation Concern
BLM	U.S. Bureau of Land Management
BOD	Biological Oxygen Demand

C

°C	Degrees Celsius or Centrigrade
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulation
cfs	Cubic Feet per Second
cfu	Colony Forming Unit
CLEAR	Community Livability for the East Alabama Region
CPUE	Catch-per-unit-effort
CWA	Clean Water Act

D

DEM	Digital Elevation Model
DIL	Drought Intensity Level
DO	Dissolved Oxygen
dsf	day-second-feet

E

EAP	Emergency Action Plan
ECOS	Environmental Conservation Online System
EFDC	Environmental Fluid Dynamics Code
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

F

°F	Degrees Fahrenheit
ft	Feet
F&W	Fish and Wildlife
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FNU	Formazin Nephelometric Unit
FOIA	Freedom of Information Act
FPA	Federal Power Act

G

GCN	Greatest Conservation Need
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning Systems
GSA	Geological Survey of Alabama

H

Harris Project	R.L. Harris Hydroelectric Project
HAT	Harris Action Team
HEC	Hydrologic Engineering Center
HEC-DSSVue	HEC-Data Storage System and Viewer
HEC-FFA	HEC-Flood Frequency Analysis
HEC-RAS	HEC-River Analysis System
HEC-ResSim	HEC-Reservoir System Simulation Model
HEC-SSP	HEC-Statistical Software Package

HDSS	High Definition Stream Survey
hp	Horsepower
HPMP	Historic Properties Management Plan
HPUE	Harvest-per-unit-effort
HSB	Horseshoe Bend National Military Park

I

IBI	Index of Biological Integrity
IDP	Inadvertent Discovery Plan
IIC	Intercompany Interchange Contract
IVM	Integrated Vegetation Management
ILP	Integrated Licensing Process
IPaC	Information Planning and Conservation
ISR	Initial Study Report

J

JTU	Jackson Turbidity Units

K

kV	Kilovolt
kva	Kilovolt-amp
kHz	Kilohertz

L

LIDAR	Light Detection and Ranging
LWF	Limited Warm-water Fishery
LWPOA	Lake Wedowee Property Owners' Association

M

m	Meter
m^3	Cubic Meter
M&I	Municipal and Industrial
mg/L	Milligrams per liter
ml	Milliliter
mgd	Million Gallons per Day
µg/L	Microgram per liter
µs/cm	Microsiemens per centimeter
mi^2	Square Miles
MOU	Memorandum of Understanding

MPN	Most Probable Number
MRLC	Multi-Resolution Land Characteristics
msl	Mean Sea Level
MW	Megawatt
MWh	Megawatt Hour

N

n	Number of Samples
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetlands Inventory

O

OAR	Office of Archaeological Resources
OAW	Outstanding Alabama Water
ORV	Off-road Vehicle
OWR	Office of Water Resources

P

PA	Programmatic Agreement
PAD	Pre-Application Document
PDF	Portable Document Format
pH	Potential of Hydrogen
PID	Preliminary Information Document
PLP	Preliminary Licensing Proposal
Project	R.L. Harris Hydroelectric Project
PUB	Palustrine Unconsolidated Bottom
PURPA	Public Utility Regulatory Policies Act
PWC	Personal Watercraft
PWS	Public Water Supply

Q

QA/QC	Quality Assurance/Quality Control

R

RM	River Mile
RTE	Rare, Threatened and Endangered
RV	Recreational Vehicle

S

S	Swimming
SCORP	State Comprehensive Outdoor Recreation Plan
SCP	Shoreline Compliance Program
SD1	Scoping Document 1
SH	Shellfish Harvesting
SHPO	State Historic Preservation Office
Skyline WMA	James D. Martin-Skyline Wildlife Management Area
SMP	Shoreline Management Plan
SU	Standard Units

T

T&E	Threatened and Endangered
TCP	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TRB	Tallapoosa River Basin
TSI	Trophic State Index
TSS	Total Suspended Soils
TVA	Tennessee Valley Authority

U

USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

W

WCM	Water Control Manual
WMA	Wildlife Management Area
WMP	Wildlife Management Plan
WQC	Water Quality Certification

APPENDIX B

TALLAPOOSA RIVER BASIN FLOOD FREQUENCY ANALYSIS

TALLAPOOSA RIVER BASIN

FLOOD FREQUENCY ANALYSIS

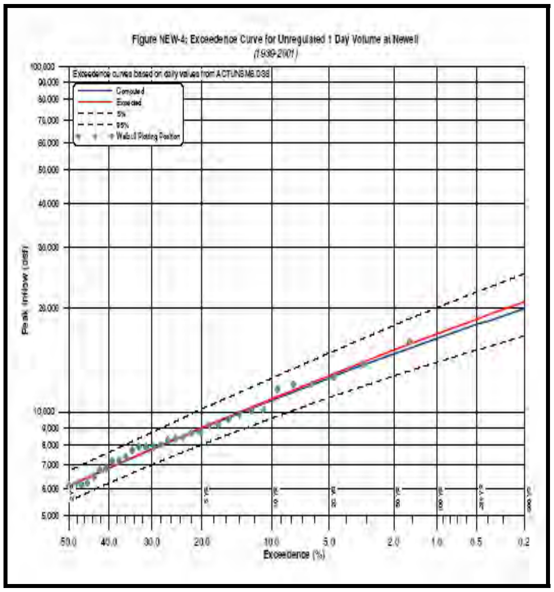

Figure HAR-1: FFA Datafile HAR.DAT

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TT TALLAPOOSA RIVER AT HEFLIN FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1      1
FR     19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00    30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID HEFLIN 1 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR           1939  20497
QR           1940  18037
QR           1941   7130
QR           1942  28406
QR           1943  28950
QR           1944  20031
QR           1945  22045
QR           1946  32432
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QR           1959  12738
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QR           1967  14279
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QR           1977  45917
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QR           1979  59002
QR           1980  25657
QR           1981  18132
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QR           1983  29121
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QR           1985  11416
QR           1986   6091
QR           1987  21853
QR           1988  14808
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QR           1990  46604
QR           1991  14900
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QR           1993  26104
QR           1994  15304
QR           1995  25511
QR           1996  42327
QR           1997  33876
QR           1998  40572
QR           1999   7342
QR           2000  13663
QR           2001  22224
ED
```

Table HAR-3: Regulation Impact on Flood Recurrences at Harris

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976		48,658	10	45,936	10
1977		45,917	10	46,110	10
1978		22,369	1	22,098	1
1979		59,002	50	59,073	50
1980		25,657	2	24,969	2
1981		18,132	1	17,574	1
1982		36,494	5	34,626	5
1983	12/7/83	29,121	2	28,790	2
1984	8/3/84	25,077	2	15,880	1
1985	2/6/85	11,416	1	11,780	1
1986	11/27/86	6,091	1	6,840	1
1987	3/2/87	21,853	1	14,060	1
1988	1/22/88	14,808	1	11,760	1
1989	6/22/89	16,047	1	14,270	1
1990	3/17/90	46,604	10	36,960	5
1991	2/21/91	14,900	1	12,940	1
1992	12/21/92	18,299	1	13,434	1
1993	3/28/93	26,104	2	13,095	1
1994	7/28/94	15,304	1	10,585	1
1995	10/6/95	25,511	2	18,306	1
1996	2/3/96	42,327	10	16,912	1
1997	3/2/97	33,876	2	24,634	2
1998	3/10/98	40,572	5	24,154	2
1999	6/28/99	7,342	1	7,198	1
2000	4/4/00	13,663	1	13,938	1
2001	3/24/01	22,224	1	12,445	1

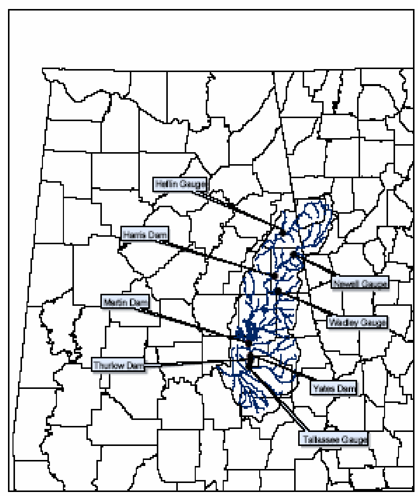

Figure 1-1: Tallapoosa River Basin

Southern Company

Southern Company Generation
Hydro Services
Reservoir Management

INTRODUCTION

This report describes the flood frequency analysis for rivers of the Tallapoosa River Basin from headwaters of the Tallapoosa River and Little Tallapoosa River in north Georgia to just below the Thurlow Dam at Tallassee, Alabama. Recurrence intervals for one up to 500 years were determined of flow records by fitting a Pearson Type III frequency distribution curve to the logarithms of the annual daily peak flows and also to annual peak flood volumes for the years 1939 through 2001. These frequency distributions were determined for four Alabama Power Company hydro projects and also for four gauge sites in the Tallapoosa River Basins. Procedures as contained in Bulletin #17B, “Guidelines for Determining Flood Flow Frequency, March 1982” and the U S Army Corps of Engineers’ Engineering Manual, “Hydrologic Frequency Analysis, EM 1110-2-1415, March 1993” were employed in these determinations. Also, the 1992 version of the COE’s computer model, HEC-FFA (Flood Frequency Analysis) was used in determining flow frequencies.

DRAINAGE BASIN DESCRIPTION

The Tallapoosa River Basin begins in Northwest Georgia and flows southwest where it terminates in the south central portion of Alabama. In Northwest Georgia, there are two headwater rivers, Tallapoosa River, Haralson County, and Little Tallapoosa River, Carroll County. From Carroll County, the Little Tallapoosa River flows 88 miles downstream to join the Tallapoosa River. Ten miles downstream of the confluence of the Tallapoosa and Little Tallapoosa Rivers is Harris Dam, Alabama Power Company’s hydro project. The Tallapoosa River Basin has a drainage area of 1,453 square miles at this point.

From Harris Dam, the Tallapoosa River flows 78.5 miles downstream to the largest reservoir on the system formed by Martin Dam. Immediately downstream are two additional hydro plants, Yates and Thurlow. The Tallapoosa River Basin has 3,308 square miles to this point; the total drainage area of the basin is 4,675 square miles. Forty-seven miles downstream is the confluence of the Tallapoosa and Coosa Rivers to form the Alabama River. The Tallapoosa River Basin has a varied composition of basin characteristics with forest cover, agricultural lands and urban areas. There have been changes in this drainage basin during this study time period. There have also been changes in agriculture practices that impact runoff characteristics. However, these changes have not been measured and are not addressed in this study.

With four major dams in the Tallapoosa River Basin, flood flows are impacted considerably. Due to this large degree of regulation and the fact that these projects have been constructed at differing times during the last ninety years presents difficulties in developing a database for determining flood frequencies. Technical Bulletin #17B states that its procedures for determining flood flow frequencies do not cover watersheds where flood flows have been appreciably altered by regulation. The following describes how this and other flow record problems have been addressed.

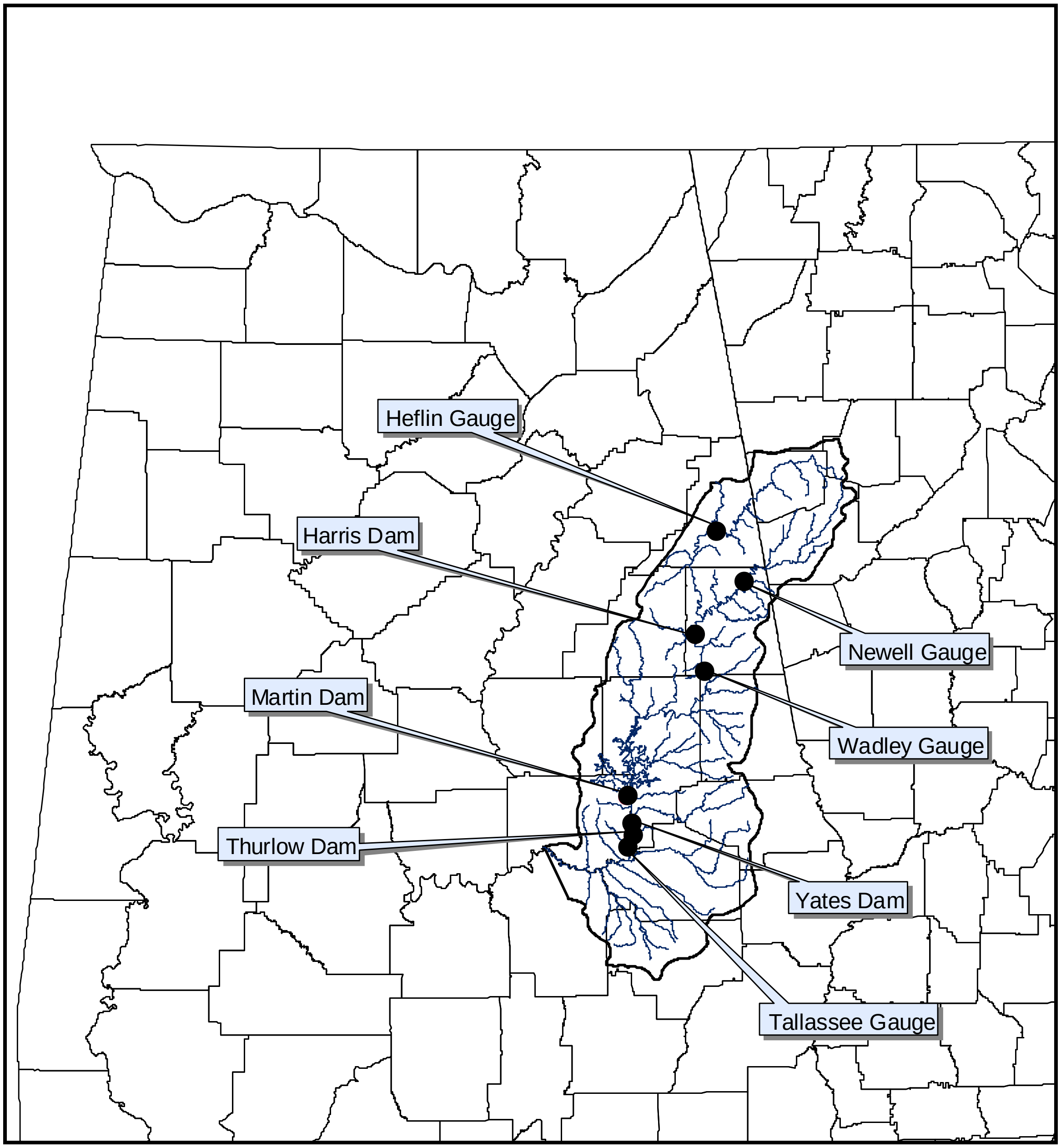

Figure 1-1: Tallapoosa River Basin

DATA

In the 1990's the Mobile District COE developed an unimpaired flow daily record for points along major rivers in the Alabama-Coosa-Tallapoosa (ACT) River Basins. This daily flow data set, which was updated in 2002, covers a period from 1939 through 2001 and was prepared for surface water models conducted in the tri-state water compact negotiations. The COE's dataset covers the entire ACT Basin which provides a uniform dataset for each reservoir along the Coosa River.

From the COE's 1997 report, ACT/ACF Comprehensive Water Resources Study – Surface Water Availability: Unimpaired Flow, unimpaired flows are defined as,

> *". . . historically observed flows adjusted for human influence by accounting for the construction of surface water reservoirs and for withdrawals and returns to serve municipal, industrial, thermal power, and agricultural water uses".*

Basically, the COE removed augmentation to river flows from the potential sources as listed above. Reservoir regulation can significantly alter both high and low flows in the river, which will skew any statistical analysis. The purpose for the COE developing this data set was for input to reservoir system models (e.g., HEC-5) to assist in evaluations that took place in the ACT/ACF Comprehensive Study. By the COE developing an unimpaired daily flow dataset for the ACT/ACF Comprehensive Study, they have also created a useful dataset for analyzing statistical flows.

In the COE's compiling daily flow records, missing records were transposed from nearby records, and routing coefficients were developed for each river reach. Most surface water models were primarily concerned with either dry or drought conditions, so most of this data set was smoothed in order to avoid any negative flow numbers. However, this dampens high flow conditions. In order that this flow data set maybe useful for flood frequency analyses, the smoothing of flow values was removed from the data. This was accomplished by modifying the DSSMATH macros which were developed by the Mobile District COE to construct unimpaired flows as contained in their cumulative flow dataset, ACTCUM6.DSS. Appendix I contains the macros as developed by the Mobile District COE. Appendix II contains the modified macros used to develop a non-smoothed cumulative dataset, ACTUNSM6.DSS, which was used in these flood frequency analyses.

Another useful application of unimpaired flow datasets is that they can provide the means of evaluating the effects of reservoir regulation. This can be achieved by comparing two approaches. One approach is to route the unimpaired flows (by modeling with HEC-RAS) without any reservoirs in place to provide an evaluation of the effects that regulation has had on specific historical flood events. Another approach is to route these same unimpaired flows in a river with reservoirs in place and with altered reservoir flood control procedures to evaluate if these altered procedures might provide a more optimum condition. By comparing the results of these two approaches, differences of elevations and differences of flow hydrograhs can be determined.

In order that the unimpaired flow datasets may be used for river routings, it is necessary to change the time step of the data from daily to hourly. This can be approached in a two step process. First, using utility portion of the COE's program DSSVUE, the time step can be changed from daily to hourly. However, this creates a ‘stair-step’ in the data. Thus, an algorithm needs to be applied to smooth these hourly values without reducing the peaks. Appendix III contains the mathematical basis for smoothing hourly values without reducing the peaks.

The primary locations in the Tallapoosa River Basin as defined in the COE’s dataset are at the four gauge locations Heflin, Newell, Wadley, and Tallassee) and four Alabama Power Company hydro facilities (Harris, Martin, Thurlow, and Yates Dam).

There several reasons for using the unimpaired daily flow data set as developed by the Mobile District COE (after the data has been unsmoothed). One reason is that Bulletin #17B states that its procedures “do not cover watersheds where flood flows are appreciably altered by reservoir regulation…” The use of the COE’s dataset addresses that point. Another reason for using the COE’s dataset is that it covers sixty-one years. A longer length of record provides greater accuracy and confidence in the results. It is also important to cover more than one hydrologic cycle. In the Southeastern United States, the drought to drought hydrologic cycle has a length of approximately thirty years.

The COE’s manual, “Hydrologic Frequency Analysis, EM 1110-2-1415, March 1993”, also provides that frequency analysis may be performed on peak annual flood volumes in a similar fashion as laid out Bulletin #17B for peak annual flows. Peak annual three-day and five-day volumes were obtained by taking running three-day and five-day summations of flows of the unimpaired flow data sets.

A regional skew coefficient is necessary in determining a log Pearson Type III frequency distribution. Bulletin #17B, “Guidelines for Determining Flood Flow Frequency, March 1982”, provides such regional skew coefficients. From Plate I, Figure 14-1, ‘Generalize Skew Coefficients of Annual Maximum Streamflow Logarithms’ in this bulletin, the regional skew coefficient is ‘0.0’ for the Tallapoosa River Basin. Figure 2 illustrates the generalized skew coefficients from Bulletin #17B.

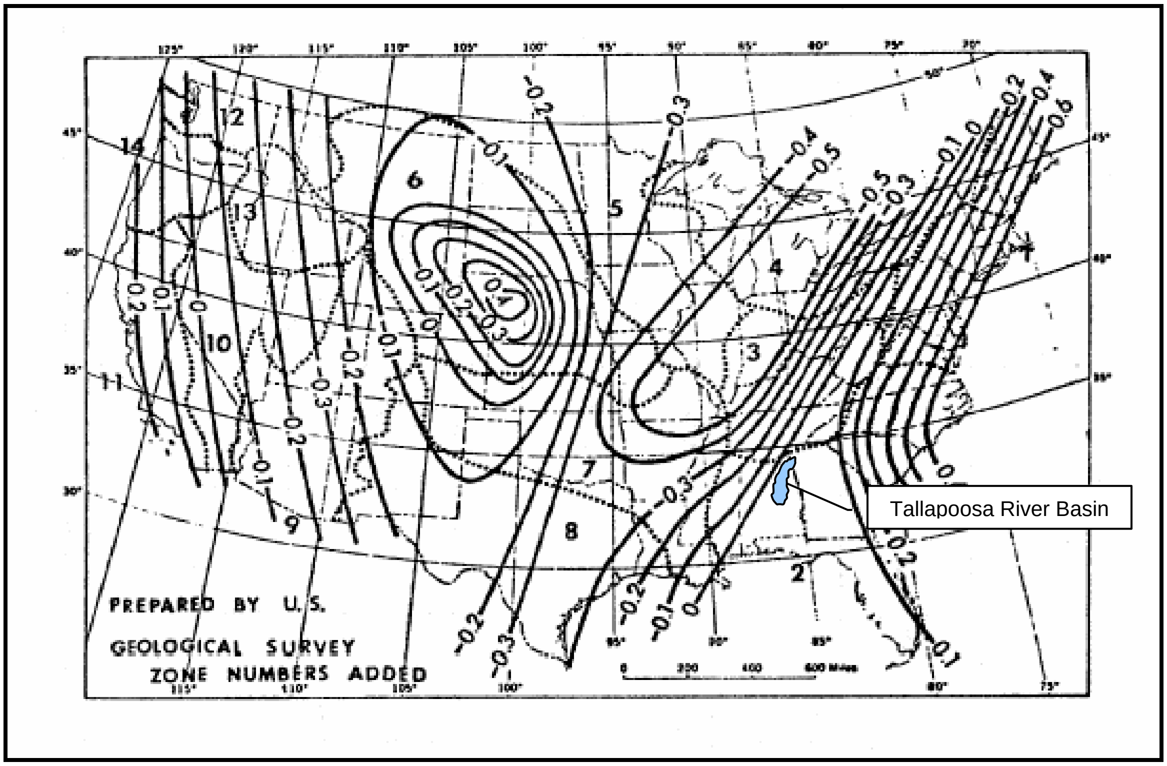

Figure 2: Generalized Skew Coefficients for Tallapoosa River Basin

ANALYSIS

The following tabs in this report list the datasets which were used in the HEC-FFA program to determine the flood frequencies for each location within the Tallapoosa Basin. These datasets are for the one day peak annual flow and also for three and five day volume peak annual flows. These datasets cover sixty-three years of records for periods of 1939 through 2001. There is no instantaneous peak flow values used in these datasets; each dataset reflects daily flow values. From these datasets, HEC-FFA provides a computed log-Pearson Type III frequency distributions for recurrence intervals of one up to 500 years.

Confidence limits for the recurrence intervals were determined by the HEC-FFA program. Additionally, Weibull plotting positions are provided for each ranked annual flood event. Weibull plotting positions do not necessarily represent the recurrence interval for each respective annual peak flow, but they do provide a validating comparison with the frequency distribution curve. Results for the peak daily flow frequency are illustrated in tables and charts for each location under its respective Tab. Results for the peak volume frequencies are also illustrated.

Flood frequency curves that are based on a log-Pearson Type III distribution contain a bias which is due to the statistical computations being based on a finite number of data ordinates. Bulletin #17B discusses procedures for eliminating this bias by an adjustment called an ‘expected probability adjustment’. HEC-FFA performs this adjustment with results shown in Summary Tables under the heading, ‘Expected Probability’ for the 1, 2, 5, 10, 25, 50, 100, 250 and 500 year daily peak floods for the each location within the Tallapoosa Basin. Also contained in each tab is a table which shows the degree of flood flow augmentation afforded by the storage projects in the Tallapoosa Basin since 1983, which is the year that the last project (Harris) was completed in the Tallapoosa Basin. The following charts illustrate flood frequencies for the Tallapoosa Basin for the one, three and five day volume peak annual floods. Also in these charts are several major historical floods to compare with the frequencies. These historical floods provide a perspective to the magnitude of several recent floods (i.e., the April of 1979 and the February and March floods of 1990) and also illustrate that major historical floods may not be of the same magnitude uniformly within a river basin. This aspect is significant as flood control procedures are evaluated for it illustrates the need for flood control procedures to be flexible in order to maximize the flood control capabilities that the reservoirs may provide.

Figure 3: Unregulated 1 Day Volume Flood Recurrence

Location	RM	10YR	25YR	50YR	100YR	250 YR	500 YR	Apr-79	Feb-90		Modify Apr-79	Modify Mar-90
Heflin	186.62	14,300	18,400	21,500	24,900	29,500	33,300	22,202	22,202		12%	12%
Newell	182.27	10,800	13,100	14,700	16,300	18,300	19,900	9,137	11,613		78%	40%
Harris	139.10	41,100	49,500	55,500	61,200	66,600	73,500	59,002	46,604		4%	31%
Wadley	120.00	48,000	58,500	66,100	73,500	80,800	90,300	68,567	75,976		7%	-3%
Martin	60.60	86,100	103,000	116,000	128,000	143,000	155,000	114,551	125,019		12%	2%
Yates	52.70	89,100	108,000	122,000	136,000	154,000	167,000	114,552	141,920		19%	-4%
Thurlow	49.70	90,400	108,000	121,000	134,000	150,000	162,000	104,491	140,790		28%	-5%
Tallassee	47.98	90,600	109,000	122,000	134,000	150,000	162,000	105,151	141,539		27%	-5%

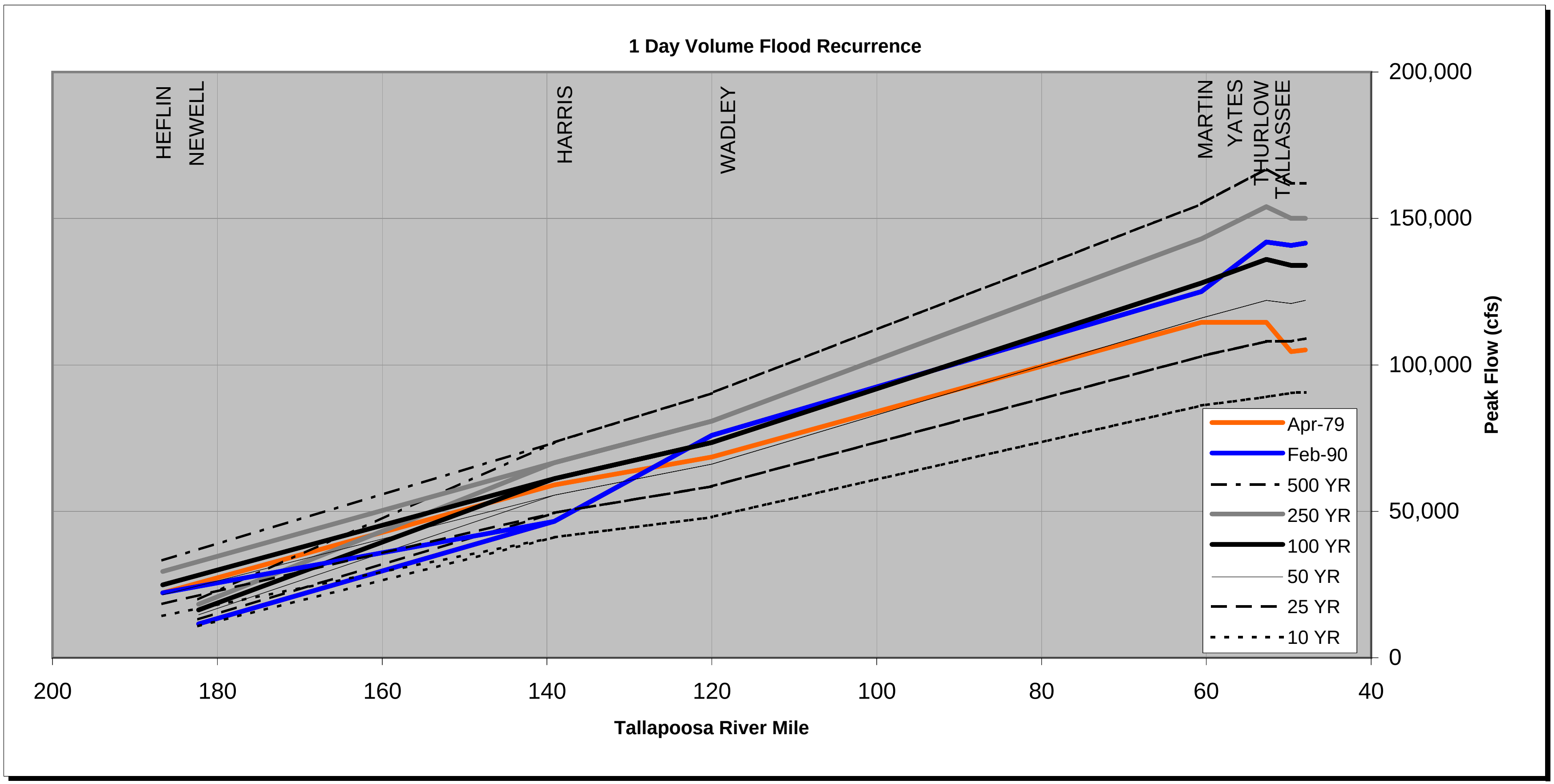

Figure 4: Unregulated 3 Day Volume Flood Recurrence

Location	RM	10YR	25YR	50YR	100YR	250 YR	500 YR	Apr-79	Feb-90		Modify Apr-79	Modify Mar-90
Heflin	186.62	36,400	47,100	55,600	64,500	77,100	87,300	56,106	56,206		15%	15%
Newell	182.27	27,400	33,000	36,900	40,600	45,300	48,800	25,341	30,215		60%	34%
Harris	139.10	96,400	117,000	132,000	147,000	162,000	181,000	133,820	127,368		10%	15%
Wadley	120.00	113,000	138,000	156,000	174,000	191,000	214,000	153,693	175,176		13%	-1%
Martin	60.60	198,000	244,000	278,000	313,000	360,000	396,000	277,337	310,830		13%	1%
Yates	52.70	203,000	252,000	290,000	329,000	382,000	423,000	277,340	353,516		19%	-7%
Thurlow	49.70	206,000	253,000	288,000	323,000	370,000	407,000	245,692	351,594		31%	-8%
Tallassee	47.98	207,000	254,000	289,000	324,000	371,000	408,000	245,574	351,594		32%	-8%

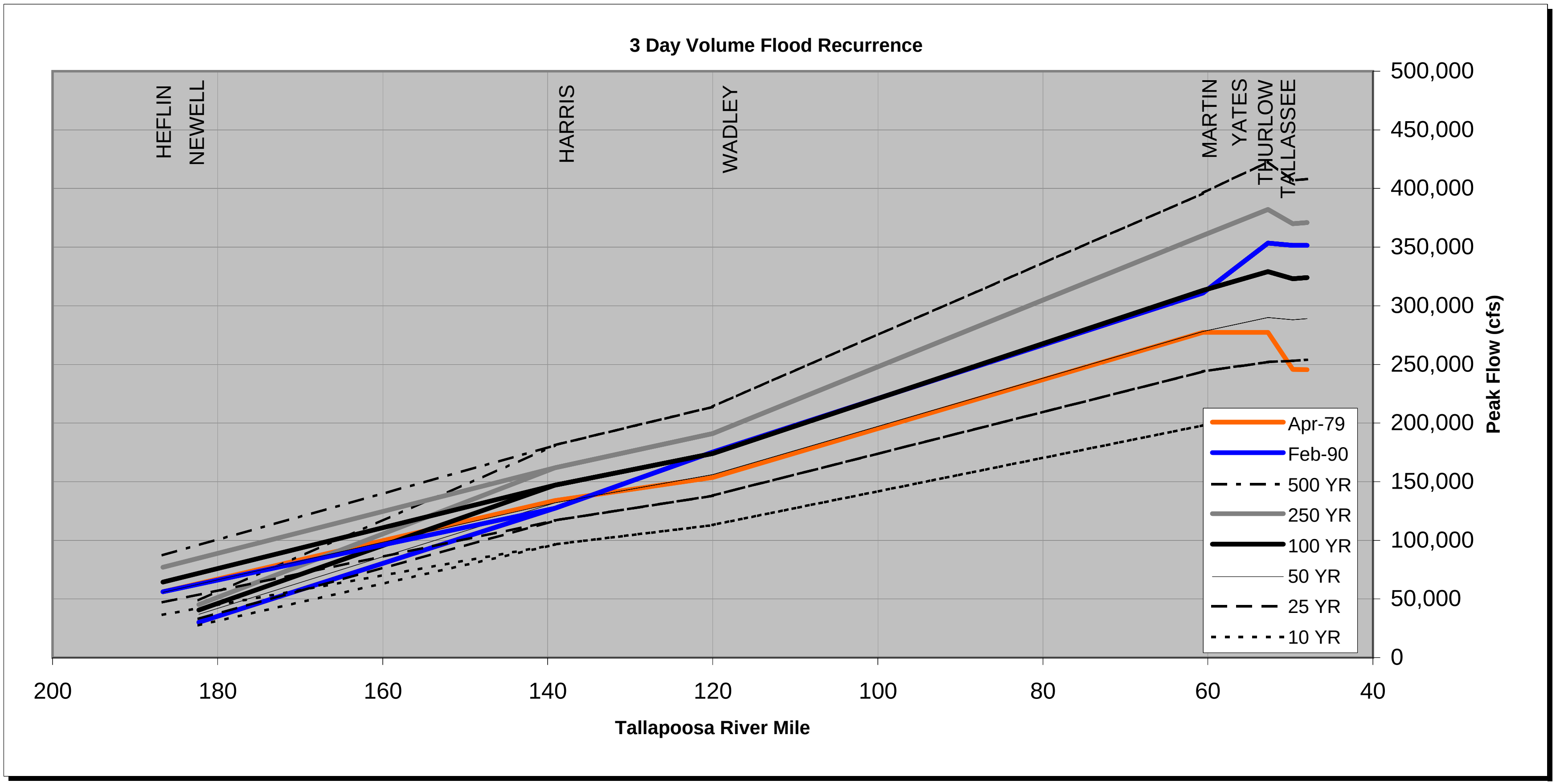

Figure 5: Unregulated 5 Day Volume Flood Recurrence

Location	RM	10YR	25YR	50YR	100YR	250 YR	500 YR	Apr-79	Feb-90		Modify Apr-79	Modify Mar-90
Heflin	186.62	45,100	58,800	70,200	82,700	101,000	117,000	64,100	68,110		29%	21%
Newell	182.27	36,100	43,200	48,300	53,100	59,100	63,500	32,195	42,111		65%	26%
Harris	139.10	129,000	157,000	177,000	197,000	216,000	241,000	173,229	174,227		14%	13%
Wadley	120.00	152,000	187,000	213,000	239,000	264,000	299,000	199,244	235,281		20%	2%
Martin	60.60	260,000	320,000	365,000	410,000	471,000	518,000	341,312	392,413		20%	4%
Yates	52.70	264,000	323,000	368,000	413,000	473,000	519,000	341,317	433,854		21%	-5%
Thurlow	49.70	269,000	330,000	375,000	420,000	481,000	528,000	307,886	431,496		36%	-3%
Tallassee	47.98	270,000	331,000	376,000	422,000	483,000	530,000	307,886	431,496		37%	-2%

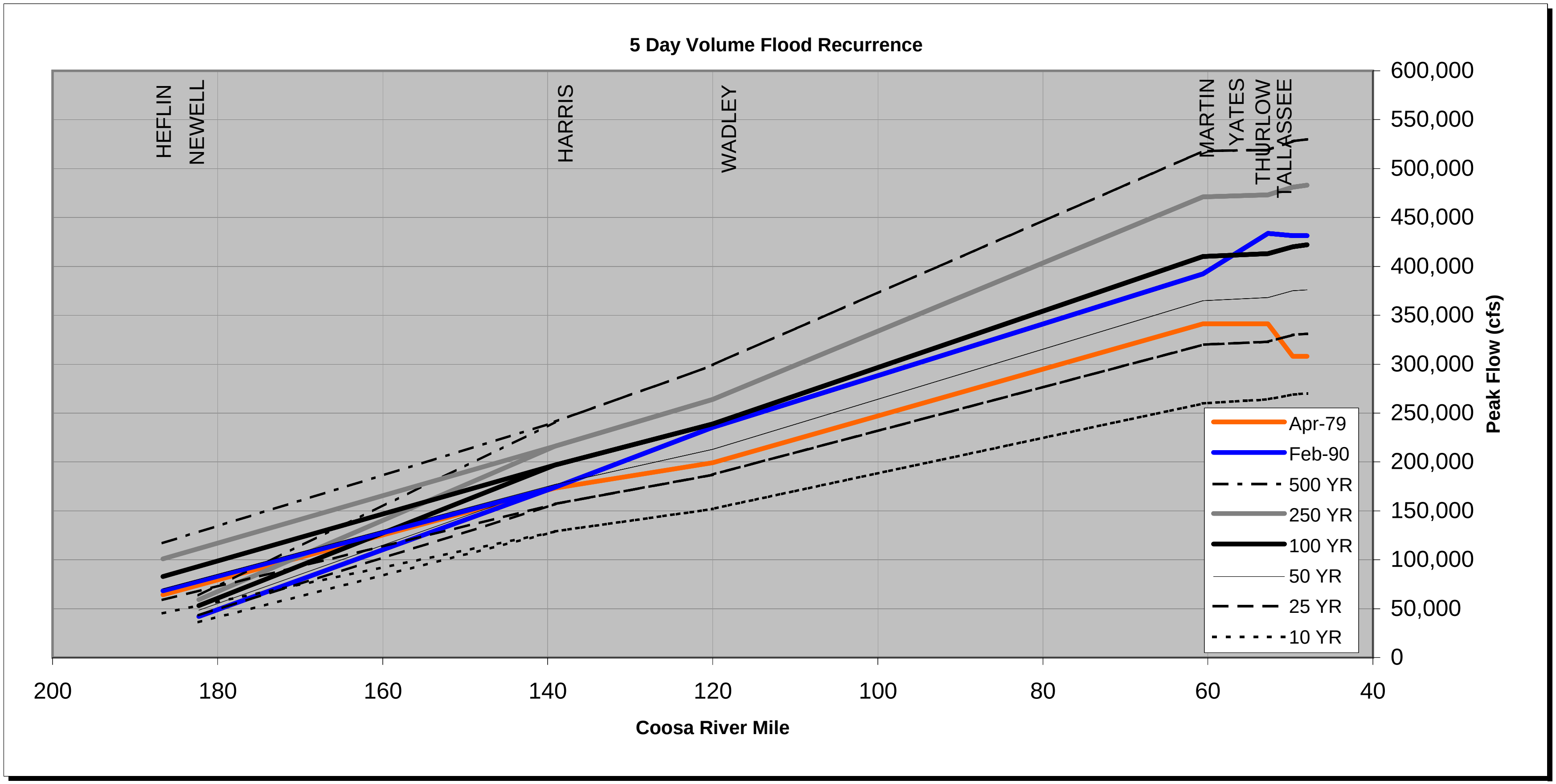

Figure HEF-1: FFA Datafile HEF.DAT

```
TT TALLAPOOSA RIVER AT HEFLIN FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID HEFLIN DSS 1939-2001
GS ALL               0.0
QR         1939     4481
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QR         1941     2087
QR         1942     9520
QR         1943     8722
QR         1944     6100
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QR         1966     6622
QR         1967     8812
QR         1968    15002
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QR         1973     7902
QR         1974     9292
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QR         1992     6352
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QR         1995     7805
QR         1996    11906
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QR         1998     9245
QR         1999     2908
QR         2000     5085
QR         2001     6985
ED
```

Figure HEF-2: FFA Datafile HEF3.DAT

```
TT TALLAPOOSA RIVER AT HEFLIN FREQUENCY ANALYSIS PROGRAM
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TT 1939-2001 3 DAY VOLUME
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FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID HEFLIN 3 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR            1939   13244
QR            1940   10736
QR            1941    5344
QR            1942   23544
QR            1943   22917
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QR            1969    9986
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ED
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Figure HEF-3: FFA Datafile HEF5.DAT

```
TT TALLAPOOSA RIVER AT HEFLIN FREQUENCY ANALYSIS PROGRAM
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TT 1939-2001 5 DAY VOLUME
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FR 25.00   30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
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QR          1942   29451
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QR          1946   38195
QR          1947   37773
QR          1948   23307
QR          1949   52787
QR          1950    9752
QR          1951   21768
QR          1952   28813
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QR          1996   40270
QR          1997   29245
QR          1998   31955
QR          1999   10195
QR          2000   13125
QR          2001   19415
ED
```

Table HEF-1: Rankings of Flood Events at Heflin

HELFIN			
Rank	Yr	Flow (cfs)	Position
1	1977	30,202	1.56
2	1979	22,202	3.13
3	1990	22,202	4.69
4	1982	17,601	6.25
5	1961	17,502	7.81
6	1968	15,002	9.38
7	1970	13,202	10.94
8	1949	13,168	12.50
9	1976	13,102	14.06
10	1996	11,906	15.63
11	1947	11,173	17.19
12	1946	10,090	18.75
13	1984	10,002	20.31
14	1952	9,577	21.88
15	1942	9,520	23.44
16	1974	9,292	25.00
17	1998	9,245	26.56
18	1963	9,202	28.13
19	1967	8,812	29.69
20	1943	8,722	31.25
21	1962	8,702	32.81
22	1972	8,682	34.38
23	1997	8,545	35.94
24	1957	8,501	37.50
25	1964	8,152	39.06
26	1980	7,982	40.63
27	1953	7,931	42.19
28	1973	7,902	43.75
29	1995	7,805	45.31
30	1983	7,792	46.88
31	1951	7,126	48.44
32	2001	6,985	50.00
33	1948	6,841	51.56
34	1956	6,781	53.13
35	1978	6,732	54.69
36	1954	6,721	56.25
37	1991	6,662	57.81
38	1966	6,622	59.38
39	1987	6,612	60.94
40	1975	6,522	62.50
41	1959	6,421	64.06
42	1992	6,352	65.63
43	1993	6,342	67.19
44	1971	6,102	68.75
45	1944	6,100	70.31
46	1989	5,744	71.88
47	1994	5,594	73.44
48	1981	5,591	75.00
49	2000	5,085	76.56
50	1960	4,822	78.13
51	1988	4,752	79.69
52	1958	4,591	81.25
53	1940	4,550	82.81
54	1955	4,501	84.38
55	1985	4,492	85.94
56	1939	4,481	87.50
57	1945	4,020	89.06
58	1965	3,972	90.63
59	1969	3,662	92.19
60	1950	3,090	93.75
61	1999	2,908	95.31
62	1941	2,087	96.88
63	1986	1,702	98.44

HELFIN - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1977	74,806	1.56
2	1990	56,206	3.13
3	1979	56,106	4.69
4	1961	45,106	6.25
5	1982	43,403	7.81
6	1949	35,400	9.38
7	1976	34,686	10.94
8	1970	33,506	12.50
9	1996	33,018	14.06
10	1947	27,876	15.63
11	1968	27,736	17.19
12	1984	27,696	18.75
13	1946	25,824	20.31
14	1998	24,435	21.88
15	1974	23,786	23.44
16	1942	23,544	25.00
17	1967	23,436	26.56
18	1943	22,917	28.13
19	1972	22,846	29.69
20	1962	22,546	31.25
21	1997	22,185	32.81
22	1952	22,108	34.38
23	1964	21,996	35.94
24	1963	21,386	37.50
25	1953	21,073	39.06
26	1995	20,625	40.63
27	1957	20,503	42.19
28	1980	20,376	43.75
29	1973	19,486	45.31
30	1951	18,910	46.88
31	1983	18,806	48.44
32	1956	18,403	50.00
33	1959	17,163	51.56
34	1966	17,066	53.13
35	1978	17,026	54.69
36	1948	16,938	56.25
37	2001	16,725	57.81
38	1975	16,586	59.38
39	1987	16,475	60.94
40	1991	16,256	62.50
41	1954	15,973	64.06
42	1971	15,566	65.63
43	1992	15,296	67.19
44	1993	15,106	68.75
45	1944	14,242	70.31
46	1989	13,832	71.88
47	1939	13,244	73.44
48	1981	12,383	75.00
49	1960	12,156	76.56
50	1985	11,456	78.13
51	1994	11,302	79.69
52	1958	11,103	81.25
53	2000	10,905	82.81
54	1988	10,876	84.38
55	1940	10,736	85.94
56	1969	9,986	87.50
57	1955	9,783	89.06
58	1965	9,086	90.63
59	1945	8,987	92.19
60	1950	7,498	93.75
61	1999	6,824	95.31
62	1941	5,344	96.88
63	1986	3,895	98.44

HELFIN - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1977	86,440	1.56
2	1990	68,110	3.13
3	1979	64,100	4.69
4	1961	62,610	6.25
5	1949	52,787	7.81
6	1982	51,325	9.38
7	1970	41,090	10.94
8	1976	40,730	12.50
9	1996	40,270	14.06
10	1984	38,200	15.63
11	1946	38,195	17.19
12	1947	37,773	18.75
13	1968	34,610	20.31
14	1998	31,955	21.88
15	1943	31,435	23.44
16	1974	29,730	25.00
17	1967	29,460	26.56
18	1942	29,451	28.13
19	1972	29,440	29.69
20	1997	29,245	31.25
21	1952	28,813	32.81
22	1962	28,710	34.38
23	1995	28,105	35.94
24	1957	27,705	37.50
25	1964	26,710	39.06
26	1966	26,610	40.63
27	1980	25,930	42.19
28	1963	25,830	43.75
29	1953	25,545	45.31
30	1983	24,430	46.88
31	1973	23,990	48.44
32	1956	23,545	50.00
33	1948	23,307	51.56
34	1975	22,060	53.13
35	1978	21,810	54.69
36	1951	21,768	56.25
37	1991	21,560	57.81
38	1971	20,690	59.38
39	1987	20,268	60.94
40	1959	19,655	62.50
41	2001	19,415	64.06
42	1992	18,620	65.63
43	1954	18,606	67.19
44	1944	18,257	68.75
45	1993	18,160	70.31
46	1939	17,533	71.88
47	1989	17,050	73.44
48	1940	16,467	75.00
49	1960	15,380	76.56
50	1985	15,150	78.13
51	1981	14,648	79.69
52	1969	13,970	81.25
53	1958	13,885	82.81
54	2000	13,125	84.38
55	1955	13,065	85.94
56	1965	13,060	87.50
57	1994	12,974	89.06
58	1988	12,950	90.63
59	1945	12,563	92.19
60	1999	10,195	93.75
61	1950	9,752	95.31
62	1941	8,965	96.88
63	1986	5,167	98.44

Figure HEF- 4: Exceedence Curve for Unregulated 1 Day Volume at Heflin
(1939-2001)

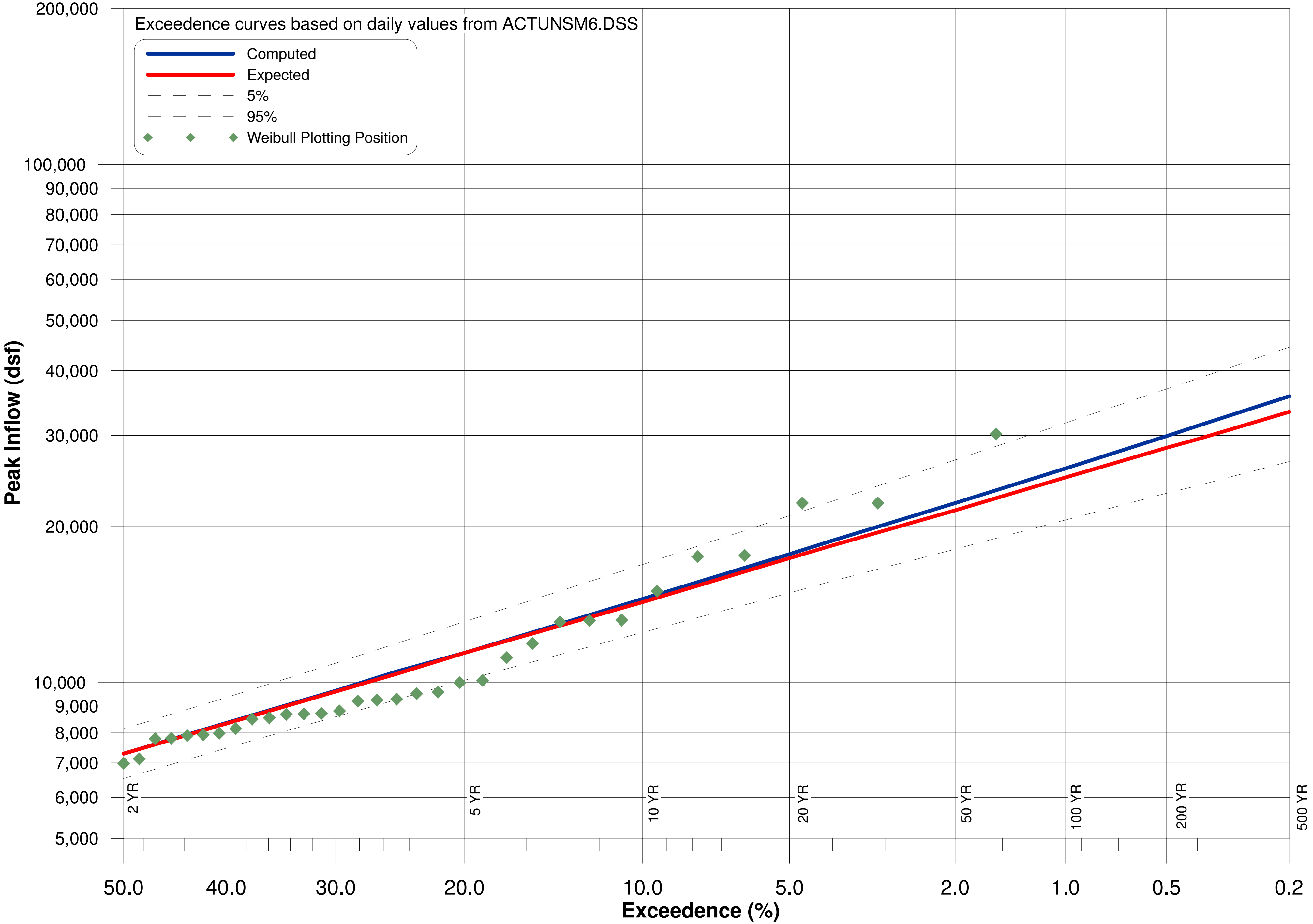


Figure HEF- 5: Exceedence Curve for Unregulated 3 Day Volume at Heflin
(1939-2001)

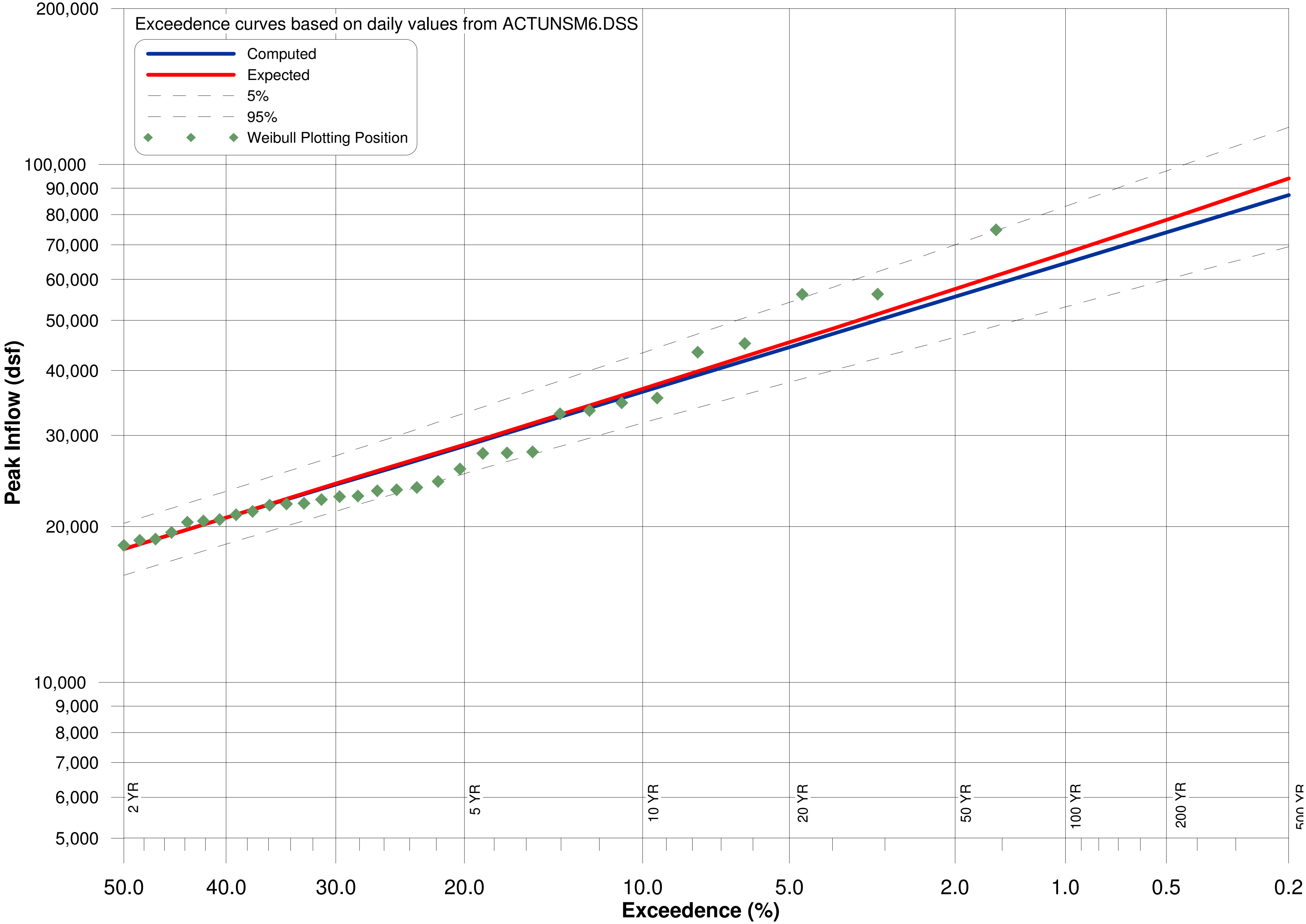


Figure HEF- 6: Exceedence Curve for Unregulated 5 Day Volume at Heflin
(1939-2001)

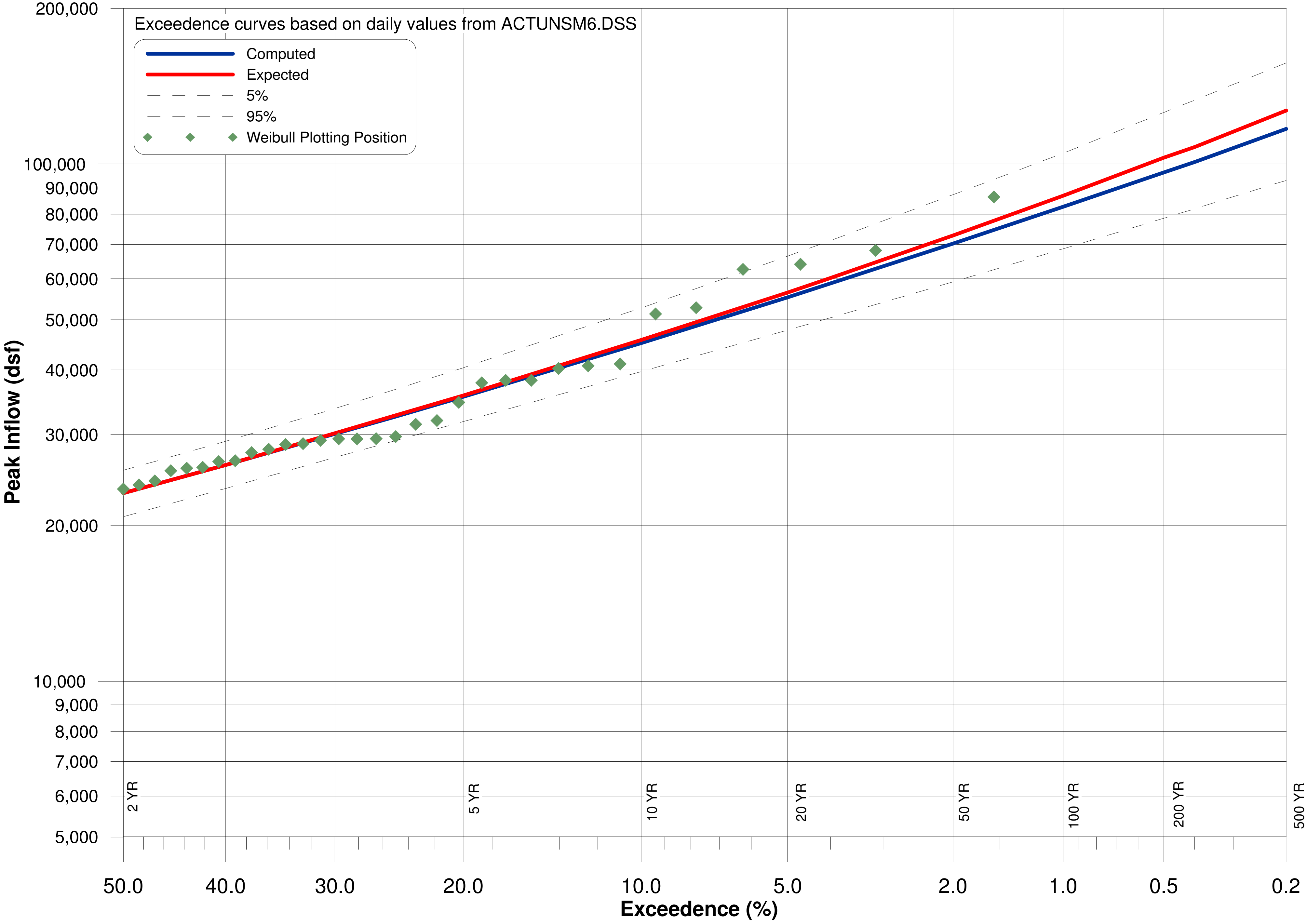


Table HEF-2: Summary of FFA Results for Heflin

HEFLIN DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
33,300	35,700	0.20	44,400	26,700
29,500	31,300	0.40	38,600	24,000
28,400	29,900	0.50	36,900	23,200
24,900	25,900	1.00	31,700	20,600
21,500	22,200	2.00	26,900	18,100
18,400	18,800	4.00	22,400	15,700
17,400	17,700	5.00	21,000	14,900
14,300	14,500	10.00	16,900	12,500
11,400	11,400	20.00	13,100	10,100
10,400	10,500	25.00	11,900	9,270
9,610	9,650	30.00	10,900	8,590
8,330	8,350	40.00	9,350	7,470
7,290	7,290	50.00	8,140	6,530
6,380	6,370	60.00	7,120	5,680
5,530	5,510	70.00	6,180	4,880
4,680	4,650	80.00	5,270	4,070
3,710	3,660	90.00	4,250	3,140
3,060	3,000	95.00	3,560	2,530
1,030	891	99.99	1,350	716
MEAN	3.8627		HISTORIC EVENTS	0
STANDARD DEV	0.2290		HIGH OUTLIERS	0
COMPUTED SKEW	0.0389		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	0.0000		SYSTEM EVENTS	63

HEFLIN 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
87,300	94,000	0.20	118,000	69,400
77,100	81,900	0.40	102,000	62,200
74,000	78,200	0.50	97,200	59,900
64,500	67,400	1.00	83,000	53,100
55,600	57,500	2.00	70,000	46,400
47,100	48,200	4.00	57,900	40,000
44,400	45,400	5.00	54,200	38,000
36,400	36,900	10.00	43,300	31,700
28,600	28,800	20.00	33,100	25,300
26,100	26,300	25.00	29,900	23,200
24,100	24,200	30.00	27,400	21,400
20,800	20,800	40.00	23,400	18,500
18,100	18,100	50.00	20,300	16,100
15,700	15,700	60.00	17,600	14,000
13,600	13,500	70.00	15,200	11,900
11,400	11,300	80.00	12,900	9,870
8,960	8,850	90.00	10,300	7,550
7,350	7,200	95.00	8,600	6,030
2,360	2,040	99.99	3,130	1,630
MEAN	4.2570		HISTORIC EVENTS	0
STANDARD DEV	0.2376		HIGH OUTLIERS	0
COMPUTED SKEW	-0.0349		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	0.0000		SYSTEM EVENTS	63

HEFLIN 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
117,000	127,000	0.20	157,000	93,000
101,000	108,000	0.40	133,000	82,000
96,400	103,000	0.50	126,000	78,600
82,700	86,900	1.00	105,000	68,600
70,200	72,800	2.00	87,300	59,200
58,800	60,300	4.00	71,200	50,500
55,300	56,500	5.00	66,400	47,800
45,100	45,700	10.00	52,700	39,700
35,500	35,700	20.00	40,400	31,800
32,500	32,700	25.00	36,700	29,200
30,100	30,200	30.00	33,700	27,100
26,200	26,200	40.00	29,100	23,600
23,100	23,100	50.00	25,600	20,800
20,400	20,400	60.00	22,600	18,300
18,000	17,900	70.00	20,000	16,000
15,600	15,500	80.00	17,400	13,700
12,800	12,700	90.00	14,500	11,000
11,000	10,800	95.00	12,600	9,270
5,160	4,730	99.99	6,420	3,880
MEAN	4.3741		HISTORIC EVENTS	0
STANDARD DEV	0.2136		HIGH OUTLIERS	0
COMPUTED SKEW	0.3812		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	0.0000		SYSTEM EVENTS	63

Table HEF-3: Regulation Impact on Flood Recurrences at Heflin

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976	3/17/1976	13,102	7	NO UPSTREAM REGULATION	
1977	3/31/1977	30,202	200		
1978	1/26/1978	6,732	1		
1979	3/5/1979	22,202	50		
1980	4/15/1980	7,982	2		
1981	2/11/1981	5,591	1		
1982	2/4/1982	17,601	19		
1983	4/10/1983	7,792	2		
1984	5/5/1984	10,002	3		
1985	2/2/1985	4,492	1		
1986	3/14/1986	1,702	1		
1987	3/1/1987	6,612	1		
1988	1/20/1988	4,752	1		
1989	6/23/1989	5,744	1		
1990	3/18/1990	22,202	50		
1991	2/21/1991	6,662	1		
1992	2/26/1992	6,352	1		
1993	1/13/1993	6,342	1		
1994	7/28/1994	5,594	1		
1995	2/18/1995	7,805	2		
1996	3/8/1996	11,906	5		
1997	3/1/1997	8,545	2		
1998	3/9/1998	9,245	3		
1999	6/29/1999	2,908	1		
2000	4/4/2000	5,085	1		
2001	3/21/2001	6,985	1		

Figure NEW-1: FFA Datafile NEW.DAT

```
TT LITTLE TALLAPOOSA RIVER AT NEWELL FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1     1
FR    19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID NEWELL DSS 1939-2001
GS ALL                 0.0
QR            1939    4080
QR            1940    4143
QR            1941    1902
QR            1942    8666
QR            1943    7940
QR            1944    5554
QR            1945    3661
QR            1946    9185
QR            1947   10170
QR            1948    6228
QR            1949   11986
QR            1950    2815
QR            1951    6488
QR            1952    8718
QR            1953    7221
QR            1954    6120
QR            1955    4099
QR            1956    6174
QR            1957    7739
QR            1958    4181
QR            1959    5847
QR            1960    4391
QR            1961   15930
QR            1962    7922
QR            1963    8377
QR            1964    7422
QR            1965    3618
QR            1966    6029
QR            1967    8022
QR            1968   13655
QR            1969    3336
QR            1970   12019
QR            1971    5558
QR            1972    7906
QR            1973    7196
QR            1974    8461
QR            1975    5941
QR            1976   12607
QR            1977    6877
QR            1978    4997
QR            1979    9137
QR            1980    5227
QR            1981    5379
QR            1982   10105
QR            1983    6024
QR            1984    4977
QR            1985    3359
QR            1986    1706
QR            1987    5447
QR            1988    2509
QR            1989    4209
QR            1990   11613
QR            1991    4033
QR            1992    5091
QR            1993    6122
QR            1994    3667
QR            1995    6783
QR            1996    9837
QR            1997    8272
QR            1998    9505
QR            1999    2145
QR            2000    3500
QR            2001    5118
```

Figure NEW-2: FFA Datafile NEW3.DAT

```
TT LITTLE TALLAPOOSA RIVER AT NEWELL FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID NEWELL 3 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR          1939   12060
QR          1940    9778
QR          1941    4871
QR          1942   21433
QR          1943   20863
QR          1944   12968
QR          1945    8187
QR          1946   23509
QR          1947   25375
QR          1948   15422
QR          1949   32223
QR          1950    6834
QR          1951   17218
QR          1952   20128
QR          1953   19187
QR          1954   14546
QR          1955    8913
QR          1956   16757
QR          1957   18667
QR          1958   10114
QR          1959   15630
QR          1960   11072
QR          1961   41056
QR          1962   20527
QR          1963   19471
QR          1964   20027
QR          1965    8278
QR          1966   15541
QR          1967   21337
QR          1968   25250
QR          1969    9098
QR          1970   30506
QR          1971   14181
QR          1972   20806
QR          1973   17748
QR          1974   21662
QR          1975   15110
QR          1976   32351
QR          1977   18611
QR          1978   13831
QR          1979   25341
QR          1980   13032
QR          1981   14525
QR          1982   26065
QR          1983   16264
QR          1984   13293
QR          1985    8985
QR          1986    4054
QR          1987   13972
QR          1988    6061
QR          1989   11312
QR          1990   30215
QR          1991   10706
QR          1992   11944
QR          1993   14996
QR          1994    7471
QR          1995   12642
QR          1996   22471
QR          1997   21914
QR          1998   26345
QR          1999    4713
QR          2000    9720
QR          2001   13374
```

Figure NEW-3: FFA Datafile NEW5.DAT

```
TT LITTLE TALLAPOOSA RIVER AT NEWELL FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1      1
FR     19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID NEWELL 5 DAY VOLUME DSS 1939-2001
GS ALL                0.0
QR          1939   15969
QR          1940   14998
QR          1941    8172
QR          1942   26814
QR          1943   28620
QR          1944   16627
QR          1945   11446
QR          1946   34772
QR          1947   34387
QR          1948   21223
QR          1949   48051
QR          1950    8892
QR          1951   19825
QR          1952   26236
QR          1953   23263
QR          1954   16949
QR          1955   11907
QR          1956   21443
QR          1957   25227
QR          1958   12652
QR          1959   17904
QR          1960   14012
QR          1961   56991
QR          1962   26144
QR          1963   23522
QR          1964   24325
QR          1965   11902
QR          1966   24232
QR          1967   26826
QR          1968   31512
QR          1969   12731
QR          1970   37419
QR          1971   18855
QR          1972   26817
QR          1973   21858
QR          1974   27082
QR          1975   20103
QR          1976   41365
QR          1977   25345
QR          1978   19055
QR          1979   32195
QR          1980   18516
QR          1981   18447
QR          1982   33275
QR          1983   22801
QR          1984   20532
QR          1985   12883
QR          1986    5393
QR          1987   19122
QR          1988    7708
QR          1989   15101
QR          1990   42111
QR          1991   15009
QR          1992   15833
QR          1993   20578
QR          1994    9661
QR          1995   19005
QR          1996   28835
QR          1997   30318
QR          1998   34995
QR          1999    5792
QR          2000   13530
QR          2001   18090
```

Table NEW-1: Rankings of Flood Events at Newell

NEWELL			
Rank	Yr	Flow (cfs)	Position
1	1961	15,930	1.56
2	1968	13,655	3.13
3	1976	12,607	4.69
4	1970	12,019	6.25
5	1949	11,986	7.81
6	1990	11,613	9.38
7	1947	10,170	10.94
8	1982	10,105	12.50
9	1996	9,837	14.06
10	1998	9,505	15.63
11	1946	9,185	17.19
12	1979	9,137	18.75
13	1952	8,718	20.31
14	1942	8,666	21.88
15	1974	8,461	23.44
16	1963	8,377	25.00
17	1997	8,272	26.56
18	1967	8,022	28.13
19	1943	7,940	29.69
20	1962	7,922	31.25
21	1972	7,906	32.81
22	1957	7,739	34.38
23	1964	7,422	35.94
24	1953	7,221	37.50
25	1973	7,196	39.06
26	1977	6,877	40.63
27	1995	6,783	42.19
28	1951	6,488	43.75
29	1948	6,228	45.31
30	1956	6,174	46.88
31	1993	6,122	48.44
32	1954	6,120	50.00
33	1966	6,029	51.56
34	1983	6,024	53.13
35	1975	5,941	54.69
36	1959	5,847	56.25
37	1971	5,558	57.81
38	1944	5,554	59.38
39	1987	5,447	60.94
40	1981	5,379	62.50
41	1980	5,227	64.06
42	2001	5,118	65.63
43	1992	5,091	67.19
44	1978	4,997	68.75
45	1984	4,977	70.31
46	1960	4,391	71.88
47	1989	4,209	73.44
48	1958	4,181	75.00
49	1940	4,143	76.56
50	1955	4,099	78.13
51	1939	4,080	79.69
52	1991	4,033	81.25
53	1994	3,667	82.81
54	1945	3,661	84.38
55	1965	3,618	85.94
56	2000	3,500	87.50
57	1985	3,359	89.06
58	1969	3,336	90.63
59	1950	2,815	92.19
60	1988	2,509	93.75
61	1999	2,145	95.31
62	1941	1,902	96.88
63	1986	1,706	98.44

NEWELL - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1961	41,056	1.56
2	1976	32,351	3.13
3	1949	32,223	4.69
4	1970	30,506	6.25
5	1990	30,215	7.81
6	1998	26,345	9.38
7	1982	26,065	10.94
8	1947	25,375	12.50
9	1979	25,341	14.06
10	1968	25,250	15.63
11	1946	23,509	17.19
12	1996	22,471	18.75
13	1997	21,914	20.31
14	1974	21,662	21.88
15	1942	21,433	23.44
16	1967	21,337	25.00
17	1943	20,863	26.56
18	1972	20,806	28.13
19	1962	20,527	29.69
20	1952	20,128	31.25
21	1964	20,027	32.81
22	1963	19,471	34.38
23	1953	19,187	35.94
24	1957	18,667	37.50
25	1977	18,611	39.06
26	1973	17,748	40.63
27	1951	17,218	42.19
28	1956	16,757	43.75
29	1983	16,264	45.31
30	1959	15,630	46.88
31	1966	15,541	48.44
32	1948	15,422	50.00
33	1975	15,110	51.56
34	1993	14,996	53.13
35	1954	14,546	54.69
36	1981	14,525	56.25
37	1971	14,181	57.81
38	1987	13,972	59.38
39	1978	13,831	60.94
40	2001	13,374	62.50
41	1984	13,293	64.06
42	1980	13,032	65.63
43	1944	12,968	67.19
44	1995	12,642	68.75
45	1939	12,060	70.31
46	1992	11,944	71.88
47	1989	11,312	73.44
48	1960	11,072	75.00
49	1991	10,706	76.56
50	1958	10,114	78.13
51	1940	9,778	79.69
52	2000	9,720	81.25
53	1969	9,098	82.81
54	1985	8,985	84.38
55	1955	8,913	85.94
56	1965	8,278	87.50
57	1945	8,187	89.06
58	1994	7,471	90.63
59	1950	6,834	92.19
60	1988	6,061	93.75
61	1941	4,871	95.31
62	1999	4,713	96.88
63	1986	4,054	98.44

NEWELL - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1961	56,991	1.56
2	1949	48,051	3.13
3	1990	42,111	4.69
4	1976	41,365	6.25
5	1970	37,419	7.81
6	1998	34,995	9.38
7	1946	34,772	10.94
8	1947	34,387	12.50
9	1982	33,275	14.06
10	1979	32,195	15.63
11	1968	31,512	17.19
12	1997	30,318	18.75
13	1996	28,835	20.31
14	1943	28,620	21.88
15	1974	27,082	23.44
16	1967	26,826	25.00
17	1972	26,817	26.56
18	1942	26,814	28.13
19	1952	26,236	29.69
20	1962	26,144	31.25
21	1977	25,345	32.81
22	1957	25,227	34.38
23	1964	24,325	35.94
24	1966	24,232	37.50
25	1963	23,522	39.06
26	1953	23,263	40.63
27	1983	22,801	42.19
28	1973	21,858	43.75
29	1956	21,443	45.31
30	1948	21,223	46.88
31	1993	20,578	48.44
32	1984	20,532	50.00
33	1975	20,103	51.56
34	1951	19,825	53.13
35	1987	19,122	54.69
36	1978	19,055	56.25
37	1995	19,005	57.81
38	1971	18,855	59.38
39	1980	18,516	60.94
40	1981	18,447	62.50
41	2001	18,090	64.06
42	1959	17,904	65.63
43	1954	16,949	67.19
44	1944	16,627	68.75
45	1939	15,969	70.31
46	1992	15,833	71.88
47	1989	15,101	73.44
48	1991	15,009	75.00
49	1940	14,998	76.56
50	1960	14,012	78.13
51	2000	13,530	79.69
52	1985	12,883	81.25
53	1969	12,731	82.81
54	1958	12,652	84.38
55	1955	11,907	85.94
56	1965	11,902	87.50
57	1945	11,446	89.06
58	1994	9,661	90.63
59	1950	8,892	92.19
60	1941	8,172	93.75
61	1988	7,708	95.31
62	1999	5,792	96.88
63	1986	5,393	98.44

Table NEW-2: Summary of FFA Results for Newell

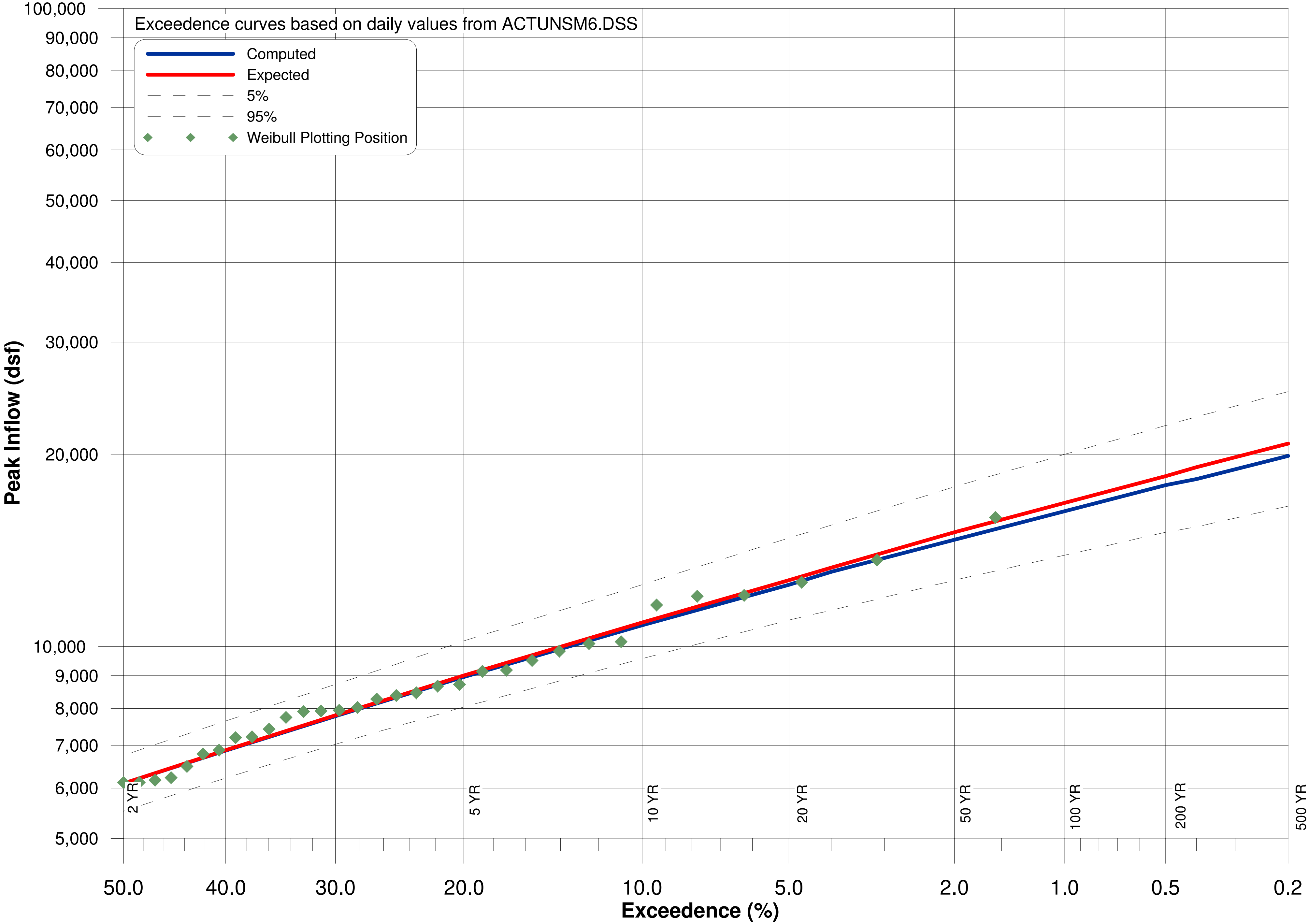
NEWELL DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
19,900	20,800	0.20	25,100	16,600
18,300	19,100	0.40	22,900	15,400
17,900	18,500	0.50	22,200	15,100
16,300	16,800	1.00	20,000	13,900
14,700	15,100	2.00	17,800	12,700
13,100	13,300	4.00	15,500	11,400
12,500	12,700	5.00	14,800	11,000
10,800	10,900	10.00	12,500	9,570
8,960	9,010	20.00	10,200	8,040
8,320	8,350	25.00	9,380	7,490
7,780	7,800	30.00	8,720	7,030
6,870	6,880	40.00	7,640	6,220
6,100	6,100	50.00	6,750	5,520
5,400	5,390	60.00	5,960	4,870
4,720	4,700	70.00	5,220	4,220
4,020	3,990	80.00	4,470	3,540
3,180	3,140	90.00	3,600	2,730
2,610	2,550	95.00	3,000	2,180
734	617	99.99	976	503
MEAN	3.7750		HISTORIC EVENTS	0
STANDARD DEV	0.2079		HIGH OUTLIERS	0
COMPUTED SKEW	-0.4285		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

NEWELL 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
48,800	50,900	0.20	61,600	40,700
45,300	47,000	0.40	56,600	38,200
44,200	45,700	0.50	55,000	37,300
40,600	41,800	1.00	49,900	34,600
36,900	37,700	2.00	44,700	31,700
33,000	33,500	4.00	39,300	28,700
31,700	32,100	5.00	37,500	27,600
27,400	27,700	10.00	31,900	24,200
22,800	22,900	20.00	26,000	20,400
21,100	21,200	25.00	23,900	19,000
19,800	19,800	30.00	22,300	17,800
17,400	17,500	40.00	19,500	15,700
15,400	15,400	50.00	17,100	13,900
13,600	13,600	60.00	15,100	12,200
11,800	11,800	70.00	13,100	10,600
9,990	9,920	80.00	11,200	8,780
7,810	7,700	90.00	8,870	6,670
6,300	6,160	95.00	7,300	5,240
1,550	1,270	99.99	2,110	1,030
MEAN	4.1744		HISTORIC EVENTS	0
STANDARD DEV	0.2141		HIGH OUTLIERS	0
COMPUTED SKEW	-0.5305		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.4000		SYSTEM EVENTS	63

NEWELL 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
63,500	66,100	0.20	79,700	53,200
59,100	61,200	0.40	73,400	49,900
57,700	59,600	0.50	71,400	48,800
53,100	54,500	1.00	64,900	45,300
48,300	49,300	2.00	58,200	41,600
43,200	43,900	4.00	51,400	37,700
41,600	42,200	5.00	49,100	36,300
36,100	36,400	10.00	41,900	31,900
30,100	30,200	20.00	34,200	27,000
28,000	28,100	25.00	31,600	25,200
26,200	26,300	30.00	29,400	23,600
23,200	23,200	40.00	25,800	20,900
20,500	20,500	50.00	22,800	18,600
18,200	18,100	60.00	20,100	16,400
15,800	15,800	70.00	17,500	14,200
13,400	13,300	80.00	15,000	11,800
10,500	10,400	90.00	11,900	9,030
8,540	8,350	95.00	9,860	7,120
2,160	1,780	99.99	2,910	1,450
MEAN	4.2988		HISTORIC EVENTS	0
STANDARD DEV	0.2099		HIGH OUTLIERS	0
COMPUTED SKEW	-0.4889		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.4000		SYSTEM EVENTS	63

Figure NEW-4: Exceedence Curve for Unregulated 1 Day Volume at Newell

(1939-2001)



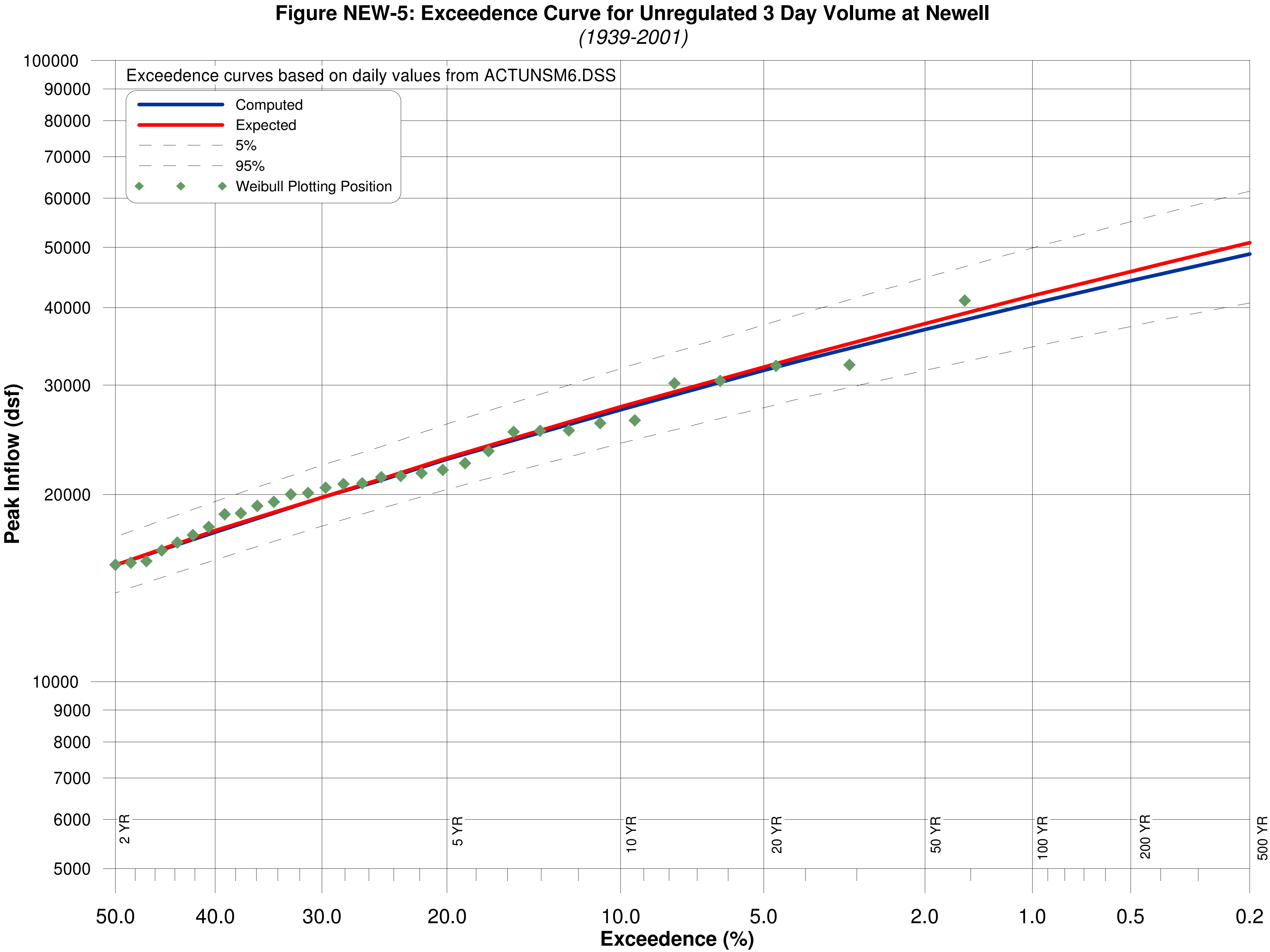


Figure NEW-5: Exceedence Curve for Unregulated 3 Day Volume at Newell
(1939-2001)
Exceedence curves based on daily values from ACTUNSM6.DSS
Computed
Expected
5%
95%
Weibull Plotting Position
Peak Inflow (dsf)
Exceedence (%)
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
9000
8000
7000
6000
5000
2 YR
5 YR
10 YR
20 YR
50 YR
100 YR
200 YR
500 YR
50.0
40.0
30.0
20.0
10.0
5.0
2.0
1.0
0.5
0.2

Figure NEW-6: Exceedence Curve for Unregulated 5 Day Volume at Newell

(1939-2001)

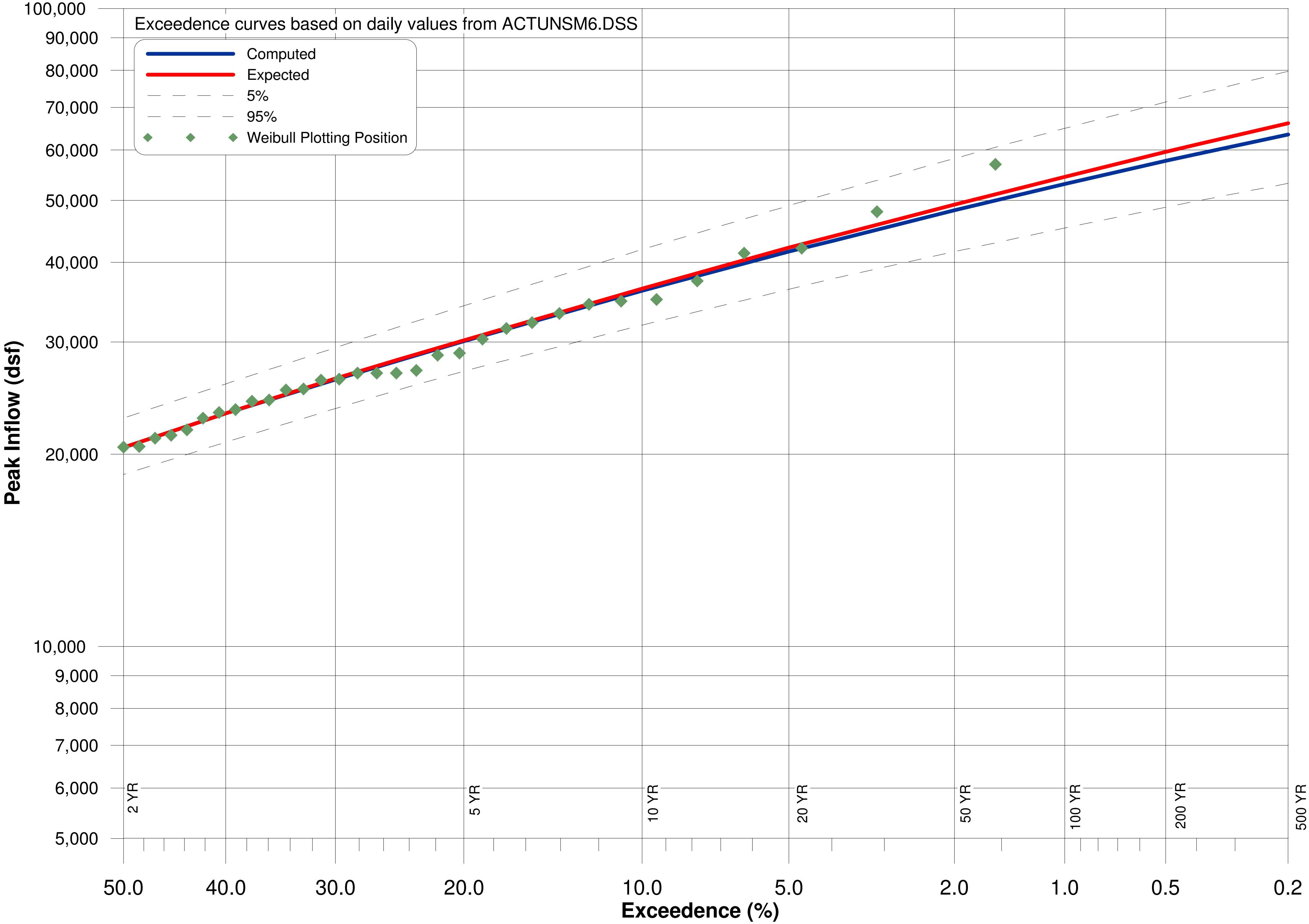


Figure HAR-1: FFA Datafile HAR.DAT

```
TT TALLAPOOSA RIVER AT HEFLIN FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID HEFLIN 1 DAY VOLUME DSS 1939-2001
GS ALL                0.0
QR           1939   20497
QR           1940   18037
QR           1941    7130
QR           1942   28406
QR           1943   28950
QR           1944   20031
QR           1945   22045
QR           1946   32432
QR           1947   31953
QR           1948   22649
QR           1949   37174
QR           1950   10361
QR           1951   17907
QR           1952   31768
QR           1953   21684
QR           1954    8313
QR           1955   16454
QR           1956   31298
QR           1957   38430
QR           1958   18166
QR           1959   12738
QR           1960   13400
QR           1961   34700
QR           1962   26224
QR           1963   33559
QR           1964   25388
QR           1965   11218
QR           1966   18770
QR           1967   14279
QR           1968   29566
QR           1969   13218
QR           1970   39455
QR           1971   36348
QR           1972   24163
QR           1973   26516
QR           1974   30863
QR           1975   28306
QR           1976   48658
QR           1977   45917
QR           1978   22369
QR           1979   59002
QR           1980   25657
QR           1981   18132
QR           1982   36494
QR           1983   29121
QR           1984   25077
QR           1985   11416
QR           1986    6091
QR           1987   21853
QR           1988   14808
QR           1989   16047
QR           1990   46604
QR           1991   14900
QR           1992   18299
QR           1993   26104
QR           1994   15304
QR           1995   25511
QR           1996   42327
QR           1997   33876
QR           1998   40572
QR           1999    7342
QR           2000   13663
QR           2001   22224
ED
```

Figure HAR-2: FFA Datafile HAR3.DAT

```
TT TALLAPOOSA RIVER AT HARRIS INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1     1
FR    19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00   30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID HARRIS 3 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR          1939   48229
QR          1940   38554
QR          1941   16545
QR          1942   69301
QR          1943   69068
QR          1944   42239
QR          1945   38197
QR          1946   68833
QR          1947   75351
QR          1948   48655
QR          1949   98355
QR          1950   21725
QR          1951   44181
QR          1952   67042
QR          1953   57340
QR          1954   22555
QR          1955   31984
QR          1956   79759
QR          1957   80381
QR          1958   39495
QR          1959   35748
QR          1960   31651
QR          1961   85805
QR          1962   59930
QR          1963   79913
QR          1964   60886
QR          1965   30270
QR          1966   45328
QR          1967   36437
QR          1968   69089
QR          1969   33960
QR          1970   94317
QR          1971   84623
QR          1972   61517
QR          1973   57318
QR          1974   70370
QR          1975   64978
QR          1976  104332
QR          1977  125178
QR          1978   54919
QR          1979  133820
QR          1980   57667
QR          1981   41805
QR          1982   98341
QR          1983   68404
QR          1984   56732
QR          1985   29778
QR          1986   13795
QR          1987   51792
QR          1988   29718
QR          1989   36741
QR          1990  127368
QR          1991   40645
QR          1992   49010
QR          1993   50949
QR          1994   32802
QR          1995   53545
QR          1996   77857
QR          1997   76283
QR          1998   90593
QR          1999   17637
QR          2000   36900
QR          2001   53359
ED
```

Figure HAR-3: FFA Datafile HAR5.DAT

```
TT TALLAPOOSA RIVER AT HARRIS INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00   30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID HARRIS 5 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR            1939   63487
QR            1940   55586
QR            1941   26416
QR            1942   86164
QR            1943   96295
QR            1944   54247
QR            1945   51217
QR            1946   98627
QR            1947  100638
QR            1948   66331
QR            1949  154798
QR            1950   29066
QR            1951   52844
QR            1952   86845
QR            1953   70198
QR            1954   29348
QR            1955   43949
QR            1956   97581
QR            1957  103266
QR            1958   51573
QR            1959   48908
QR            1960   44338
QR            1961  136097
QR            1962   75183
QR            1963   94802
QR            1964   82432
QR            1965   42217
QR            1966   73249
QR            1967   50854
QR            1968   85101
QR            1969   47043
QR            1970  120839
QR            1971  108436
QR            1972   92696
QR            1973   73238
QR            1974   90161
QR            1975   91826
QR            1976  138645
QR            1977  171365
QR            1978   72334
QR            1979  173229
QR            1980   78263
QR            1981   50899
QR            1982  136324
QR            1983   86551
QR            1984   87988
QR            1985   43169
QR            1986   18515
QR            1987   66327
QR            1988   36182
QR            1989   48665
QR            1990  174227
QR            1991   55560
QR            1992   63981
QR            1993   67148
QR            1994   41236
QR            1995   77562
QR            1996  107487
QR            1997   98869
QR            1998  116097
QR            1999   23168
QR            2000   48860
QR            2001   64007
ED
```

Table HAR-1: Rankings of Flood Events at Harris

HARRIS			
Rank	Yr	Flow (cfs)	Position
1	1979	59,002	1.56
2	1976	48,658	3.13
3	1990	46,604	4.69
4	1977	45,917	6.25
5	1996	42,327	7.81
6	1998	40,572	9.38
7	1970	39,455	10.94
8	1957	38,430	12.50
9	1949	37,174	14.06
10	1982	36,494	15.63
11	1971	36,348	17.19
12	1961	34,700	18.75
13	1997	33,876	20.31
14	1963	33,559	21.88
15	1946	32,432	23.44
16	1947	31,953	25.00
17	1952	31,768	26.56
18	1956	31,298	28.13
19	1974	30,863	29.69
20	1968	29,566	31.25
21	1983	29,121	32.81
22	1943	28,950	34.38
23	1942	28,406	35.94
24	1975	28,306	37.50
25	1973	26,516	39.06
26	1962	26,224	40.63
27	1993	26,104	42.19
28	1980	25,657	43.75
29	1995	25,511	45.31
30	1964	25,388	46.88
31	1984	25,077	48.44
32	1972	24,163	50.00
33	1948	22,649	51.56
34	1978	22,369	53.13
35	2001	22,224	54.69
36	1945	22,045	56.25
37	1987	21,853	57.81
38	1953	21,684	59.38
39	1939	20,497	60.94
40	1944	20,031	62.50
41	1966	18,770	64.06
42	1992	18,299	65.63
43	1958	18,166	67.19
44	1981	18,132	68.75
45	1940	18,037	70.31
46	1951	17,907	71.88
47	1955	16,454	73.44
48	1989	16,047	75.00
49	1994	15,304	76.56
50	1991	14,900	78.13
51	1988	14,808	79.69
52	1967	14,279	81.25
53	2000	13,663	82.81
54	1960	13,400	84.38
55	1969	13,218	85.94
56	1959	12,738	87.50
57	1985	11,416	89.06
58	1965	11,218	90.63
59	1950	10,361	92.19
60	1954	8,313	93.75
61	1999	7,342	95.31
62	1941	7,130	96.88
63	1986	6,091	98.44

HARRIS - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1979	133,820	1.56
2	1990	127,368	3.13
3	1977	125,178	4.69
4	1976	104,332	6.25
5	1949	98,355	7.81
6	1982	98,341	9.38
7	1970	94,317	10.94
8	1998	90,593	12.50
9	1961	85,805	14.06
10	1971	84,623	15.63
11	1957	80,381	17.19
12	1963	79,913	18.75
13	1956	79,759	20.31
14	1996	77,857	21.88
15	1997	76,283	23.44
16	1947	75,351	25.00
17	1974	70,370	26.56
18	1942	69,301	28.13
19	1968	69,089	29.69
20	1943	69,068	31.25
21	1946	68,833	32.81
22	1983	68,404	34.38
23	1952	67,042	35.94
24	1975	64,978	37.50
25	1972	61,517	39.06
26	1964	60,886	40.63
27	1962	59,930	42.19
28	1980	57,667	43.75
29	1953	57,340	45.31
30	1973	57,318	46.88
31	1984	56,732	48.44
32	1978	54,919	50.00
33	1995	53,545	51.56
34	2001	53,359	53.13
35	1987	51,792	54.69
36	1993	50,949	56.25
37	1992	49,010	57.81
38	1948	48,655	59.38
39	1939	48,229	60.94
40	1966	45,328	62.50
41	1951	44,181	64.06
42	1944	42,239	65.63
43	1981	41,805	67.19
44	1991	40,645	68.75
45	1958	39,495	70.31
46	1940	38,554	71.88
47	1945	38,197	73.44
48	2000	36,900	75.00
49	1989	36,741	76.56
50	1967	36,437	78.13
51	1959	35,748	79.69
52	1969	33,960	81.25
53	1994	32,802	82.81
54	1955	31,984	84.38
55	1960	31,651	85.94
56	1965	30,270	87.50
57	1985	29,778	89.06
58	1988	29,718	90.63
59	1954	22,555	92.19
60	1950	21,725	93.75
61	1999	17,637	95.31
62	1941	16,545	96.88
63	1986	13,795	98.44

HARRIS - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	174,227	1.56
2	1979	173,229	3.13
3	1977	171,365	4.69
4	1949	154,798	6.25
5	1976	138,645	7.81
6	1982	136,324	9.38
7	1961	136,097	10.94
8	1970	120,839	12.50
9	1998	116,097	14.06
10	1971	108,436	15.63
11	1996	107,487	17.19
12	1957	103,266	18.75
13	1947	100,638	20.31
14	1997	98,869	21.88
15	1946	98,627	23.44
16	1956	97,581	25.00
17	1943	96,295	26.56
18	1963	94,802	28.13
19	1972	92,696	29.69
20	1975	91,826	31.25
21	1974	90,161	32.81
22	1984	87,988	34.38
23	1952	86,845	35.94
24	1983	86,551	37.50
25	1942	86,164	39.06
26	1968	85,101	40.63
27	1964	82,432	42.19
28	1980	78,263	43.75
29	1995	77,562	45.31
30	1962	75,183	46.88
31	1966	73,249	48.44
32	1973	73,238	50.00
33	1978	72,334	51.56
34	1953	70,198	53.13
35	1993	67,148	54.69
36	1948	66,331	56.25
37	1987	66,327	57.81
38	2001	64,007	59.38
39	1992	63,981	60.94
40	1939	63,487	62.50
41	1940	55,586	64.06
42	1991	55,560	65.63
43	1944	54,247	67.19
44	1951	52,844	68.75
45	1958	51,573	70.31
46	1945	51,217	71.88
47	1981	50,899	73.44
48	1967	50,854	75.00
49	1959	48,908	76.56
50	2000	48,860	78.13
51	1989	48,665	79.69
52	1969	47,043	81.25
53	1960	44,338	82.81
54	1955	43,949	84.38
55	1985	43,169	85.94
56	1965	42,217	87.50
57	1994	41,236	89.06
58	1988	36,182	90.63
59	1954	29,348	92.19
60	1950	29,066	93.75
61	1941	26,416	95.31
62	1999	23,168	96.88
63	1986	18,515	98.44

Table HAR-2: Summary of FFA Results for Harris

HARRIS DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
73,500	76,700	0.20	93,000	61,300
68,300	70,800	0.40	85,400	57,400
66,600	68,900	0.50	83,000	56,100
61,200	62,900	1.00	75,200	52,000
55,500	56,700	2.00	67,300	47,700
49,500	50,400	4.00	59,100	43,000
47,600	48,300	5.00	56,500	41,400
41,100	41,500	10.00	47,900	36,300
34,100	34,300	20.00	38,900	30,500
31,700	31,800	25.00	35,900	28,400
29,600	29,700	30.00	33,300	26,600
26,100	26,100	40.00	29,100	23,500
23,100	23,100	50.00	25,600	20,800
20,300	20,300	60.00	22,500	18,200
17,600	17,600	70.00	19,600	15,700
14,900	14,800	80.00	16,600	13,100
11,600	11,400	90.00	13,200	9,890
9,340	9,130	95.00	10,800	7,750
2,270	1,860	99.99	3,090	1,500
MEAN	4.3483		HISTORIC EVENTS	0
STANDARD DEV	0.2159		HIGH OUTLIERS	0
COMPUTED SKEW	-0.5585		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.4000		SYSTEM EVENTS	63

HARRIS 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
181,000	189,000	0.20	230,000	150,000
166,000	173,000	0.40	209,000	139,000
162,000	168,000	0.50	203,000	136,000
147,000	152,000	1.00	182,000	125,000
132,000	136,000	2.00	161,000	114,000
117,000	119,000	4.00	140,000	102,000
112,000	114,000	5.00	133,000	97,800
96,400	97,300	10.00	112,000	85,000
79,400	79,800	20.00	90,500	71,000
73,500	73,900	25.00	83,200	66,000
68,700	68,900	30.00	77,200	61,800
60,400	60,500	40.00	67,400	54,500
53,400	53,400	50.00	59,300	48,200
47,100	47,000	60.00	52,200	42,300
41,000	40,900	70.00	45,500	36,500
34,700	34,500	80.00	38,800	30,500
27,300	26,900	90.00	31,000	23,300
22,200	21,700	95.00	25,700	18,500
6,020	5,030	99.99	8,070	4,070
MEAN	4.7170		HISTORIC EVENTS	0
STANDARD DEV	0.2144		HIGH OUTLIERS	0
COMPUTED SKEW	-0.4644		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

HARRIS 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
241,000	253,000	0.20	307,000	200,000
222,000	231,000	0.40	279,000	186,000
216,000	224,000	0.50	270,000	182,000
197,000	203,000	1.00	243,000	167,000
177,000	181,000	2.00	215,000	152,000
157,000	160,000	4.00	187,000	136,000
150,000	153,000	5.00	178,000	131,000
129,000	130,000	10.00	150,000	114,000
106,000	107,000	20.00	121,000	95,000
98,500	98,900	25.00	111,000	88,400
91,900	92,200	30.00	103,000	82,800
80,900	81,000	40.00	90,200	73,100
71,600	71,600	50.00	79,400	64,600
63,100	63,000	60.00	69,900	56,700
55,000	54,800	70.00	61,000	49,000
46,600	46,200	80.00	52,000	40,900
36,700	36,200	90.00	41,600	31,400
29,900	29,200	95.00	34,600	24,900
8,110	6,780	99.99	10,900	5,500
MEAN	4.8441		HISTORIC EVENTS	0
STANDARD DEV	0.2137		HIGH OUTLIERS	0
COMPUTED SKEW	-0.3700		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

Figure HEF- 4: Exceedence Curve for Unregulated 1 Day Volume at Heflin
(1939-2001)

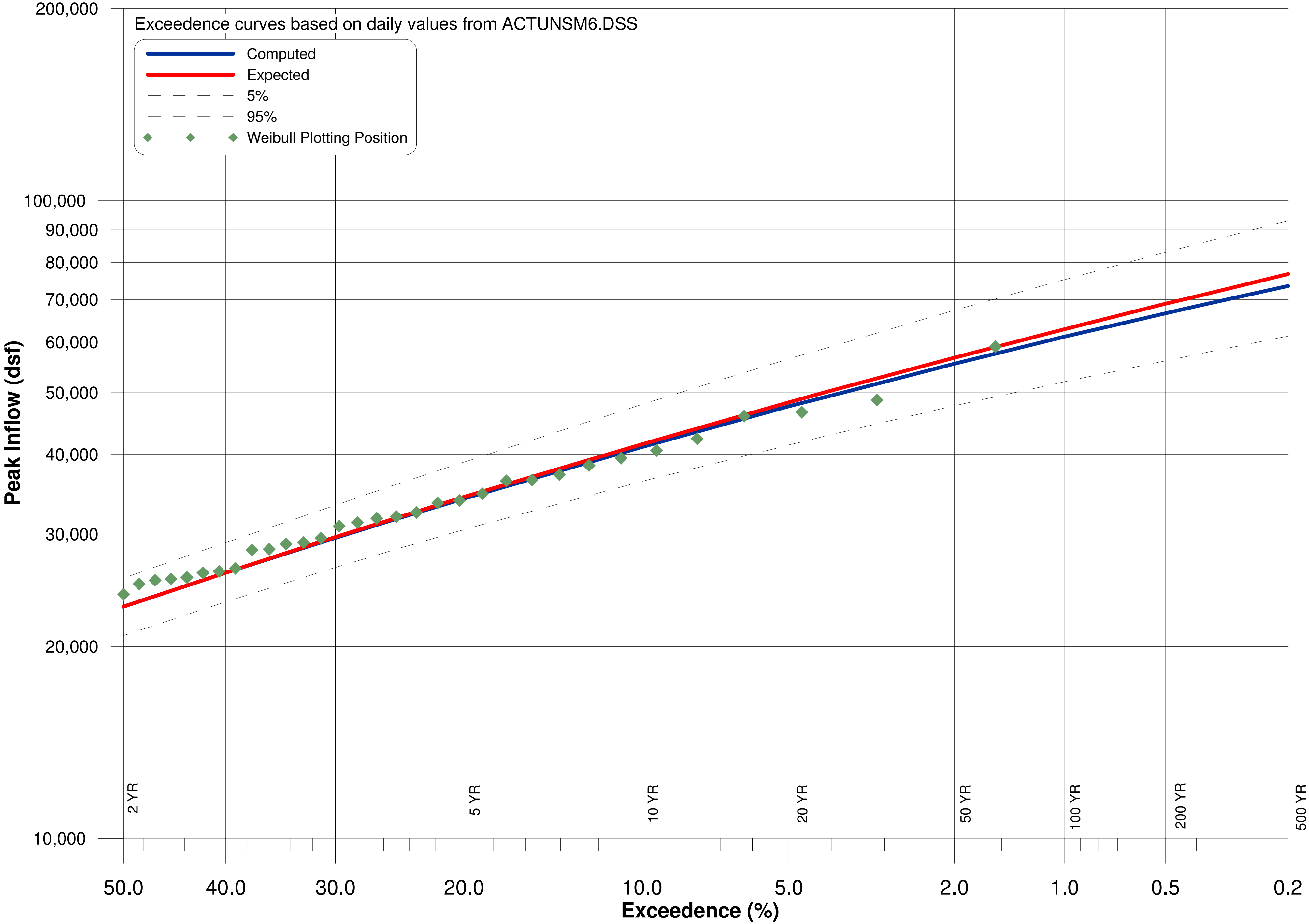


Figure HAR- 5: Exceedence Curve for Unregulated 3 Day Volume at Harris

(1939-2001)

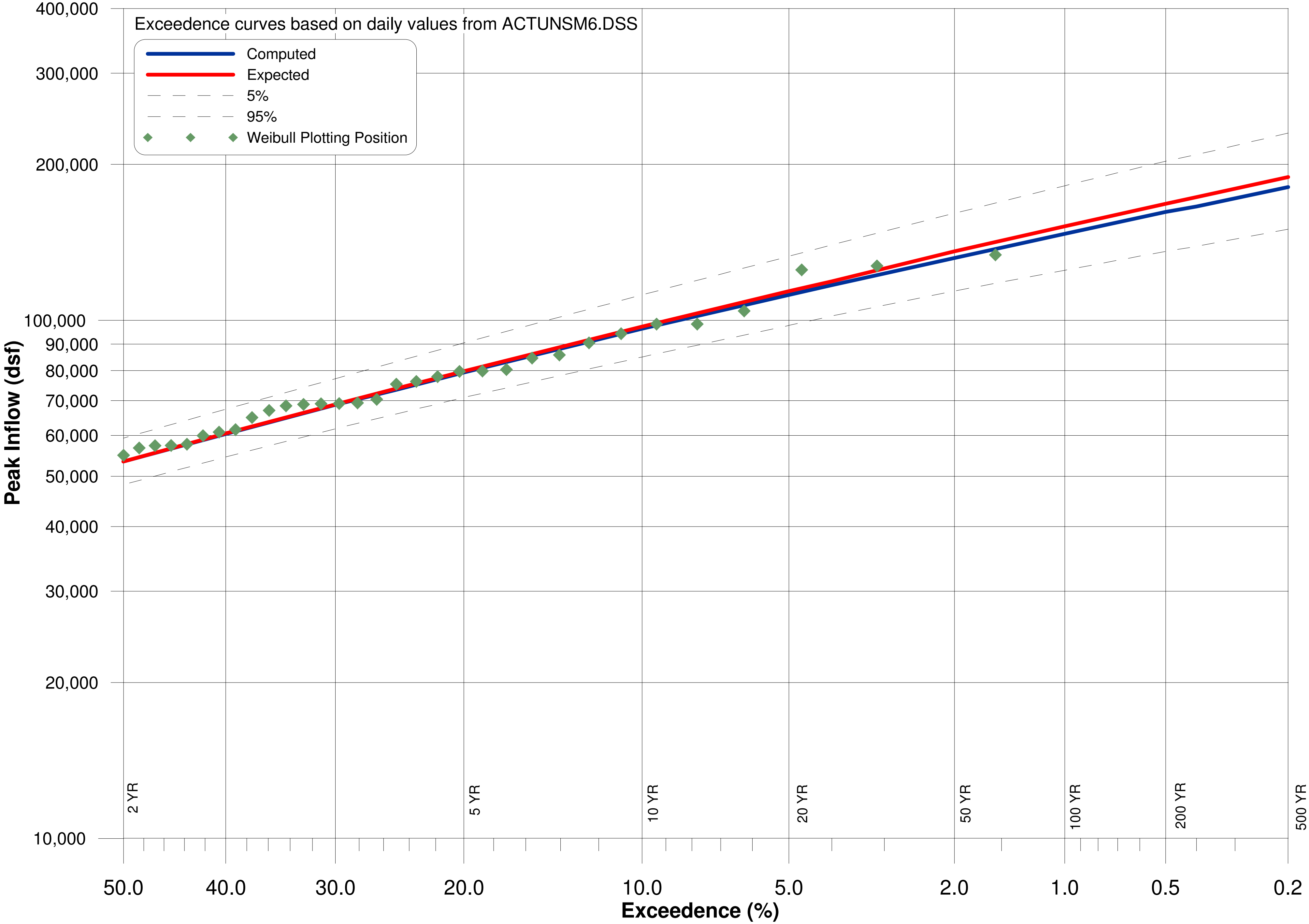


Figure HAR- 6: Exceedence Curve for Unregulated 5 Day Volume at Harris
(1939-2001)

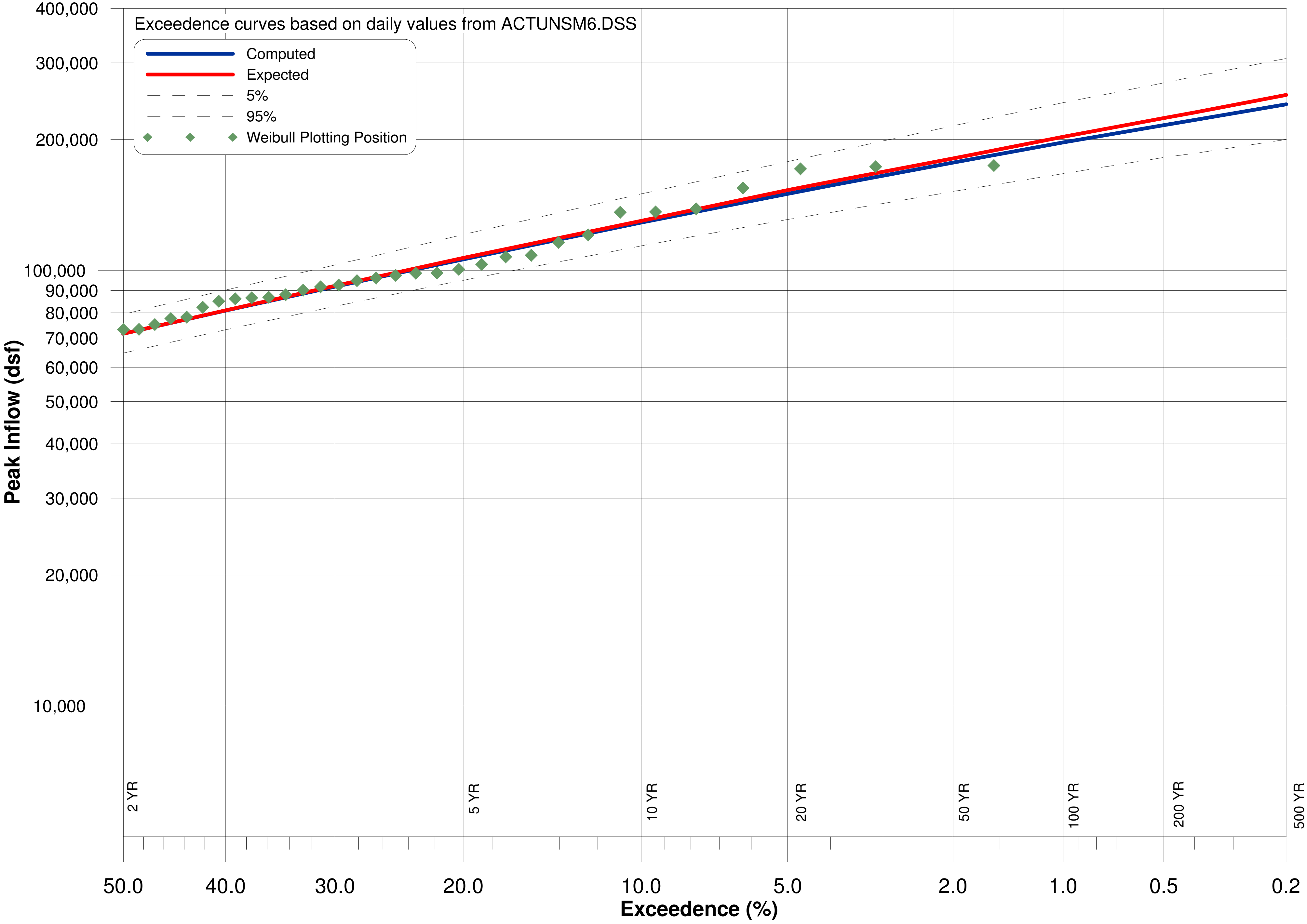


Table HAR-3: Regulation Impact on Flood Recurrences at Harris

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976		48,658	10	45,936	10
1977		45,917	10	46,110	10
1978		22,369	1	22,098	1
1979		59,002	50	59,073	50
1980		25,657	2	24,969	2
1981		18,132	1	17,574	1
1982		36,494	5	34,626	5
1983	12/7/83	29,121	2	28,790	2
1984	8/3/84	25,077	2	15,880	1
1985	2/6/85	11,416	1	11,780	1
1986	11/27/86	6,091	1	6,840	1
1987	3/2/87	21,853	1	14,060	1
1988	1/22/88	14,808	1	11,760	1
1989	6/22/89	16,047	1	14,270	1
1990	3/17/90	46,604	10	36,960	5
1991	2/21/91	14,900	1	12,940	1
1992	12/21/92	18,299	1	13,434	1
1993	3/28/93	26,104	2	13,095	1
1994	7/28/94	15,304	1	10,585	1
1995	10/6/95	25,511	2	18,306	1
1996	2/3/96	42,327	10	16,912	1
1997	3/2/97	33,876	2	24,634	2
1998	3/10/98	40,572	5	24,154	2
1999	6/28/99	7,342	1	7,198	1
2000	4/4/00	13,663	1	13,938	1
2001	3/24/01	22,224	1	12,445	1

Figure WAD-1: FFA Datafile WAD.DAT

```
TT TALLAPOOSA RIVER AT WADLEY FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1      1
FR     19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID WADLEY DSS 1939-2001
GS ALL                0.0
QR           1939   23147
QR           1940   20575
QR           1941    8214
QR           1942   31428
QR           1943   33162
QR           1944   22901
QR           1945   25120
QR           1946   37244
QR           1947   35906
QR           1948   25196
QR           1949   42807
QR           1950   11796
QR           1951   21140
QR           1952   35711
QR           1953   24527
QR           1954    9522
QR           1955   18647
QR           1956   35766
QR           1957   43657
QR           1958   20784
QR           1959   14152
QR           1960   15307
QR           1961   39704
QR           1962   29729
QR           1963   39324
QR           1964   29171
QR           1965   12918
QR           1966   21374
QR           1967   16328
QR           1968   33052
QR           1969   14927
QR           1970   44476
QR           1971   41640
QR           1972   27587
QR           1973   29987
QR           1974   35125
QR           1975   32396
QR           1976   55146
QR           1977   53273
QR           1978   25932
QR           1979   68567
QR           1980   29356
QR           1981   20618
QR           1982   40838
QR           1983   32792
QR           1984   26724
QR           1985   14943
QR           1986    7311
QR           1987   23485
QR           1988   26496
QR           1989   18163
QR           1990   75976
QR           1991   15493
QR           1992   22169
QR           1993   30366
QR           1994   20204
QR           1995   30621
QR           1996   46420
QR           1997   35080
QR           1998   47858
QR           1999    8683
QR           2000   16601
QR           2001   27550
ED
```

Figure WAD-2: FFA Datafile WAD3.DAT

```
TT TALLAPOOSA RIVER AT WADLEY FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID WADLEY 3 DAY VOLUME DSS 1939-2001
GS ALL                  0.0
QR            1939    55284
QR            1940    44222
QR            1941    19039
QR            1942    79543
QR            1943    79286
QR            1944    48532
QR            1945    44064
QR            1946    79031
QR            1947    86765
QR            1948    55899
QR            1949   112169
QR            1950    25064
QR            1951    50801
QR            1952    77157
QR            1953    65963
QR            1954    26701
QR            1955    36813
QR            1956    91858
QR            1957    92681
QR            1958    45291
QR            1959    40922
QR            1960    36379
QR            1961    98965
QR            1962    68898
QR            1963    92407
QR            1964    69539
QR            1965    34658
QR            1966    51940
QR            1967    41965
QR            1968    79998
QR            1969    39150
QR            1970   108450
QR            1971    96964
QR            1972    70931
QR            1973    66317
QR            1974    81360
QR            1975    75036
QR            1976   120583
QR            1977   143963
QR            1978    62965
QR            1979   153693
QR            1980    66461
QR            1981    47969
QR            1982   112983
QR            1983    83466
QR            1984    69288
QR            1985    35866
QR            1986    15805
QR            1987    57963
QR            1988    38345
QR            1989    47391
QR            1990   175176
QR            1991    43034
QR            1992    55585
QR            1993    66210
QR            1994    40383
QR            1995    63959
QR            1996   100625
QR            1997    94338
QR            1998   115378
QR            1999    22011
QR            2000    44321
QR            2001    66811
ED
```

Figure WAD-3: FFA Datafile WAD5.DAT

```
TT TALLAPOOSA RIVER AT WADLEY FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID WADLEY 5 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR          1939   73072
QR          1940   63788
QR          1941   30264
QR          1942   99290
QR          1943  110816
QR          1944   62508
QR          1945   58834
QR          1946  113251
QR          1947  115504
QR          1948   76350
QR          1949  177598
QR          1950   33495
QR          1951   60809
QR          1952   99851
QR          1953   81011
QR          1954   33791
QR          1955   50519
QR          1956  112626
QR          1957  118621
QR          1958   59287
QR          1959   56302
QR          1960   51078
QR          1961  156860
QR          1962   86555
QR          1963  109213
QR          1964   95072
QR          1965   48544
QR          1966   83784
QR          1967   58935
QR          1968   98103
QR          1969   54201
QR          1970  139430
QR          1971  124723
QR          1972  106824
QR          1973   84385
QR          1974  103981
QR          1975  105760
QR          1976  159534
QR          1977  197158
QR          1978   83191
QR          1979  199244
QR          1980   90000
QR          1981   58496
QR          1982  156913
QR          1983  110479
QR          1984  104056
QR          1985   50720
QR          1986   22167
QR          1987   77026
QR          1988   45019
QR          1989   70623
QR          1990  235281
QR          1991   61764
QR          1992   75221
QR          1993   86756
QR          1994   54912
QR          1995   86040
QR          1996  126167
QR          1997  123082
QR          1998  147314
QR          1999   29522
QR          2000   59080
QR          2001   85014
ED
```

Table WAD-1: Rankings of Flood Events at Wadley

WADLEY				WADLEY - 3 DAY				WADLEY - 5 DAY			
Rank	Yr	Flow (cfs)	Position	Rank	Yr	Flow (cfs)	Position	Rank	Yr	Flow (cfs)	Position
1	1990	75,976	1.56	1	1990	175,176	1.56	1	1990	235,281	1.56
2	1979	68,567	3.13	2	1979	153,693	3.13	2	1979	199,244	3.13
3	1976	55,146	4.69	3	1977	143,963	4.69	3	1977	197,158	4.69
4	1977	53,273	6.25	4	1976	120,583	6.25	4	1949	177,598	6.25
5	1998	47,858	7.81	5	1998	115,378	7.81	5	1976	159,534	7.81
6	1996	46,420	9.38	6	1982	112,983	9.38	6	1982	156,913	9.38
7	1970	44,476	10.94	7	1949	112,169	10.94	7	1961	156,860	10.94
8	1957	43,657	12.50	8	1970	108,450	12.50	8	1998	147,314	12.50
9	1949	42,807	14.06	9	1996	100,625	14.06	9	1970	139,430	14.06
10	1971	41,640	15.63	10	1961	98,965	15.63	10	1996	126,167	15.63
11	1982	40,838	17.19	11	1971	96,964	17.19	11	1971	124,723	17.19
12	1961	39,704	18.75	12	1997	94,338	18.75	12	1997	123,082	18.75
13	1963	39,324	20.31	13	1957	92,681	20.31	13	1957	118,621	20.31
14	1946	37,244	21.88	14	1963	92,407	21.88	14	1947	115,504	21.88
15	1947	35,906	23.44	15	1956	91,858	23.44	15	1946	113,251	23.44
16	1956	35,766	25.00	16	1947	86,765	25.00	16	1956	112,626	25.00
17	1952	35,711	26.56	17	1983	83,466	26.56	17	1943	110,816	26.56
18	1974	35,125	28.13	18	1974	81,360	28.13	18	1983	110,479	28.13
19	1997	35,080	29.69	19	1968	79,998	29.69	19	1963	109,213	29.69
20	1943	33,162	31.25	20	1942	79,543	31.25	20	1972	106,824	31.25
21	1968	33,052	32.81	21	1943	79,286	32.81	21	1975	105,760	32.81
22	1983	32,792	34.38	22	1946	79,031	34.38	22	1984	104,056	34.38
23	1975	32,396	35.94	23	1952	77,157	35.94	23	1974	103,981	35.94
24	1942	31,428	37.50	24	1975	75,036	37.50	24	1952	99,851	37.50
25	1995	30,621	39.06	25	1972	70,931	39.06	25	1942	99,290	39.06
26	1993	30,366	40.63	26	1964	69,539	40.63	26	1968	98,103	40.63
27	1973	29,987	42.19	27	1984	69,288	42.19	27	1964	95,072	42.19
28	1962	29,729	43.75	28	1962	68,898	43.75	28	1980	90,000	43.75
29	1980	29,356	45.31	29	2001	66,811	45.31	29	1993	86,756	45.31
30	1964	29,171	46.88	30	1980	66,461	46.88	30	1962	86,555	46.88
31	1972	27,587	48.44	31	1973	66,317	48.44	31	1995	86,040	48.44
32	2001	27,550	50.00	32	1993	66,210	50.00	32	2001	85,014	50.00
33	1984	26,724	51.56	33	1953	65,963	51.56	33	1973	84,385	51.56
34	1988	26,496	53.13	34	1995	63,959	53.13	34	1966	83,784	53.13
35	1978	25,932	54.69	35	1978	62,965	54.69	35	1978	83,191	54.69
36	1948	25,196	56.25	36	1987	57,963	56.25	36	1953	81,011	56.25
37	1945	25,120	57.81	37	1948	55,899	57.81	37	1987	77,026	57.81
38	1953	24,527	59.38	38	1992	55,585	59.38	38	1948	76,350	59.38
39	1987	23,485	60.94	39	1939	55,284	60.94	39	1992	75,221	60.94
40	1939	23,147	62.50	40	1966	51,940	62.50	40	1939	73,072	62.50
41	1944	22,901	64.06	41	1951	50,801	64.06	41	1989	70,623	64.06
42	1992	22,169	65.63	42	1944	48,532	65.63	42	1940	63,788	65.63
43	1966	21,374	67.19	43	1981	47,969	67.19	43	1944	62,508	67.19
44	1951	21,140	68.75	44	1989	47,391	68.75	44	1991	61,764	68.75
45	1958	20,784	70.31	45	1958	45,291	70.31	45	1951	60,809	70.31
46	1981	20,618	71.88	46	2000	44,321	71.88	46	1958	59,287	71.88
47	1940	20,575	73.44	47	1940	44,222	73.44	47	2000	59,080	73.44
48	1994	20,204	75.00	48	1945	44,064	75.00	48	1967	58,935	75.00
49	1955	18,647	76.56	49	1991	43,034	76.56	49	1945	58,834	76.56
50	1989	18,163	78.13	50	1967	41,965	78.13	50	1981	58,496	78.13
51	2000	16,601	79.69	51	1959	40,922	79.69	51	1959	56,302	79.69
52	1967	16,328	81.25	52	1994	40,383	81.25	52	1994	54,912	81.25
53	1991	15,493	82.81	53	1969	39,150	82.81	53	1969	54,201	82.81
54	1960	15,307	84.38	54	1988	38,345	84.38	54	1960	51,078	84.38
55	1985	14,943	85.94	55	1955	36,813	85.94	55	1985	50,720	85.94
56	1969	14,927	87.50	56	1960	36,379	87.50	56	1955	50,519	87.50
57	1959	14,152	89.06	57	1985	35,866	89.06	57	1965	48,544	89.06
58	1965	12,918	90.63	58	1965	34,658	90.63	58	1988	45,019	90.63
59	1950	11,796	92.19	59	1954	26,701	92.19	59	1954	33,791	92.19
60	1954	9,522	93.75	60	1950	25,064	93.75	60	1950	33,495	93.75
61	1999	8,683	95.31	61	1999	22,011	95.31	61	1941	30,264	95.31
62	1941	8,214	96.88	62	1941	19,039	96.88	62	1999	29,522	96.88
63	1986	7,311	98.44	63	1986	15,805	98.44	63	1986	22,167	98.44

Table WAD-2: Summary of FFA Results for Wadley

WADLEY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
90,300	94,700	0.20	115,000	74,800
83,100	86,500	0.40	105,000	69,500
80,800	83,900	0.50	101,000	67,800
73,500	75,800	1.00	90,900	62,300
66,100	67,700	2.00	80,500	56,600
58,500	59,500	4.00	70,000	50,700
56,000	56,900	5.00	66,600	48,700
48,000	48,500	10.00	56,000	42,300
39,500	39,700	20.00	45,100	35,300
36,600	36,700	25.00	41,400	32,800
34,100	34,200	30.00	38,400	30,700
30,000	30,100	40.00	33,500	27,100
26,500	26,500	50.00	29,500	23,900
23,400	23,300	60.00	25,900	21,000
20,300	20,300	70.00	22,600	18,100
17,200	17,100	80.00	19,200	15,100
13,500	13,300	90.00	15,400	11,500
11,000	10,700	95.00	12,700	9,130
2,950	2,460	99.99	3,960	1,990
MEAN	4.4129		HISTORIC EVENTS	0
STANDARD DEV	0.2156		HIGH OUTLIERS	0
COMPUTED SKEW	-0.4531		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

WADLEY 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
214,000	224,000	0.20	273,000	177,000
197,000	205,000	0.40	248,000	164,000
191,000	199,000	0.50	240,000	160,000
174,000	179,000	1.00	215,000	147,000
156,000	160,000	2.00	190,000	134,000
138,000	141,000	4.00	166,000	120,000
132,000	135,000	5.00	158,000	115,000
113,000	115,000	10.00	132,000	100,000
93,400	93,900	20.00	107,000	83,400
86,400	86,800	25.00	97,900	77,500
80,700	80,900	30.00	90,800	72,500
70,900	71,000	40.00	79,100	63,900
62,600	62,600	50.00	69,600	56,500
55,200	55,100	60.00	61,100	49,500
48,000	47,800	70.00	53,300	42,700
40,600	40,300	80.00	45,400	35,600
31,900	31,400	90.00	36,200	27,200
25,900	25,300	95.00	30,000	21,500
6,940	5,790	99.99	9,330	4,680
MEAN	4.7860		HISTORIC EVENTS	0
STANDARD DEV	0.2160		HIGH OUTLIERS	0
COMPUTED SKEW	-0.4024		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

WADLEY 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
299,000	315,000	0.20	383,000	247,000
273,000	285,000	0.40	345,000	227,000
264,000	276,000	0.50	333,000	221,000
239,000	247,000	1.00	296,000	202,000
213,000	218,000	2.00	259,000	182,000
187,000	190,000	4.00	224,000	162,000
179,000	182,000	5.00	212,000	155,000
152,000	154,000	10.00	177,000	134,000
125,000	125,000	20.00	142,000	111,000
115,000	116,000	25.00	130,000	103,000
107,000	108,000	30.00	121,000	96,800
94,400	94,500	40.00	105,000	85,300
83,500	83,500	50.00	92,600	75,400
73,700	73,600	60.00	81,600	66,300
64,300	64,100	70.00	71,400	57,400
54,700	54,300	80.00	61,100	48,100
43,400	42,900	90.00	49,300	37,200
35,700	35,000	95.00	41,300	29,800
10,800	9,150	99.99	14,200	7,440
MEAN	4.9146		HISTORIC EVENTS	0
STANDARD DEV	0.2126		HIGH OUTLIERS	0
COMPUTED SKEW	-0.3123		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.2000		SYSTEM EVENTS	63

Figure WAD-4: Exceedence Curve for Unregulated 1 Day Volume at Wadley

(1939-2001)

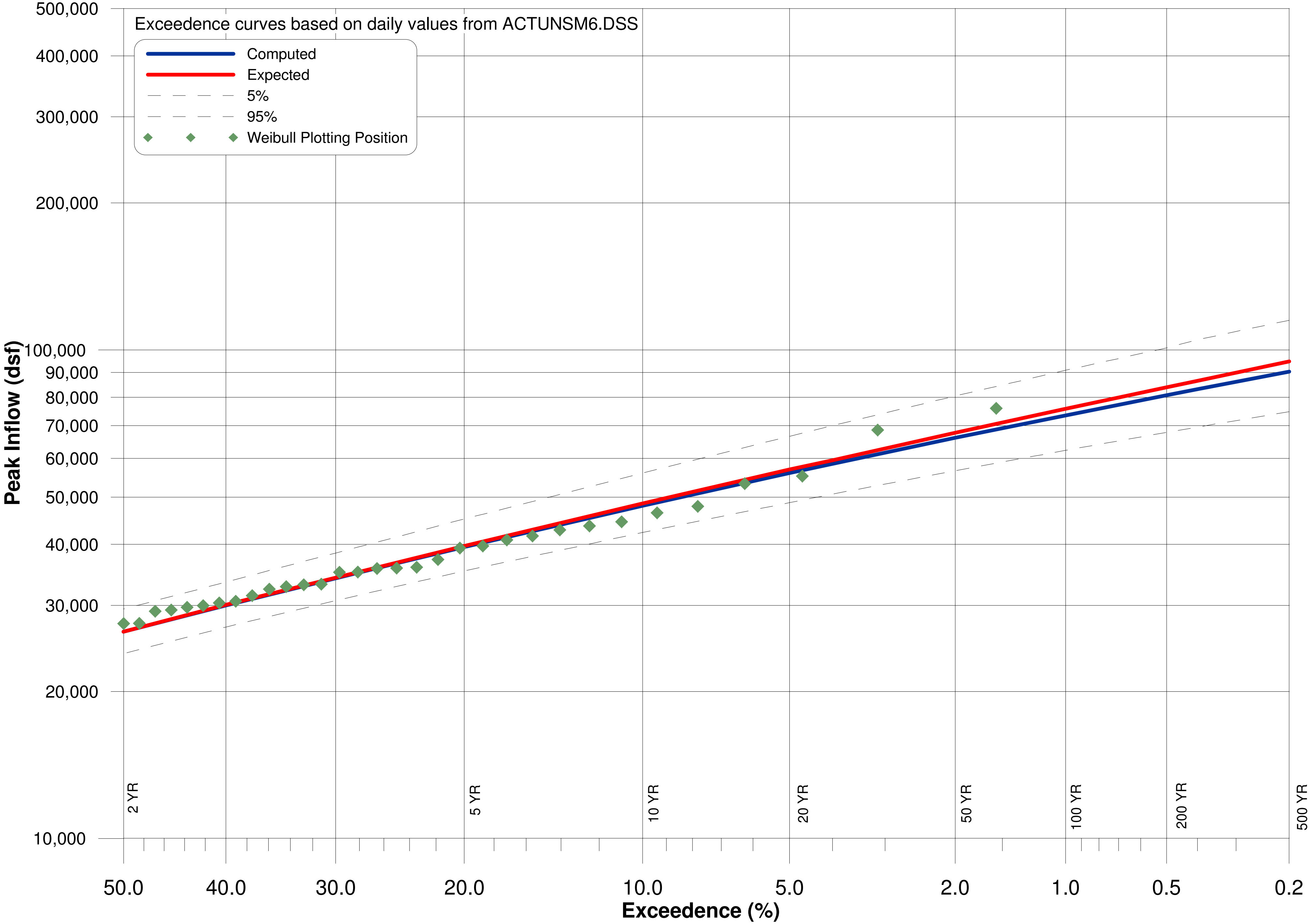


Figure WAD- 5: Exceedence Curve for Unregulated 3 Day Volume at Wadley
(1939-2001)

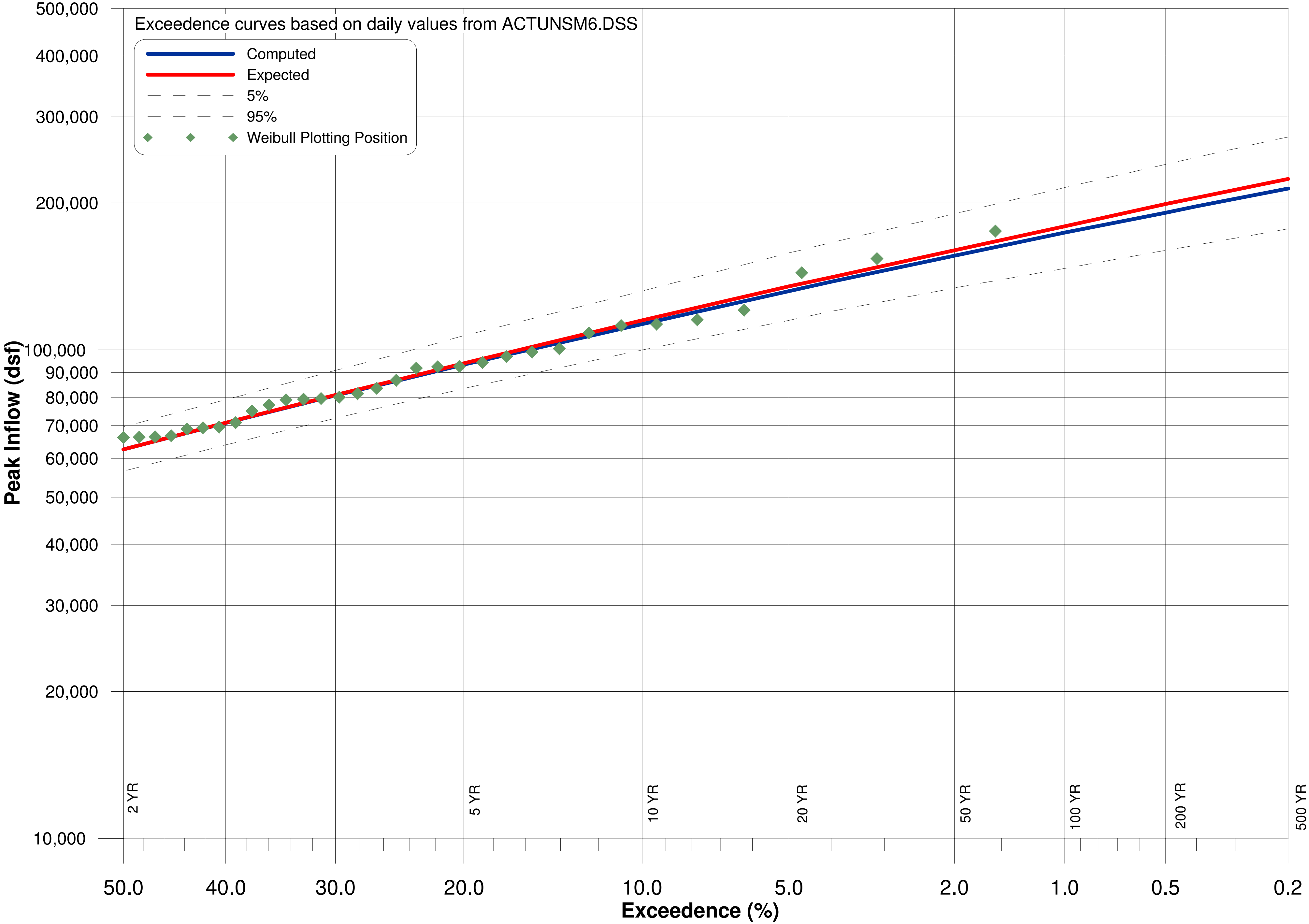


Figure WAD-6: Exceedence Curve for Unregulated 5 Day Volume at Wadley

(1939-2001)

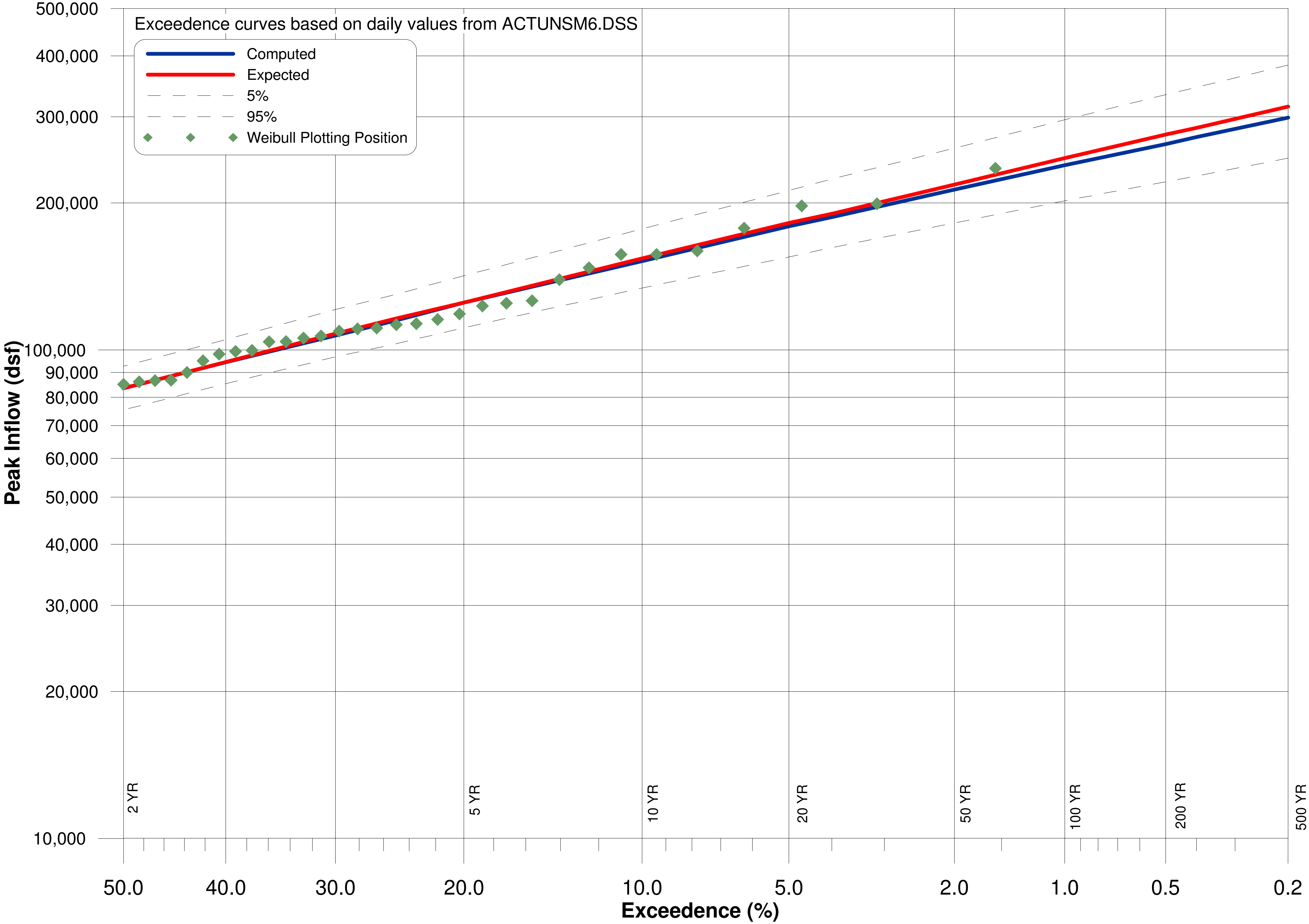


Table WAD-3: Regulation Impact on Flood Recurrences at Wadley

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976	3/16/76	55,146	10	52,800	10
1977	3/31/77	53,273	10	53,000	10
1978	1/26/78	25,932	1	25,400	1
1979	4/14/79	68,567	50	67,900	50
1980	4/14/80	29,356	2	28,700	2
1981	2/10/81	20,618	1	20,200	1
1982	2/4/82	40,838	5	39,800	5
1983	12/7/83	32,792	2	34,400	2
1984	8/3/84	26,724	2	20,900	1
1985	2/6/85	14,943	1	14,700	1
1986	3/14/86	7,311	1	8,610	1
1987	3/1/87	23,485	1	17,000	1
1988	9/17/88	26,496	1	20,700	1
1989	6/22/89	18,163	1	18,300	1
1990	3/17/90	75,976	100	60,300	25
1991	2/23/91	15,493	1	14,400	1
1992	12/21/92	22,169	1	15,700	1
1993	3/28/93	30,366	2	15,300	1
1994	7/28/94	20,204	1	14,200	1
1995	10/5/95	30,621	2	26,900	2
1996	2/3/96	46,420	5	23,700	1
1997	3/2/97	35,080	2	28,500	2
1998	3/10/98	47,858	5	28,700	2
1999	1/23/99	8,683	1	8,180	1
2000	4/4/00	16,601	1	16,500	1
2001	3/20/01	27,550	2	19,200	1

Figure MAR-1: FFA Datafile MAR.DAT

```
TT TALLAPOOSA RIVER AT MARTIN INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1      1
FR     19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID MARTIN DSS 1939-2001
GS ALL                0.0
QR           1939   57332
QR           1940   51549
QR           1941   18165
QR           1942   67963
QR           1943   82080
QR           1944   60086
QR           1945   79747
QR           1946   63604
QR           1947   83142
QR           1948   33361
QR           1949   79682
QR           1950   24288
QR           1951   32404
QR           1952   48973
QR           1953   36073
QR           1954   41719
QR           1955   37571
QR           1956   65953
QR           1957   71604
QR           1958   36531
QR           1959   18624
QR           1960   41874
QR           1961  101863
QR           1962   64107
QR           1963   37010
QR           1964   70381
QR           1965   41461
QR           1966   48003
QR           1967   27577
QR           1968   43163
QR           1969   43378
QR           1970   58060
QR           1971   81919
QR           1972   82244
QR           1973   45790
QR           1974   34444
QR           1975   46422
QR           1976   62770
QR           1977   67838
QR           1978   41279
QR           1979  114551
QR           1980   43314
QR           1981   45182
QR           1982   79903
QR           1983   59471
QR           1984   52079
QR           1985   25809
QR           1986   18419
QR           1987   39327
QR           1988   56474
QR           1989   70776
QR           1990  125019
QR           1991   24378
QR           1992   32235
QR           1993   60578
QR           1994   36506
QR           1995   49119
QR           1996   74747
QR           1997   53919
QR           1998   86225
QR           1999   18100
QR           2000   20784
QR           2001   56160
ED
```

Figure MAR-2: FFA Datafile MAR3.DAT

```
TT TALLAPOOSA RIVER AT MARTIN INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID MARTIN 3 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR          1939  119664
QR          1940  103569
QR          1941   37893
QR          1942  161924
QR          1943  168418
QR          1944  128930
QR          1945  145359
QR          1946  148512
QR          1947  162624
QR          1948   88684
QR          1949  207857
QR          1950   50419
QR          1951   76445
QR          1952  107733
QR          1953   97331
QR          1954   65523
QR          1955   84428
QR          1956  161399
QR          1957  163442
QR          1958   81287
QR          1959   50079
QR          1960   84750
QR          1961  251983
QR          1962  154363
QR          1963   97811
QR          1964  179414
QR          1965  100445
QR          1966  107059
QR          1967   61047
QR          1968   90194
QR          1969   83664
QR          1970  150661
QR          1971  189380
QR          1972  184547
QR          1973   98457
QR          1974   93956
QR          1975  104939
QR          1976  171459
QR          1977  174722
QR          1978  105379
QR          1979  277337
QR          1980   99584
QR          1981   90245
QR          1982  176792
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QR          1984  108099
QR          1985   65304
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QR          1988  100407
QR          1989  158789
QR          1990  310830
QR          1991   58222
QR          1992   75381
QR          1993  116844
QR          1994   72194
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QR          1996  156030
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QR          1998  196202
QR          1999   43607
QR          2000   55027
QR          2001  111236
ED
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Figure MAR-3: FFA Datafile MAR5.DAT

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TT TALLAPOOSA RIVER AT MARTIN INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID MARTIN 5 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
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QR           1940  122653
QR           1941   51113
QR           1942  200597
QR           1943  215119
QR           1944  162153
QR           1945  172547
QR           1946  205578
QR           1947  201981
QR           1948  130398
QR           1949  292626
QR           1950   64480
QR           1951   94022
QR           1952  146468
QR           1953  122227
QR           1954   72301
QR           1955  112091
QR           1956  204597
QR           1957  212591
QR           1958  123883
QR           1959   72187
QR           1960  116425
QR           1961  339012
QR           1962  242822
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QR           1964  236297
QR           1965  119375
QR           1966  172202
QR           1967   79289
QR           1968  108982
QR           1969  108046
QR           1970  197952
QR           1971  233980
QR           1972  241084
QR           1973  120300
QR           1974  132085
QR           1975  155843
QR           1976  220904
QR           1977  241688
QR           1978  135076
QR           1979  341312
QR           1980  137771
QR           1981  113041
QR           1982  231952
QR           1983  187407
QR           1984  175414
QR           1985   86179
QR           1986   53488
QR           1987  112017
QR           1988  110740
QR           1989  202949
QR           1990  392413
QR           1991   76646
QR           1992  103116
QR           1993  154107
QR           1994   92370
QR           1995  134405
QR           1996  202746
QR           1997  181977
QR           1998  247526
QR           1999   63760
QR           2000   73354
QR           2001  140215
ED
```

Table MAR-2: Summary of FFA Results for Martin

MARTIN DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
155,000	162,000	0.20	194,000	130,000
143,000	149,000	0.40	177,000	121,000
140,000	145,000	0.50	172,000	119,000
128,000	132,000	1.00	156,000	110,000
116,000	118,000	2.00	139,000	100,000
103,000	105,000	4.00	122,000	90,600
99,300	101,000	5.00	117,000	87,300
86,100	86,900	10.00	99,300	76,600
71,900	72,300	20.00	81,200	64,800
66,900	67,200	25.00	75,100	60,500
62,800	63,000	30.00	70,100	56,900
55,700	55,800	40.00	61,700	50,600
49,700	49,700	50.00	54,700	45,100
44,200	44,100	60.00	48,600	40,000
38,800	38,700	70.00	42,800	34,900
33,200	33,000	80.00	36,900	29,400
26,600	26,200	90.00	29,900	23,000
21,900	21,500	95.00	25,100	18,500
6,480	5,480	99.99	8,530	4,500
MEAN	4.6862		HISTORIC EVENTS	0
STANDARD DEV	0.1999		HIGH OUTLIERS	0
COMPUTED SKEW	-0.3896		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

MARTIN 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
396,000	419,000	0.20	506,000	328,000
360,000	377,000	0.40	453,000	301,000
348,000	364,000	0.50	436,000	293,000
313,000	324,000	1.00	386,000	266,000
278,000	286,000	2.00	337,000	240,000
244,000	249,000	4.00	290,000	213,000
233,000	237,000	5.00	275,000	204,000
198,000	201,000	10.00	229,000	176,000
163,000	164,000	20.00	184,000	147,000
151,000	152,000	25.00	170,000	136,000
141,000	142,000	30.00	157,000	128,000
125,000	125,000	40.00	138,000	113,000
111,000	111,000	50.00	122,000	101,000
98,500	98,300	60.00	108,000	89,000
86,700	86,400	70.00	95,600	77,700
74,600	74,100	80.00	82,800	66,000
60,300	59,600	90.00	68,000	52,100
50,500	49,600	95.00	57,900	42,700
17,700	15,400	99.99	22,700	12,700
MEAN	5.0412		HISTORIC EVENTS	0
STANDARD DEV	0.2018		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1683		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

MARTIN 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
518,000	548,000	0.20	661,000	429,000
471,000	493,000	0.40	592,000	394,000
456,000	476,000	0.50	571,000	383,000
410,000	424,000	1.00	505,000	349,000
365,000	374,000	2.00	441,000	314,000
320,000	326,000	4.00	380,000	279,000
305,000	310,000	5.00	360,000	267,000
260,000	263,000	10.00	301,000	231,000
214,000	215,000	20.00	241,000	192,000
198,000	199,000	25.00	222,000	179,000
185,000	186,000	30.00	207,000	168,000
164,000	164,000	40.00	181,000	149,000
146,000	146,000	50.00	160,000	132,000
129,000	129,000	60.00	142,000	117,000
114,000	114,000	70.00	126,000	102,000
98,000	97,400	80.00	109,000	86,800
79,400	78,500	90.00	89,400	68,600
66,500	65,300	95.00	76,100	56,200
23,300	20,300	99.99	30,000	16,700
MEAN	5.1595		HISTORIC EVENTS	0
STANDARD DEV	0.2012		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1806		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

Figure MAR- 4: Exceedence Curve for Unregulated 1 Day Volume at Martin
(1939-2001)

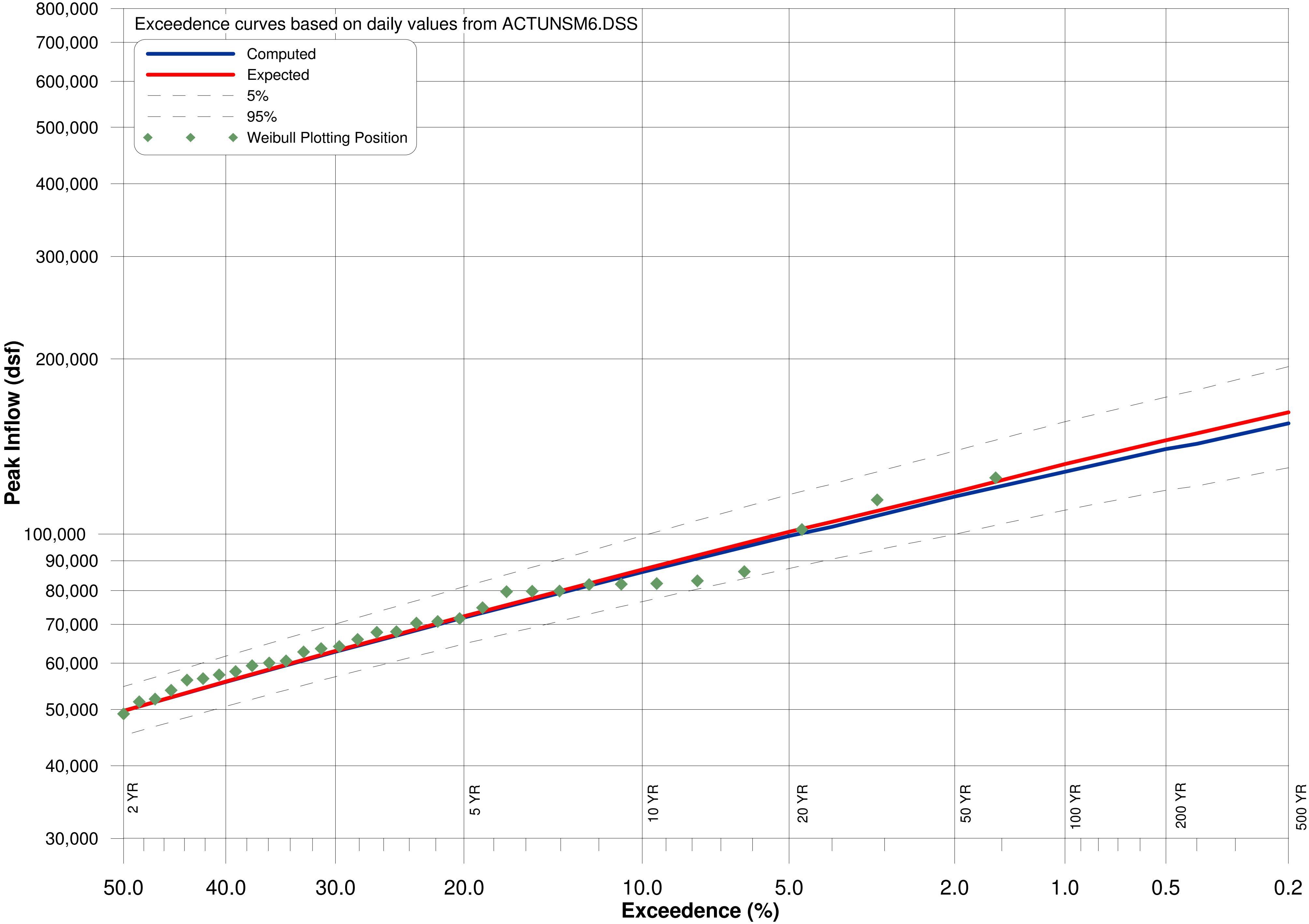

Figure MAR- 5: Exceedence Curve for Unregulated 3 Day Volume at Martin
(1939-2001)

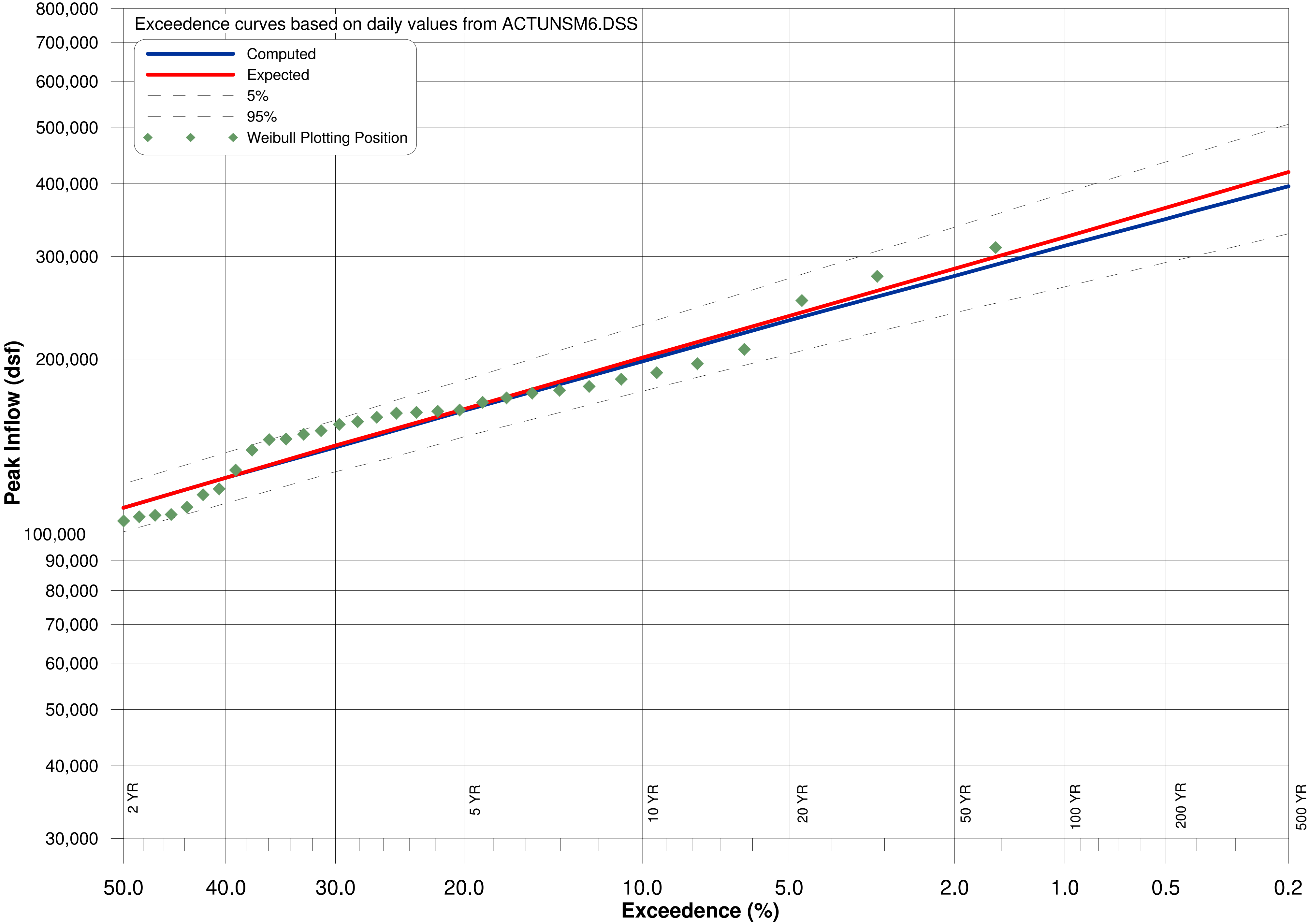

Table MAR-1: Rankings of Flood Events at Martin

MARTIN			
Rank	Yr	Flow (cfs)	Position
1	1990	125,019	1.56
2	1979	114,551	3.13
3	1961	101,863	4.69
4	1998	86,225	6.25
5	1947	83,142	7.81
6	1972	82,244	9.38
7	1943	82,080	10.94
8	1971	81,919	12.50
9	1982	79,903	14.06
10	1945	79,747	15.63
11	1949	79,682	17.19
12	1996	74,747	18.75
13	1957	71,604	20.31
14	1989	70,776	21.88
15	1964	70,381	23.44
16	1942	67,963	25.00
17	1977	67,838	26.56
18	1956	65,953	28.13
19	1962	64,107	29.69
20	1946	63,604	31.25
21	1976	62,770	32.81
22	1993	60,578	34.38
23	1944	60,086	35.94
24	1983	59,471	37.50
25	1970	58,060	39.06
26	1939	57,332	40.63
27	1988	56,474	42.19
28	2001	56,160	43.75
29	1997	53,919	45.31
30	1984	52,079	46.88
31	1940	51,549	48.44
32	1995	49,119	50.00
33	1952	48,973	51.56
34	1966	48,003	53.13
35	1975	46,422	54.69
36	1973	45,790	56.25
37	1981	45,182	57.81
38	1969	43,378	59.38
39	1980	43,314	60.94
40	1968	43,163	62.50
41	1960	41,874	64.06
42	1954	41,719	65.63
43	1965	41,461	67.19
44	1978	41,279	68.75
45	1987	39,327	70.31
46	1955	37,571	71.88
47	1963	37,010	73.44
48	1958	36,531	75.00
49	1994	36,506	76.56
50	1953	36,073	78.13
51	1974	34,444	79.69
52	1948	33,361	81.25
53	1951	32,404	82.81
54	1992	32,235	84.38
55	1967	27,577	85.94
56	1985	25,809	87.50
57	1991	24,378	89.06
58	1950	24,288	90.63
59	2000	20,784	92.19
60	1959	18,624	93.75
61	1986	18,419	95.31
62	1941	18,165	96.88
63	1999	18,100	98.44

MARTIN - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	310,830	1.56
2	1979	277,337	3.13
3	1961	251,983	4.69
4	1949	207,857	6.25
5	1998	196,202	7.81
6	1971	189,380	9.38
7	1972	184,547	10.94
8	1964	179,414	12.50
9	1982	176,792	14.06
10	1977	174,722	15.63
11	1976	171,459	17.19
12	1943	168,418	18.75
13	1957	163,442	20.31
14	1947	162,624	21.88
15	1942	161,924	23.44
16	1956	161,399	25.00
17	1989	158,789	26.56
18	1996	156,030	28.13
19	1962	154,363	29.69
20	1970	150,661	31.25
21	1946	148,512	32.81
22	1983	145,718	34.38
23	1945	145,359	35.94
24	1997	139,450	37.50
25	1944	128,930	39.06
26	1939	119,664	40.63
27	1993	116,844	42.19
28	2001	111,236	43.75
29	1984	108,099	45.31
30	1952	107,733	46.88
31	1966	107,059	48.44
32	1978	105,379	50.00
33	1975	104,939	51.56
34	1995	103,762	53.13
35	1940	103,569	54.69
36	1965	100,445	56.25
37	1988	100,407	57.81
38	1980	99,584	59.38
39	1973	98,457	60.94
40	1963	97,811	62.50
41	1953	97,331	64.06
42	1974	93,956	65.63
43	1981	90,245	67.19
44	1968	90,194	68.75
45	1948	88,684	70.31
46	1960	84,750	71.88
47	1955	84,428	73.44
48	1969	83,664	75.00
49	1958	81,287	76.56
50	1987	79,922	78.13
51	1951	76,445	79.69
52	1992	75,381	81.25
53	1994	72,194	82.81
54	1954	65,523	84.38
55	1985	65,304	85.94
56	1967	61,047	87.50
57	1991	58,222	89.06
58	2000	55,027	90.63
59	1950	50,419	92.19
60	1959	50,079	93.75
61	1999	43,607	95.31
62	1986	42,427	96.88
63	1941	37,893	98.44

MARTIN - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	392,413	1.56
2	1979	341,312	3.13
3	1961	339,012	4.69
4	1949	292,626	6.25
5	1998	247,526	7.81
6	1962	242,822	9.38
7	1977	241,688	10.94
8	1972	241,084	12.50
9	1964	236,297	14.06
10	1971	233,980	15.63
11	1982	231,952	17.19
12	1976	220,904	18.75
13	1943	215,119	20.31
14	1957	212,591	21.88
15	1946	205,578	23.44
16	1956	204,597	25.00
17	1989	202,949	26.56
18	1996	202,746	28.13
19	1947	201,981	29.69
20	1942	200,597	31.25
21	1970	197,952	32.81
22	1983	187,407	34.38
23	1997	181,977	35.94
24	1984	175,414	37.50
25	1945	172,547	39.06
26	1966	172,202	40.63
27	1944	162,153	42.19
28	1939	157,746	43.75
29	1975	155,843	45.31
30	1993	154,107	46.88
31	1952	146,468	48.44
32	2001	140,215	50.00
33	1980	137,771	51.56
34	1978	135,076	53.13
35	1995	134,405	54.69
36	1974	132,085	56.25
37	1948	130,398	57.81
38	1958	123,883	59.38
39	1940	122,653	60.94
40	1953	122,227	62.50
41	1973	120,300	64.06
42	1963	119,914	65.63
43	1965	119,375	67.19
44	1960	116,425	68.75
45	1981	113,041	70.31
46	1955	112,091	71.88
47	1987	112,017	73.44
48	1988	110,740	75.00
49	1968	108,982	76.56
50	1969	108,046	78.13
51	1992	103,116	79.69
52	1951	94,022	81.25
53	1994	92,370	82.81
54	1985	86,179	84.38
55	1967	79,289	85.94
56	1991	76,646	87.50
57	2000	73,354	89.06
58	1954	72,301	90.63
59	1959	72,187	92.19
60	1950	64,480	93.75
61	1999	63,760	95.31
62	1986	53,488	96.88
63	1941	51,113	98.44

Figure MAR- 6: Exceedence Curve for Unregulated 5 Day Volume at Martin

(1939-2001)

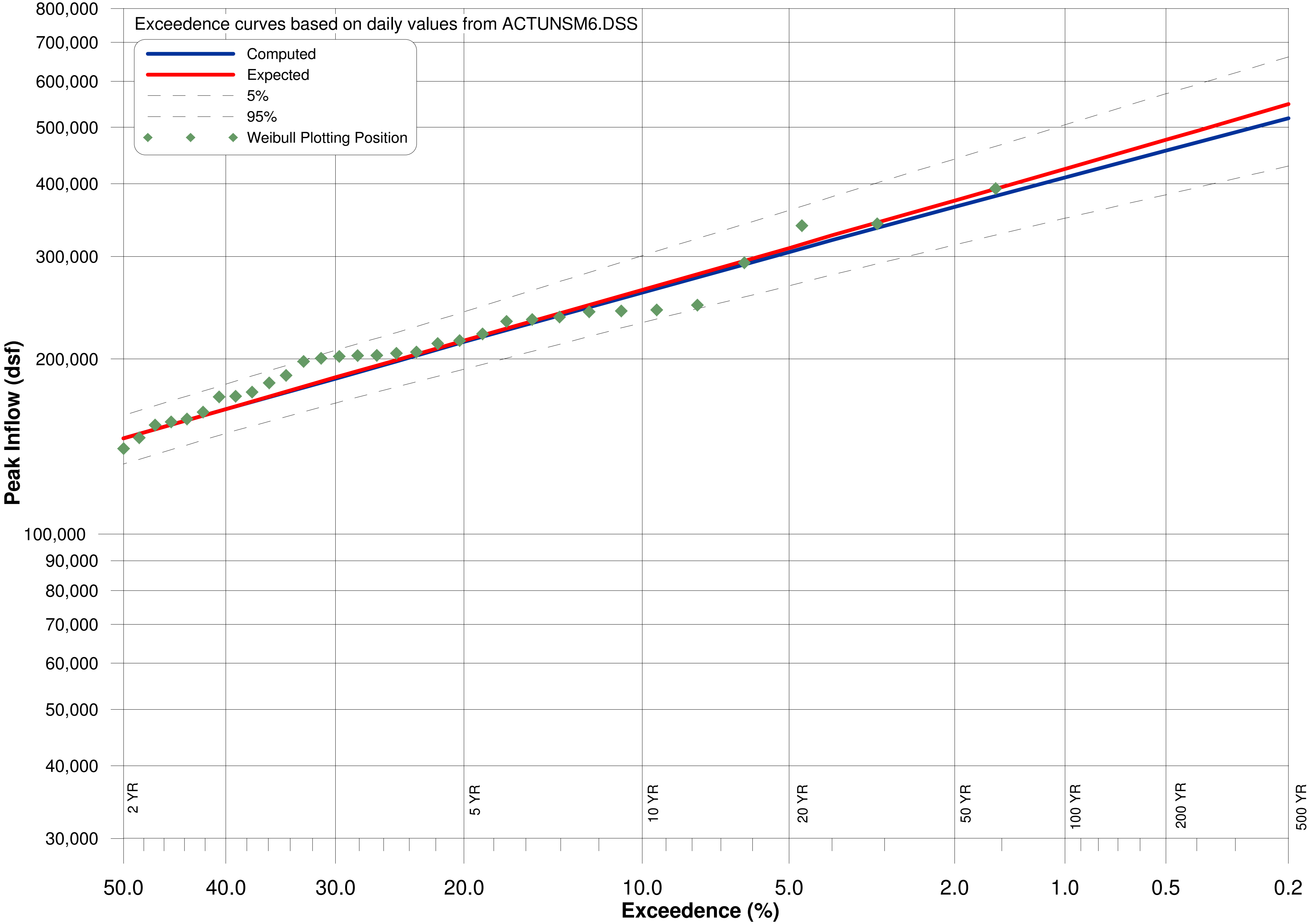

Table MAR-3: Regulation Impact on Flood Recurrences at Martin

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976	4/2/76	62,770	2	36,940	1
1977	3/31/77	67,838	2	63,290	2
1978	5/9/78	41,279	1	21,500	1
1979	4/15/79	114,551	25	119,410	50
1980	4/14/80	43,314	1	37,860	1
1981	2/14/81	45,182	1	9,660	1
1982	4/26/82	79,903	5	35,700	1
1983	4/9/83	59,471	2	34,250	1
1984	8/2/84	52,079	2	45,800	1
1985	2/16/85	25,809	1	9,680	1
1986	12/3/86	18,419	1	9,470	1
1987	3/6/87	39,327	1	10,880	1
1988	9/18/88	56,474	2	15,690	1
1989	6/20/89	70,776	2	63,940	2
1990	3/17/90	125,019	50	107,240	25
1991	5/14/91	24,378	1	14,210	1
1992	12/23/92	32,235	1	15,800	1
1993	3/30/93	60,578	2	11,081	1
1994	4/16/94	36,506	1	16,155	1
1995	10/6/95	49,119	1	32,783	1
1996	2/3/96	74,747	5	27,481	1
1997	6/17/97	53,919	2	20,179	1
1998	3/10/98	86,225	5	40,576	1
1999	7/1/99	18,100	1	13,493	1
2000	4/5/00	20,784	1	10,300	1
2001	4/4/01	56,160	2	34,852	1

Figure YAT-1: FFA Datafile YAT.DAT

```
TT TALLAPOOSA RIVER AT YATES INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID YATES DSS 1939-2001
GS ALL              0.0
QR          1939   57333
QR          1940   51550
QR          1941   18166
QR          1942   67964
QR          1943   82081
QR          1944   60087
QR          1945   79748
QR          1946   63605
QR          1947   83143
QR          1948   33362
QR          1949   79683
QR          1950   24289
QR          1951   32405
QR          1952   48974
QR          1953   36074
QR          1954   41720
QR          1955   37572
QR          1956   65954
QR          1957   71605
QR          1958   36532
QR          1959   18625
QR          1960   41875
QR          1961  101865
QR          1962   64109
QR          1963   37011
QR          1964   70382
QR          1965   41462
QR          1966   48004
QR          1967   27578
QR          1968   43164
QR          1969   43379
QR          1970   58061
QR          1971   81920
QR          1972   82246
QR          1973   45792
QR          1974   34445
QR          1975   46423
QR          1976   62772
QR          1977   67840
QR          1978   41281
QR          1979  114552
QR          1980   43313
QR          1981   45181
QR          1982   90386
QR          1983   66643
QR          1984   61734
QR          1985   31926
QR          1986   20614
QR          1987   42660
QR          1988   58075
QR          1989   84507
QR          1990  141920
QR          1991   26500
QR          1992   34751
QR          1993   68361
QR          1994   36972
QR          1995   53588
QR          1996   82099
QR          1997   56480
QR          1998   94109
QR          1999   21822
QR          2000   22223
QR          2001   56952
ED
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Figure YAT-2: FFA Datafile YAT3.DAT

```
TT TALLAPOOSA RIVER AT YATES INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID YATES 3 DAY VOLUME DSS 1939-2001
GS ALL              0.0
QR          1939  119667
QR          1940  103572
QR          1941   37896
QR          1942  161927
QR          1943  168421
QR          1944  128933
QR          1945  145362
QR          1946  148515
QR          1947  162627
QR          1948   88687
QR          1949  207860
QR          1950   50422
QR          1951   76448
QR          1952  107736
QR          1953   97335
QR          1954   65526
QR          1955   84431
QR          1956  161402
QR          1957  163445
QR          1958   81290
QR          1959   50082
QR          1960   84754
QR          1961  251987
QR          1962  154368
QR          1963   97814
QR          1964  179417
QR          1965  100449
QR          1966  107063
QR          1967   61052
QR          1968   90197
QR          1969   83668
QR          1970  150664
QR          1971  189384
QR          1972  184552
QR          1973   98461
QR          1974   93961
QR          1975  104943
QR          1976  171464
QR          1977  174727
QR          1978  105383
QR          1979  277340
QR          1980   99580
QR          1981   90246
QR          1982  191333
QR          1983  159609
QR          1984  117022
QR          1985   76938
QR          1986   49579
QR          1987   86590
QR          1988  103305
QR          1989  182947
QR          1990  353516
QR          1991   63941
QR          1992   80732
QR          1993  128317
QR          1994   73098
QR          1995  108451
QR          1996  163527
QR          1997  146023
QR          1998  205913
QR          1999   51023
QR          2000   58868
QR          2001  123852
ED
```

Figure YAT-3: FFA Datafile YAT5.DAT

```
TT TALLAPOOSA RIVER AT YATES INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID YATES 5 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR          1939  157751
QR          1940  122658
QR          1941   51118
QR          1942  200602
QR          1943  215124
QR          1944  162158
QR          1945  172552
QR          1946  205583
QR          1947  201986
QR          1948  130403
QR          1949  292631
QR          1950   64485
QR          1951   94028
QR          1952  146473
QR          1953  122234
QR          1954   72306
QR          1955  112096
QR          1956  204602
QR          1957  212596
QR          1958  123888
QR          1959   72192
QR          1960  116431
QR          1961  339018
QR          1962  242829
QR          1963  119919
QR          1964  236302
QR          1965  119381
QR          1966  172209
QR          1967   79296
QR          1968  108987
QR          1969  108052
QR          1970  197957
QR          1971  233986
QR          1972  241092
QR          1973  120307
QR          1974  132093
QR          1975  155851
QR          1976  220912
QR          1977  241696
QR          1978  135083
QR          1979  341317
QR          1980  137766
QR          1981  113041
QR          1982  250200
QR          1983  202350
QR          1984  183585
QR          1985   98567
QR          1986   62785
QR          1987  121101
QR          1988  114439
QR          1989  228100
QR          1990  433854
QR          1991   81406
QR          1992  110271
QR          1993  165923
QR          1994   93967
QR          1995  138800
QR          1996  207859
QR          1997  187455
QR          1998  251795
QR          1999   73400
QR          2000   79139
QR          2001  153192
ED
```

Table YAT-1: Rankings of Flood Events at Yates

YATES			
Rank	Yr	Flow (cfs)	Position
1	1990	141,920	1.56
2	1979	114,552	3.13
3	1961	101,865	4.69
4	1998	94,109	6.25
5	1982	90,386	7.81
6	1989	84,507	9.38
7	1947	83,143	10.94
8	1972	82,246	12.50
9	1996	82,099	14.06
10	1943	82,081	15.63
11	1971	81,920	17.19
12	1945	79,748	18.75
13	1949	79,683	20.31
14	1957	71,605	21.88
15	1964	70,382	23.44
16	1993	68,361	25.00
17	1942	67,964	26.56
18	1977	67,840	28.13
19	1983	66,643	29.69
20	1956	65,954	31.25
21	1962	64,109	32.81
22	1946	63,605	34.38
23	1976	62,772	35.94
24	1984	61,734	37.50
25	1944	60,087	39.06
26	1988	58,075	40.63
27	1970	58,061	42.19
28	1939	57,333	43.75
29	2001	56,952	45.31
30	1997	56,480	46.88
31	1995	53,588	48.44
32	1940	51,550	50.00
33	1952	48,974	51.56
34	1966	48,004	53.13
35	1975	46,423	54.69
36	1973	45,792	56.25
37	1981	45,181	57.81
38	1969	43,379	59.38
39	1980	43,313	60.94
40	1968	43,164	62.50
41	1987	42,660	64.06
42	1960	41,875	65.63
43	1954	41,720	67.19
44	1965	41,462	68.75
45	1978	41,281	70.31
46	1955	37,572	71.88
47	1963	37,011	73.44
48	1994	36,972	75.00
49	1958	36,532	76.56
50	1953	36,074	78.13
51	1992	34,751	79.69
52	1974	34,445	81.25
53	1948	33,362	82.81
54	1951	32,405	84.38
55	1985	31,926	85.94
56	1967	27,578	87.50
57	1991	26,500	89.06
58	1950	24,289	90.63
59	2000	22,223	92.19
60	1999	21,822	93.75
61	1986	20,614	95.31
62	1959	18,625	96.88
63	1941	18,166	98.44

YATES - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	353,516	1.56
2	1979	277,340	3.13
3	1961	251,987	4.69
4	1949	207,860	6.25
5	1998	205,913	7.81
6	1982	191,333	9.38
7	1971	189,384	10.94
8	1972	184,552	12.50
9	1989	182,947	14.06
10	1964	179,417	15.63
11	1977	174,727	17.19
12	1976	171,464	18.75
13	1943	168,421	20.31
14	1996	163,527	21.88
15	1957	163,445	23.44
16	1947	162,627	25.00
17	1942	161,927	26.56
18	1956	161,402	28.13
19	1983	159,609	29.69
20	1962	154,368	31.25
21	1970	150,664	32.81
22	1946	148,515	34.38
23	1997	146,023	35.94
24	1945	145,362	37.50
25	1944	128,933	39.06
26	1993	128,317	40.63
27	2001	123,852	42.19
28	1939	119,667	43.75
29	1984	117,022	45.31
30	1995	108,451	46.88
31	1952	107,736	48.44
32	1966	107,063	50.00
33	1978	105,383	51.56
34	1975	104,943	53.13
35	1940	103,572	54.69
36	1988	103,305	56.25
37	1965	100,449	57.81
38	1980	99,580	59.38
39	1973	98,461	60.94
40	1963	97,814	62.50
41	1953	97,335	64.06
42	1974	93,961	65.63
43	1981	90,246	67.19
44	1968	90,197	68.75
45	1948	88,687	70.31
46	1987	86,590	71.88
47	1960	84,754	73.44
48	1955	84,431	75.00
49	1969	83,668	76.56
50	1958	81,290	78.13
51	1992	80,732	79.69
52	1985	76,938	81.25
53	1951	76,448	82.81
54	1994	73,098	84.38
55	1954	65,526	85.94
56	1991	63,941	87.50
57	1967	61,052	89.06
58	2000	58,868	90.63
59	1999	51,023	92.19
60	1950	50,422	93.75
61	1959	50,082	95.31
62	1986	49,579	96.88
63	1941	37,896	98.44

YATES - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	433,854	1.56
2	1979	341,317	3.13
3	1961	339,018	4.69
4	1949	292,631	6.25
5	1998	251,795	7.81
6	1982	250,200	9.38
7	1962	242,829	10.94
8	1977	241,696	12.50
9	1972	241,092	14.06
10	1964	236,302	15.63
11	1971	233,986	17.19
12	1989	228,100	18.75
13	1976	220,912	20.31
14	1943	215,124	21.88
15	1957	212,596	23.44
16	1996	207,859	25.00
17	1946	205,583	26.56
18	1956	204,602	28.13
19	1983	202,350	29.69
20	1947	201,986	31.25
21	1942	200,602	32.81
22	1970	197,957	34.38
23	1997	187,455	35.94
24	1984	183,585	37.50
25	1945	172,552	39.06
26	1966	172,209	40.63
27	1993	165,923	42.19
28	1944	162,158	43.75
29	1939	157,751	45.31
30	1975	155,851	46.88
31	2001	153,192	48.44
32	1952	146,473	50.00
33	1995	138,800	51.56
34	1980	137,766	53.13
35	1978	135,083	54.69
36	1974	132,093	56.25
37	1948	130,403	57.81
38	1958	123,888	59.38
39	1940	122,658	60.94
40	1953	122,234	62.50
41	1987	121,101	64.06
42	1973	120,307	65.63
43	1963	119,919	67.19
44	1965	119,381	68.75
45	1960	116,431	70.31
46	1988	114,439	71.88
47	1981	113,041	73.44
48	1955	112,096	75.00
49	1992	110,271	76.56
50	1968	108,987	78.13
51	1969	108,052	79.69
52	1985	98,567	81.25
53	1951	94,028	82.81
54	1994	93,967	84.38
55	1991	81,406	85.94
56	1967	79,296	87.50
57	2000	79,139	89.06
58	1999	73,400	90.63
59	1954	72,306	92.19
60	1959	72,192	93.75
61	1950	64,485	95.31
62	1986	62,785	96.88
63	1941	51,118	98.44

Table YAT-2: Summary of FFA Results for Yates

YATES DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
167,000	176,000	0.20	211,000	140,000
154,000	160,000	0.40	192,000	130,000
149,000	155,000	0.50	185,000	127,000
136,000	140,000	1.00	166,000	116,000
122,000	125,000	2.00	147,000	106,000
108,000	110,000	4.00	128,000	94,600
104,000	105,000	5.00	122,000	91,000
89,100	90,000	10.00	103,000	79,300
74,000	74,300	20.00	83,500	66,700
68,800	69,000	25.00	77,100	62,200
64,400	64,600	30.00	71,800	58,400
57,100	57,200	40.00	63,100	51,900
50,900	50,900	50.00	56,000	46,300
45,300	45,200	60.00	49,800	41,000
39,900	39,800	70.00	43,900	35,800
34,300	34,100	80.00	38,000	30,400
27,600	27,300	90.00	31,100	23,900
23,000	22,600	95.00	26,300	19,500
7,500	6,450	99.99	9,730	5,310
MEAN	4.7001		HISTORIC EVENTS	0
STANDARD DEV	0.1987		HIGH OUTLIERS	0
COMPUTED SKEW	-0.2581		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.2000		SYSTEM EVENTS	63

YATES 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
423,000	450,000	0.20	544,000	349,000
382,000	401,000	0.40	482,000	319,000
368,000	386,000	0.50	463,000	309,000
329,000	341,000	1.00	406,000	279,000
290,000	298,000	2.00	352,000	249,000
252,000	257,000	4.00	300,000	220,000
240,000	245,000	5.00	284,000	211,000
203,000	206,000	10.00	235,000	181,000
166,000	167,000	20.00	188,000	150,000
154,000	155,000	25.00	173,000	139,000
144,000	144,000	30.00	160,000	130,000
127,000	127,000	40.00	140,000	115,000
113,000	113,000	50.00	124,000	103,000
101,000	100,000	60.00	111,000	91,000
88,900	88,600	70.00	97,900	79,800
76,800	76,400	80.00	85,200	68,100
62,800	62,100	90.00	70,600	54,400
53,100	52,200	95.00	60,700	45,000
20,500	18,200	99.99	26,000	15,000
MEAN	5.0532		HISTORIC EVENTS	0
STANDARD DEV	0.1992		HIGH OUTLIERS	0
COMPUTED SKEW	-0.0571		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	0.0000		SYSTEM EVENTS	63

YATES 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	95% (cfs)
519,000	549,000	0.20	660,000	432,000
473,000	495,000	0.40	592,000	397,000
458,000	478,000	0.50	571,000	386,000
413,000	427,000	1.00	506,000	352,000
368,000	377,000	2.00	444,000	317,000
323,000	329,000	4.00	383,000	282,000
309,000	314,000	5.00	363,000	271,000
264,000	266,000	10.00	304,000	235,000
217,000	218,000	20.00	245,000	196,000
202,000	203,000	25.00	226,000	183,000
189,000	189,000	30.00	210,000	171,000
167,000	167,000	40.00	185,000	152,000
149,000	149,000	50.00	164,000	135,000
133,000	132,000	60.00	146,000	120,000
117,000	117,000	70.00	129,000	105,000
101,000	100,000	80.00	112,000	89,500
82,000	81,100	90.00	92,200	71,000
68,900	67,700	95.00	78,700	58,300
24,600	21,500	99.99	31,500	17,700
MEAN	5.1695		HISTORIC EVENTS	0
STANDARD DEV	0.1980		HIGH OUTLIERS	0
COMPUTED SKEW	-0.0939		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

Figure YAT- 4: Exceedence Curve for Unregulated 1 Day Volume at Yates
(1939-2001)

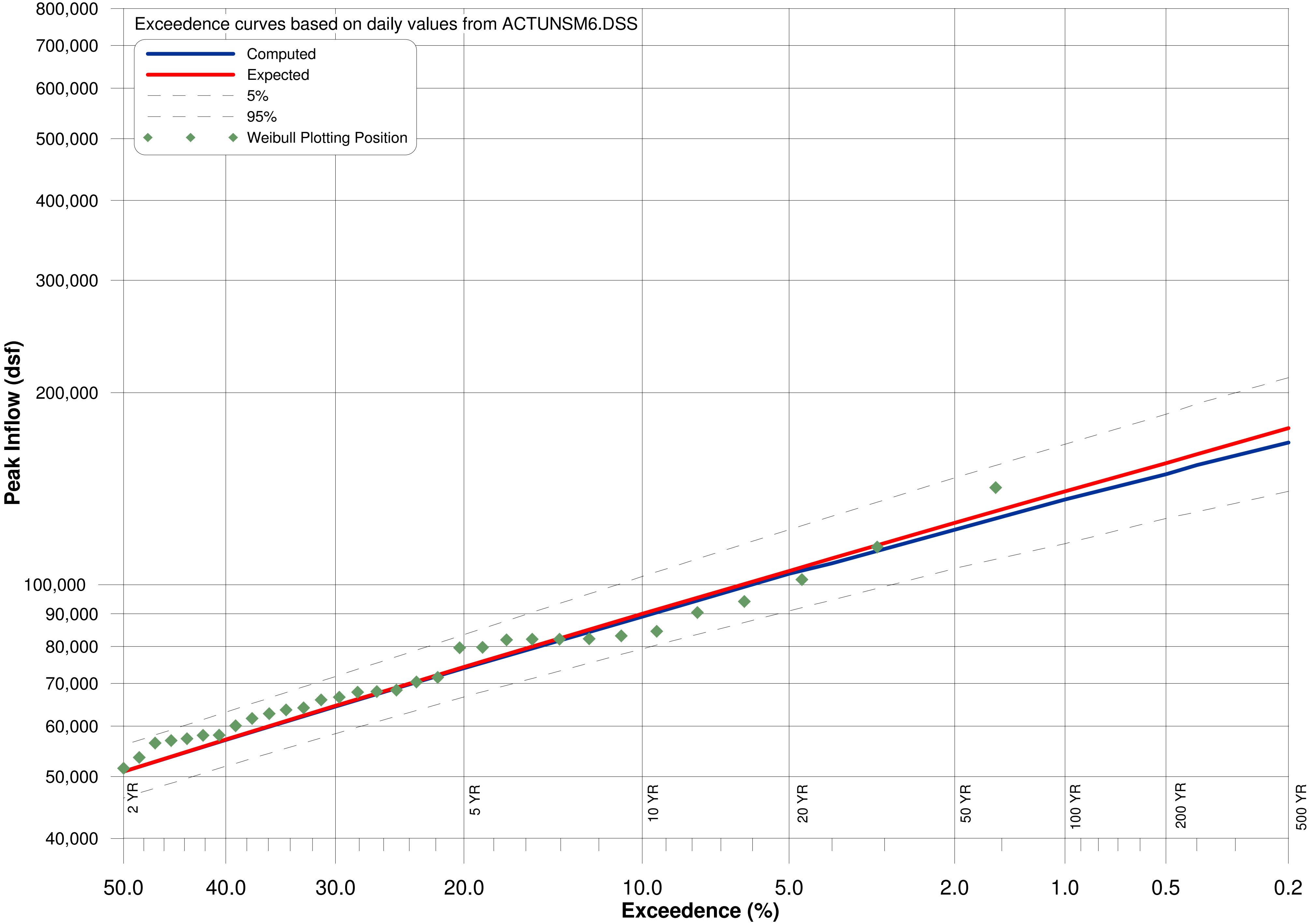

Figure YAT- 5: Exceedence Curve for Unregulated 3 Day Volume at Yates

(1939-2001)

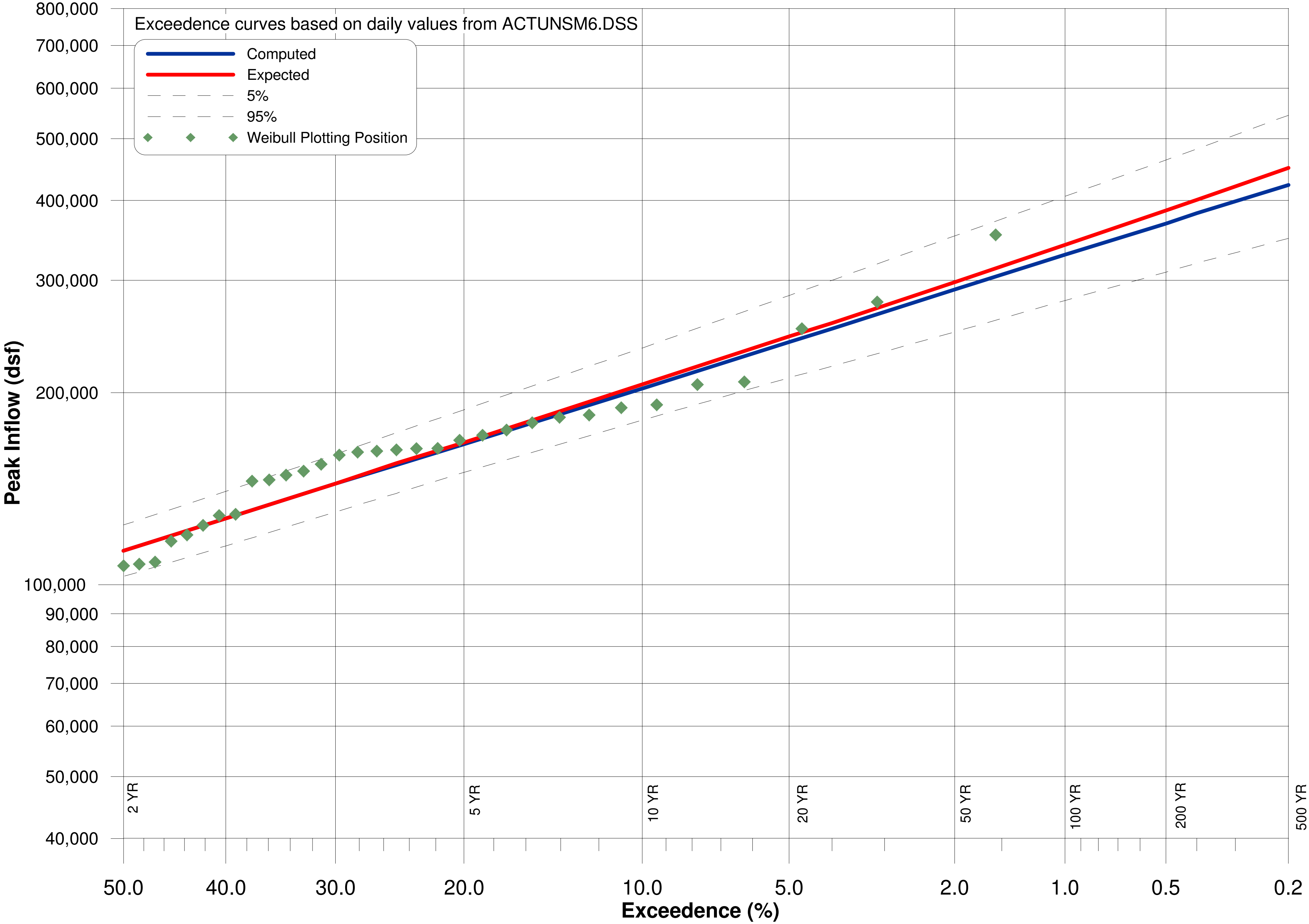

Figure YAT- 6: Exceedence Curve for Unregulated 5 Day Volume at Yates

(1939-2001)

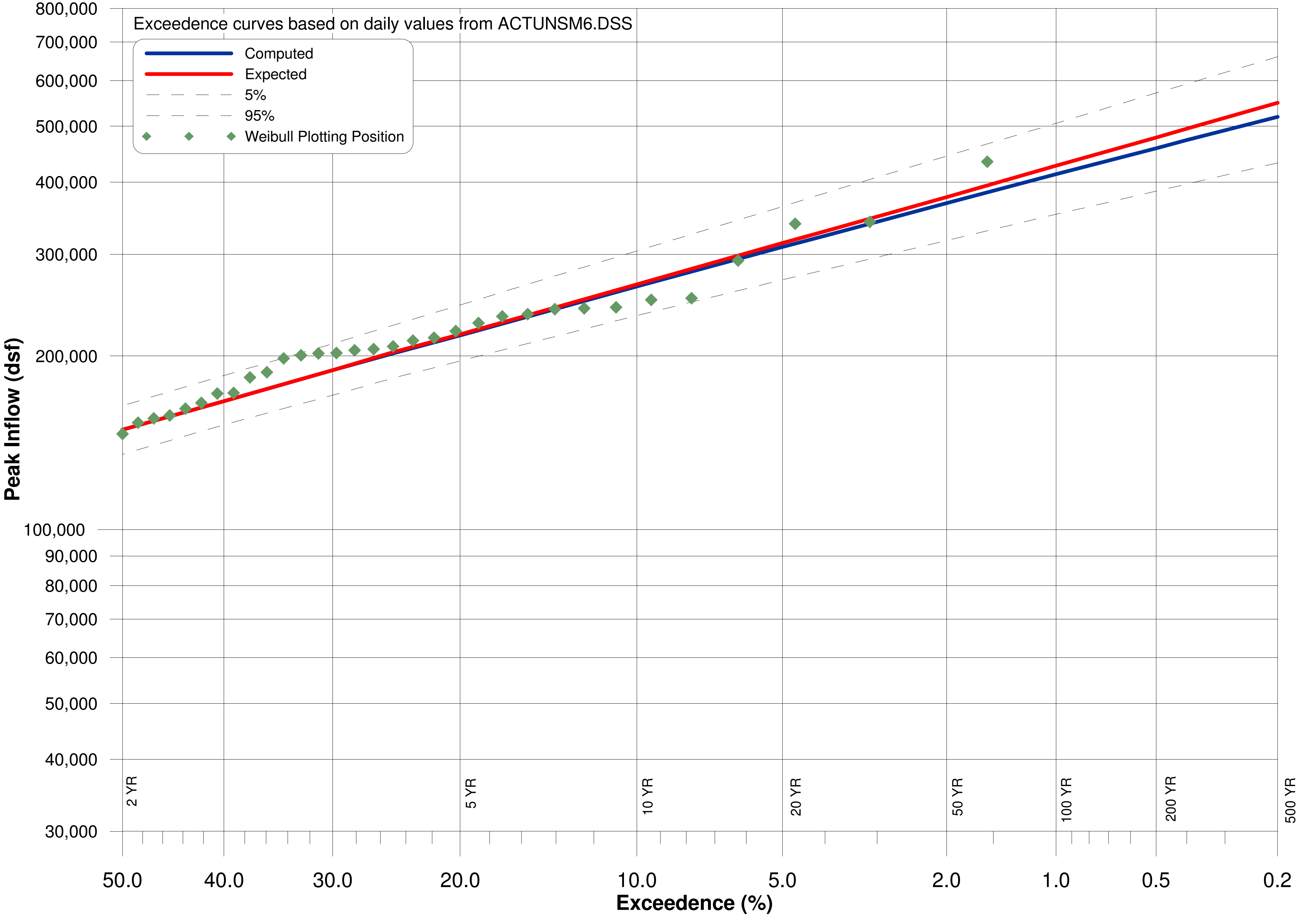

Table YAT-3: Regulation Impact on Flood Recurrences at Yates

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976		62,772	2	36,940	1
1977		67,840	2	63,290	2
1978		41,281	1	21,500	1
1979		114,552	25	119,410	25
1980		43,313	1	37,860	1
1981		45,181	1	9,660	1
1982	4/26/82	90,386	10	32,771	1
1983	5/21/83	66,643	2	38,796	1
1984	8/2/84	61,734	2	47,938	1
1985	2/6/85	31,926	1	9,588	1
1986	11/21/86	20,614	1	9,612	1
1987	3/6/87	42,660	1	10,670	1
1988	9/18/88	58,075	2	16,130	1
1989	6/20/89	84,507	5	74,420	5
1990	3/17/90	141,920	110	125,390	50
1991	6/27/91	26,500	1	16,530	1
1992	12/20/92	34,751	1	15,818	1
1993	1/23/93	68,361	2	10,273	1
1994	4/17/94	36,972	1	15,843	1
1995	10/6/95	53,588	2	34,401	1
1996	8/21/96	82,099	5	25,943	1
1997	6/18/97	56,480	2	17,573	1
1998	3/9/98	94,109	10	41,220	1
1999	6/29/99	21,822	1	18,473	1
2000	4/5/00	22,223	1	11,666	1
2001	4/5/01	56,952	2	33,354	1

Figure THU-1: FFA Datafile THU.DAT

```
TT TALLAPOOSA RIVER AT THURLOW INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1      1
FR     19    0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID THURLOW DSS 1939-2001
GS ALL                 0.0
QR          1939    57872
QR          1940    52106
QR          1941    18183
QR          1942    68781
QR          1943    82835
QR          1944    65051
QR          1945    80408
QR          1946    64316
QR          1947    83747
QR          1948    36226
QR          1949    85892
QR          1950    24655
QR          1951    32649
QR          1952    50346
QR          1953    37862
QR          1954    42306
QR          1955    38038
QR          1956    66734
QR          1957    74080
QR          1958    37001
QR          1959    19412
QR          1960    43420
QR          1961   109523
QR          1962    64919
QR          1963    39801
QR          1964    76180
QR          1965    42143
QR          1966    48559
QR          1967    28192
QR          1968    43738
QR          1969    44519
QR          1970    63354
QR          1971    82569
QR          1972    88382
QR          1973    37965
QR          1974    36168
QR          1975    51568
QR          1976    61496
QR          1977    68373
QR          1978    49734
QR          1979   104491
QR          1980    40755
QR          1981    57217
QR          1982    90354
QR          1983    66556
QR          1984    61419
QR          1985    32686
QR          1986    20932
QR          1987    41662
QR          1988    57018
QR          1989    80063
QR          1990   140790
QR          1991    26571
QR          1992    35303
QR          1993    68746
QR          1994    37144
QR          1995    54694
QR          1996    81798
QR          1997    57921
QR          1998    94513
QR          1999    21303
QR          2000    22217
QR          2001    60638
ED
```

Figure THU-2: FFA Datafile THU3.DAT

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TT TALLAPOOSA RIVER AT THURLOW INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID THURLOW 3 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR            1939  121506
QR            1940  104764
QR            1941   38591
QR            1942  163844
QR            1943  171452
QR            1944  139308
QR            1945  147091
QR            1946  150064
QR            1947  164540
QR            1948   90142
QR            1949  220988
QR            1950   51365
QR            1951   77022
QR            1952  111954
QR            1953   99112
QR            1954   66416
QR            1955   85626
QR            1956  163413
QR            1957  171248
QR            1958   83010
QR            1959   52348
QR            1960   88441
QR            1961  267574
QR            1962  156273
QR            1963  104235
QR            1964  192245
QR            1965  102465
QR            1966  108226
QR            1967   62769
QR            1968   92231
QR            1969   87328
QR            1970  154764
QR            1971  204555
QR            1972  190730
QR            1973   93054
QR            1974   99308
QR            1975  120547
QR            1976  160667
QR            1977  179639
QR            1978  126399
QR            1979  245692
QR            1980   99935
QR            1981  109317
QR            1982  191808
QR            1983  159213
QR            1984  116359
QR            1985   79068
QR            1986   49974
QR            1987   90368
QR            1988  102175
QR            1989  175042
QR            1990  351594
QR            1991   64264
QR            1992   82266
QR            1993  129946
QR            1994   73648
QR            1995  113051
QR            1996  165495
QR            1997  149823
QR            1998  205876
QR            1999   49524
QR            2000   58646
QR            2001  121494
ED
```

Figure THU-3: FFA Datafile THU5.DAT

```
TT TALLAPOOSA RIVER AT THURLOW INFLOW FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1     1
FR    19    0.20    0.40    0.50    1.00    2.00    4.00    5.00   10.00   20.00
FR 25.00   30.00   40.00   50.00   60.00   70.00   80.00   90.00   95.00   99.99
ID THURLOW 5 DAY VOLUME DSS 1939-2001
GS ALL               0.0
QR          1939  160435
QR          1940  123930
QR          1941   52230
QR          1942  203164
QR          1943  222142
QR          1944  175546
QR          1945  175411
QR          1946  207887
QR          1947  204971
QR          1948  132704
QR          1949  309955
QR          1950   65807
QR          1951   94729
QR          1952  148590
QR          1953  129877
QR          1954   73698
QR          1955  113858
QR          1956  207597
QR          1957  224553
QR          1958  126336
QR          1959   76039
QR          1960  123618
QR          1961  355353
QR          1962  246209
QR          1963  128250
QR          1964  253885
QR          1965  122631
QR          1966  174160
QR          1967   82222
QR          1968  112493
QR          1969  112976
QR          1970  206089
QR          1971  252832
QR          1972  243909
QR          1973  124928
QR          1974  141068
QR          1975  160495
QR          1976  207644
QR          1977  249167
QR          1978  158866
QR          1979  307886
QR          1980  134734
QR          1981  138746
QR          1982  248563
QR          1983  201688
QR          1984  183674
QR          1985  100617
QR          1986   63341
QR          1987  125475
QR          1988  112773
QR          1989  224965
QR          1990  431496
QR          1991   81025
QR          1992  112718
QR          1993  168313
QR          1994   94878
QR          1995  145816
QR          1996  215385
QR          1997  194189
QR          1998  256048
QR          1999   71771
QR          2000   78734
QR          2001  150996
ED
```

Table THU-1: Rankings of Flood Events at Thurlow

THURLOW			
Rank	Yr	Flow (cfs)	Position
1	1990	140,790	1.56
2	1961	109,523	3.13
3	1979	104,491	4.69
4	1998	94,513	6.25
5	1982	90,354	7.81
6	1972	88,382	9.38
7	1949	85,892	10.94
8	1947	83,747	12.50
9	1943	82,835	14.06
10	1971	82,569	15.63
11	1996	81,798	17.19
12	1945	80,408	18.75
13	1989	80,063	20.31
14	1964	76,180	21.88
15	1957	74,080	23.44
16	1942	68,781	25.00
17	1993	68,746	26.56
18	1977	68,373	28.13
19	1956	66,734	29.69
20	1983	66,556	31.25
21	1944	65,051	32.81
22	1962	64,919	34.38
23	1946	64,316	35.94
24	1970	63,354	37.50
25	1976	61,496	39.06
26	1984	61,419	40.63
27	2001	60,638	42.19
28	1997	57,921	43.75
29	1939	57,872	45.31
30	1981	57,217	46.88
31	1988	57,018	48.44
32	1995	54,694	50.00
33	1940	52,106	51.56
34	1975	51,568	53.13
35	1952	50,346	54.69
36	1978	49,734	56.25
37	1966	48,559	57.81
38	1969	44,519	59.38
39	1968	43,738	60.94
40	1960	43,420	62.50
41	1954	42,306	64.06
42	1965	42,143	65.63
43	1987	41,662	67.19
44	1980	40,755	68.75
45	1963	39,801	70.31
46	1955	38,038	71.88
47	1973	37,965	73.44
48	1953	37,862	75.00
49	1994	37,144	76.56
50	1958	37,001	78.13
51	1948	36,226	79.69
52	1974	36,168	81.25
53	1992	35,303	82.81
54	1985	32,686	84.38
55	1951	32,649	85.94
56	1967	28,192	87.50
57	1991	26,571	89.06
58	1950	24,655	90.63
59	2000	22,217	92.19
60	1999	21,303	93.75
61	1986	20,932	95.31
62	1959	19,412	96.88
63	1941	18,183	98.44

THURLOW - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	351,594	1.56
2	1961	267,574	3.13
3	1979	245,692	4.69
4	1949	220,988	6.25
5	1998	205,876	7.81
6	1971	204,555	9.38
7	1964	192,245	10.94
8	1982	191,808	12.50
9	1972	190,730	14.06
10	1977	179,639	15.63
11	1989	175,042	17.19
12	1943	171,452	18.75
13	1957	171,248	20.31
14	1996	165,495	21.88
15	1947	164,540	23.44
16	1942	163,844	25.00
17	1956	163,413	26.56
18	1976	160,667	28.13
19	1983	159,213	29.69
20	1962	156,273	31.25
21	1970	154,764	32.81
22	1946	150,064	34.38
23	1997	149,823	35.94
24	1945	147,091	37.50
25	1944	139,308	39.06
26	1993	129,946	40.63
27	1978	126,399	42.19
28	1939	121,506	43.75
29	2001	121,494	45.31
30	1975	120,547	46.88
31	1984	116,359	48.44
32	1995	113,051	50.00
33	1952	111,954	51.56
34	1981	109,317	53.13
35	1966	108,226	54.69
36	1940	104,764	56.25
37	1963	104,235	57.81
38	1965	102,465	59.38
39	1988	102,175	60.94
40	1980	99,935	62.50
41	1974	99,308	64.06
42	1953	99,112	65.63
43	1973	93,054	67.19
44	1968	92,231	68.75
45	1987	90,368	70.31
46	1948	90,142	71.88
47	1960	88,441	73.44
48	1969	87,328	75.00
49	1955	85,626	76.56
50	1958	83,010	78.13
51	1992	82,266	79.69
52	1985	79,068	81.25
53	1951	77,022	82.81
54	1994	73,648	84.38
55	1954	66,416	85.94
56	1991	64,264	87.50
57	1967	62,769	89.06
58	2000	58,646	90.63
59	1959	52,348	92.19
60	1950	51,365	93.75
61	1986	49,974	95.31
62	1999	49,524	96.88
63	1941	38,591	98.44

THURLOW - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	431,496	1.56
2	1961	355,353	3.13
3	1949	309,955	4.69
4	1979	307,886	6.25
5	1998	256,048	7.81
6	1964	253,885	9.38
7	1971	252,832	10.94
8	1977	249,167	12.50
9	1982	248,563	14.06
10	1962	246,209	15.63
11	1972	243,909	17.19
12	1989	224,965	18.75
13	1957	224,553	20.31
14	1943	222,142	21.88
15	1996	215,385	23.44
16	1946	207,887	25.00
17	1976	207,644	26.56
18	1956	207,597	28.13
19	1970	206,089	29.69
20	1947	204,971	31.25
21	1942	203,164	32.81
22	1983	201,688	34.38
23	1997	194,189	35.94
24	1984	183,674	37.50
25	1944	175,546	39.06
26	1945	175,411	40.63
27	1966	174,160	42.19
28	1993	168,313	43.75
29	1975	160,495	45.31
30	1939	160,435	46.88
31	1978	158,866	48.44
32	2001	150,996	50.00
33	1952	148,590	51.56
34	1995	145,816	53.13
35	1974	141,068	54.69
36	1981	138,746	56.25
37	1980	134,734	57.81
38	1948	132,704	59.38
39	1953	129,877	60.94
40	1963	128,250	62.50
41	1958	126,336	64.06
42	1987	125,475	65.63
43	1973	124,928	67.19
44	1940	123,930	68.75
45	1960	123,618	70.31
46	1965	122,631	71.88
47	1955	113,858	73.44
48	1969	112,976	75.00
49	1988	112,773	76.56
50	1992	112,718	78.13
51	1968	112,493	79.69
52	1985	100,617	81.25
53	1994	94,878	82.81
54	1951	94,729	84.38
55	1967	82,222	85.94
56	1991	81,025	87.50
57	2000	78,734	89.06
58	1959	76,039	90.63
59	1954	73,698	92.19
60	1999	71,771	93.75
61	1950	65,807	95.31
62	1986	63,341	96.88
63	1941	52,230	98.44

Table 8-2: Summary of FFA Results for Thurlow

THURLOW DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
162,000	169,000	0.20	202,000	136,000
150,000	155,000	0.40	185,000	127,000
146,000	151,000	0.50	180,000	124,000
134,000	138,000	1.00	163,000	115,000
121,000	124,000	2.00	145,000	105,000
108,000	110,000	4.00	128,000	95,000
104,000	106,000	5.00	122,000	91,600
90,400	91,200	10.00	104,000	80,500
75,600	76,000	20.00	85,300	68,100
70,400	70,700	25.00	78,900	63,700
66,100	66,300	30.00	73,700	59,900
58,700	58,800	40.00	64,900	53,400
52,400	52,400	50.00	57,700	47,600
46,600	46,500	60.00	51,200	42,200
41,000	40,900	70.00	45,200	36,900
35,100	34,900	80.00	39,000	31,200
28,200	27,800	90.00	31,700	24,400
23,300	22,800	95.00	26,700	19,600
6,950	5,890	99.99	9,120	4,840
MEAN	4.7092		HISTORIC EVENTS	0
STANDARD DEV	0.1983		HIGH OUTLIERS	0
COMPUTED SKEW	-0.3373		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

THURLOW 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
407,000	430,000	0.20	517,000	338,000
370,000	387,000	0.40	464,000	311,000
359,000	374,000	0.50	447,000	302,000
323,000	334,000	1.00	397,000	275,000
288,000	295,000	2.00	347,000	248,000
253,000	258,000	4.00	300,000	221,000
242,000	246,000	5.00	284,000	212,000
206,000	209,000	10.00	238,000	184,000
170,000	171,000	20.00	192,000	153,000
158,000	159,000	25.00	177,000	143,000
148,000	148,000	30.00	165,000	134,000
131,000	131,000	40.00	144,000	119,000
117,000	117,000	50.00	128,000	106,000
104,000	104,000	60.00	114,000	94,000
91,600	91,300	70.00	101,000	82,300
79,000	78,500	80.00	87,600	70,000
64,200	63,400	90.00	72,200	55,600
53,900	53,000	95.00	61,600	45,700
19,200	16,800	99.99	24,600	13,900
MEAN	5.0631		HISTORIC EVENTS	0
STANDARD DEV	0.1980		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1476		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

THURLOW 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
528,000	558,000	0.20	671,000	440,000
481,000	504,000	0.40	602,000	405,000
466,000	487,000	0.50	581,000	394,000
420,000	435,000	1.00	515,000	359,000
375,000	385,000	2.00	452,000	324,000
330,000	336,000	4.00	390,000	288,000
315,000	320,000	5.00	371,000	277,000
269,000	272,000	10.00	310,000	240,000
222,000	224,000	20.00	251,000	201,000
207,000	207,000	25.00	231,000	187,000
193,000	194,000	30.00	215,000	175,000
171,000	171,000	40.00	189,000	156,000
153,000	153,000	50.00	168,000	139,000
136,000	136,000	60.00	150,000	123,000
120,000	120,000	70.00	132,000	108,000
104,000	103,000	80.00	115,000	92,100
84,400	83,500	90.00	94,900	73,200
71,100	69,800	95.00	81,100	60,200
25,500	22,300	99.99	32,600	18,400
MEAN	5.1817		HISTORIC EVENTS	0
STANDARD DEV	0.1969		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1730		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

Figure THU- 4: Exceedence Curve for Unregulated 1 Day Volume at Thurlow

(1939-2001)

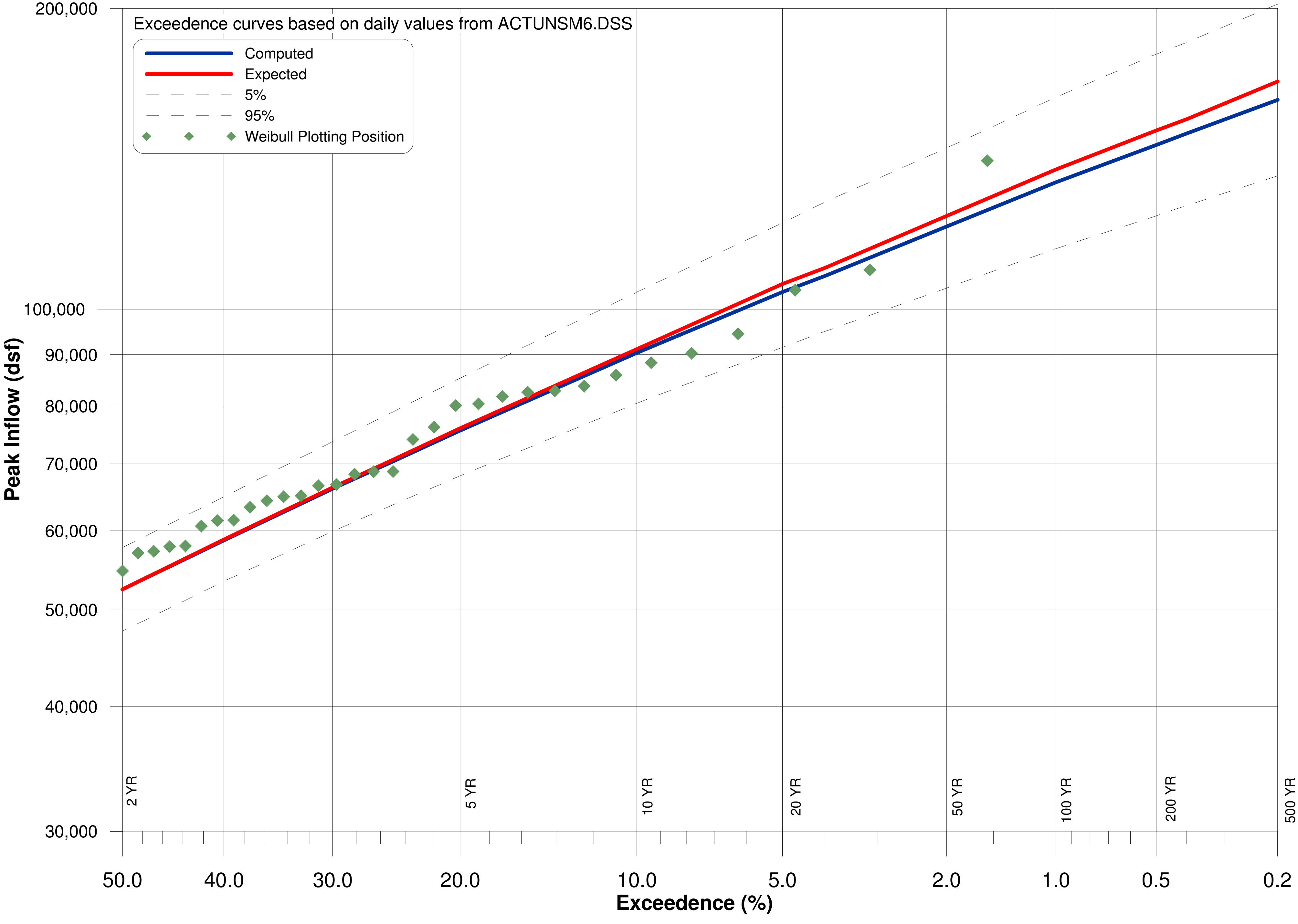

Figure THU- 5: Exceedence Curve for Unregulated 3 Day Volume at Thurlow

(1939-2001)

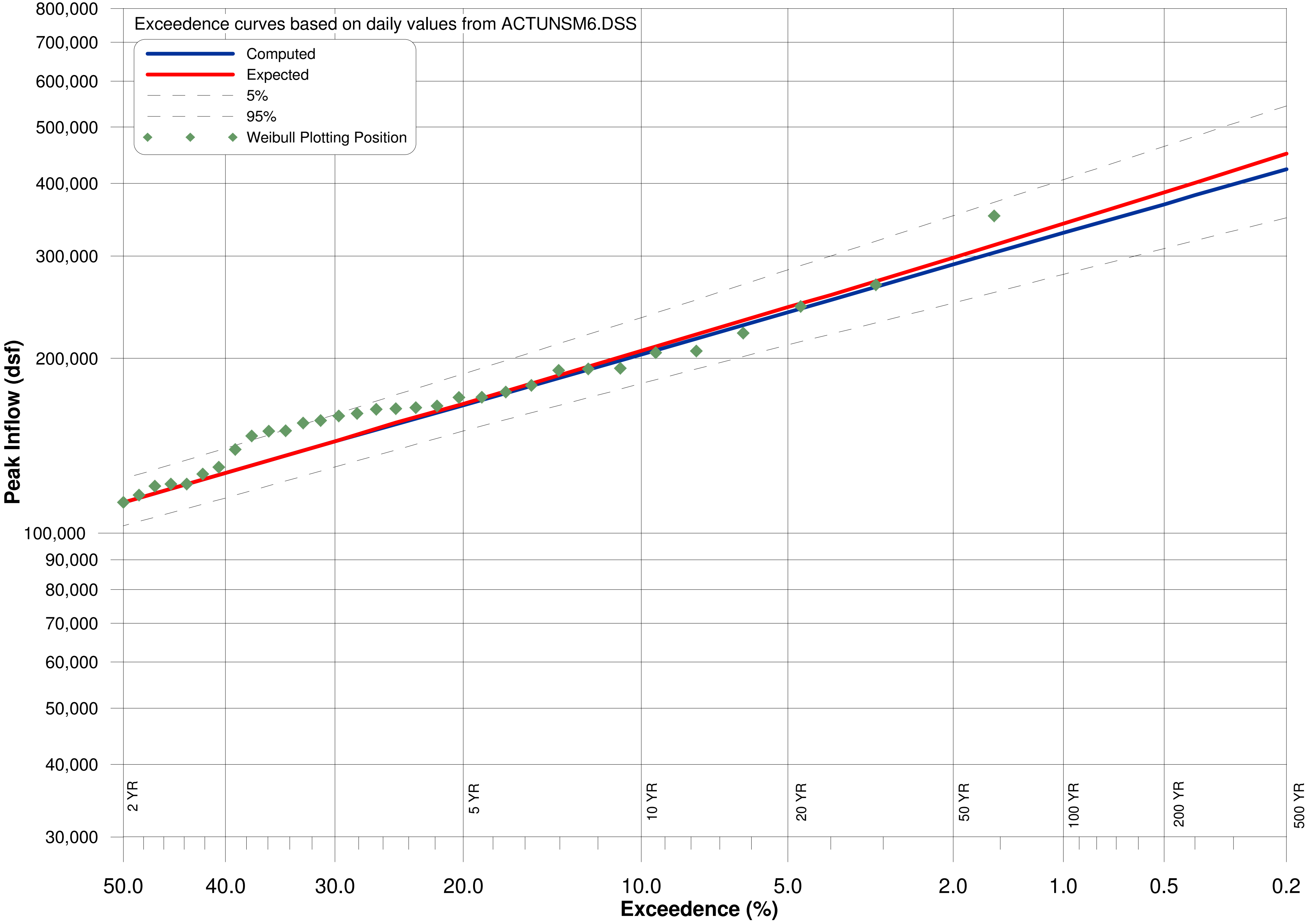

Figure THU - 6: Exceedence Curve for Unregulated 5 Day Volume at Thurlow
(1939-2001)

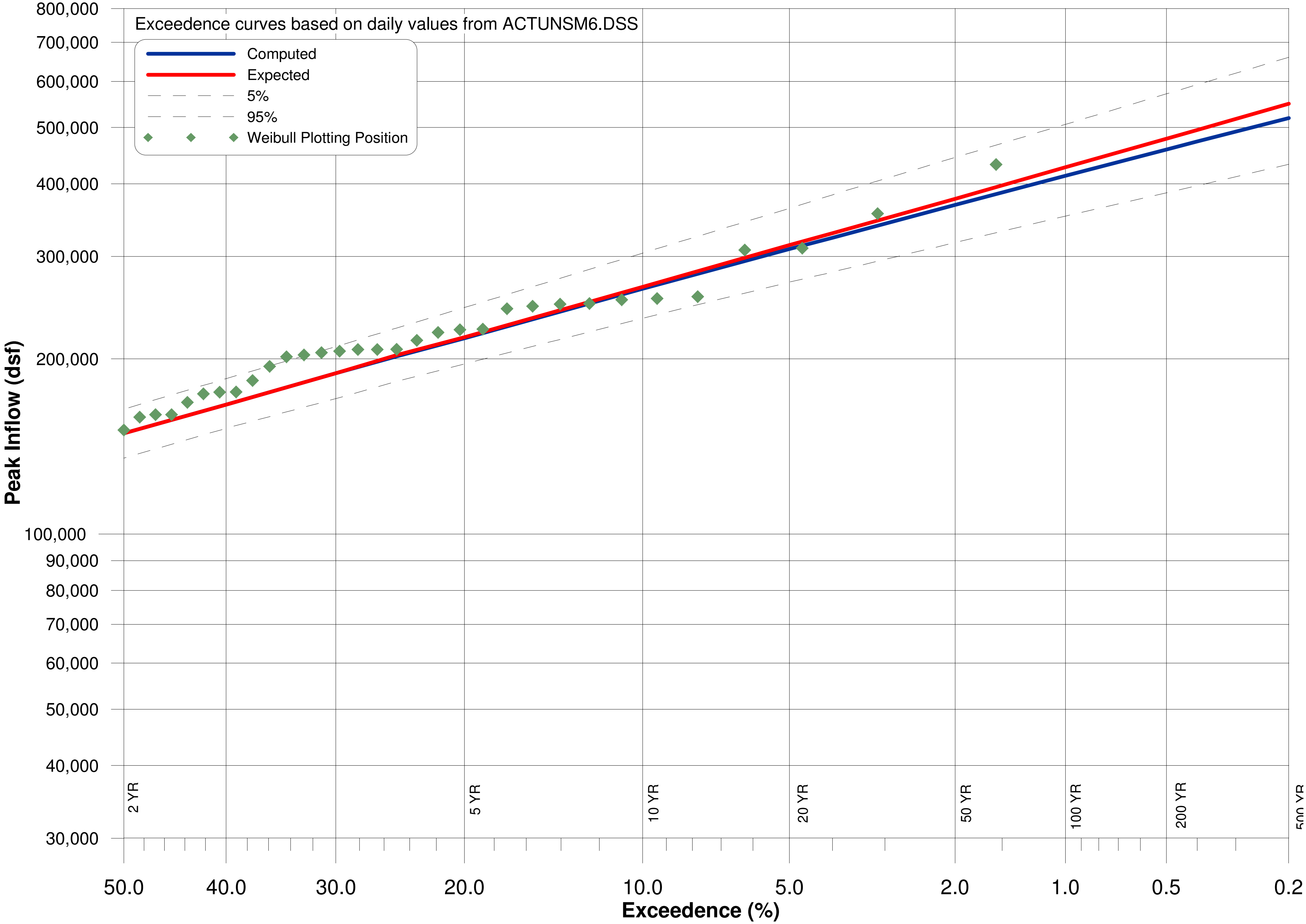

Table THU-3: Regulation Impact on Flood Recurrences at Thurlow

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976		61,496	2	36,182	1
1977		68,373	2	63,815	2
1978		49,734	1	21,769	1
1979		104,491	10	109,340	10
1980		40,755	1	35,188	1
1981		57,217	2	13,121	1
1982	4/26/82	90,354	5	32,603	1
1983	4/9/83	66,556	2	38,269	1
1984	8/2/84	61,419	2	47,613	1
1985	2/6/85	32,686	1	10,338	1
1986	12/1/86	20,932	1	10,139	1
1987	1/22/87	41,662	1	10,238	1
1988	9/18/88	57,018	2	16,003	1
1989	6/20/89	80,063	5	69,978	2
1990	3/18/90	140,790	120	124,250	50
1991	6/27/91	26,571	1	17,494	1
1992	12/22/92	35,303	1	17,097	1
1993	3/31/93	68,746	2	10,934	1
1994	7/7/94	37,144	1	16,250	1
1995	10/6/95	54,694	2	36,229	1
1996	2/3/96	81,798	5	25,854	1
1997	6/18/97	57,921	2	21,249	1
1998	3/10/98	94,513	10	40,842	1
1999	6/29/99	21,303	1	20,923	1
2000	4/5/00	22,217	1	11,411	1
2001	4/5/01	60,638	2	36,057	1

Figure TAL-1: FFA Datafile TAL.DAT

```
TT TALLAPOOSA RIVER AT WADLEY FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID WADLEY DSS 1939-2001
GS ALL                  0.0
QR            1939    57914
QR            1940    52149
QR            1941    18183
QR            1942    68845
QR            1943    82894
QR            1944    65447
QR            1945    80460
QR            1946    64372
QR            1947    83795
QR            1948    36454
QR            1949    86388
QR            1950    24683
QR            1951    32668
QR            1952    50454
QR            1953    38070
QR            1954    42352
QR            1955    38074
QR            1956    66795
QR            1957    74277
QR            1958    37050
QR            1959    19474
QR            1960    43543
QR            1961   110134
QR            1962    64983
QR            1963    40024
QR            1964    76642
QR            1965    42196
QR            1966    48602
QR            1967    28240
QR            1968    43783
QR            1969    44609
QR            1970    63390
QR            1971    82819
QR            1972    88444
QR            1973    38130
QR            1974    36224
QR            1975    51901
QR            1976    61570
QR            1977    68758
QR            1978    49799
QR            1979   105151
QR            1980    40861
QR            1981    57289
QR            1982    90444
QR            1983    66675
QR            1984    61706
QR            1985    32747
QR            1986    20949
QR            1987    41707
QR            1988    57066
QR            1989    80397
QR            1990   141539
QR            1991    26611
QR            1992    35362
QR            1993    68811
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QR            1995    54693
QR            1996    81797
QR            1997    57896
QR            1998    94503
QR            1999    21282
QR            2000    22225
QR            2001    60689
ED
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Figure TAL-2: FFA Datafile TAL3.DAT

```
TT TALLAPOOSA RIVER AT WADLEY FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 3 DAY VOLUME
J1      1
FR     19     0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00    30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID WADLEY 3 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR           1939  121652
QR           1940  104857
QR           1941   38644
QR           1942  163994
QR           1943  171692
QR           1944  140136
QR           1945  147227
QR           1946  150185
QR           1947  164691
QR           1948   90255
QR           1949  222036
QR           1950   51437
QR           1951   77066
QR           1952  112288
QR           1953   99250
QR           1954   66485
QR           1955   85719
QR           1956  163571
QR           1957  171870
QR           1958   83145
QR           1959   52527
QR           1960   88733
QR           1961  268816
QR           1962  156423
QR           1963  104746
QR           1964  193267
QR           1965  102622
QR           1966  108316
QR           1967   62903
QR           1968   92390
QR           1969   87656
QR           1970  154930
QR           1971  205210
QR           1972  190917
QR           1973   93586
QR           1974   99466
QR           1975  121158
QR           1976  160919
QR           1977  180492
QR           1978  126589
QR           1979  247067
QR           1980  100091
QR           1981  109476
QR           1982  192039
QR           1983  159689
QR           1984  117044
QR           1985   79248
QR           1986   50013
QR           1987   90523
QR           1988  102337
QR           1989  176046
QR           1990  353133
QR           1991   64394
QR           1992   82435
QR           1993  130151
QR           1994   73701
QR           1995  113135
QR           1996  165489
QR           1997  149838
QR           1998  205805
QR           1999   49570
QR           2000   58653
QR           2001  121481
ED
```

Figure TAL-3: FFA Datafile TAL5.DAT

```
TT TALLAPOOSA RIVER AT TALLASSEE FREQUENCY ANALYSIS PROGRAM
TT LOG-PEARSON TYPE III DIST
TT 1939-2001 5 DAY VOLUME
J1     1
FR    19    0.20     0.40     0.50     1.00     2.00     4.00     5.00    10.00    20.00
FR 25.00   30.00    40.00    50.00    60.00    70.00    80.00    90.00    95.00    99.99
ID TALLASSEE 5 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR          1939  160646
QR          1940  124027
QR          1941   52314
QR          1942  203364
QR          1943  222699
QR          1944  176613
QR          1945  175636
QR          1946  208066
QR          1947  205206
QR          1948  132883
QR          1949  311337
QR          1950   65907
QR          1951   94780
QR          1952  148754
QR          1953  130645
QR          1954   73805
QR          1955  113995
QR          1956  207832
QR          1957  225506
QR          1958  126527
QR          1959   76343
QR          1960  124187
QR          1961  356654
QR          1962  246475
QR          1963  128912
QR          1964  255286
QR          1965  122885
QR          1966  174311
QR          1967   82451
QR          1968  112768
QR          1969  113363
QR          1970  206450
QR          1971  253800
QR          1972  244294
QR          1973  125629
QR          1974  141334
QR          1975  161092
QR          1976  208231
QR          1977  250458
QR          1978  159166
QR          1979  309661
QR          1980  135426
QR          1981  138967
QR          1982  248914
QR          1983  202420
QR          1984  184044
QR          1985  100874
QR          1986   63393
QR          1987  125726
QR          1988  113065
QR          1989  226269
QR          1990  433501
QR          1991   81225
QR          1992  113003
QR          1993  168705
QR          1994   94952
QR          1995  145931
QR          1996  215362
QR          1997  194287
QR          1998  256019
QR          1999   71885
QR          2000   78748
QR          2001  150975
ED
```

Table TAL-1: Rankings of Flood Events at Tallassee

TALLASSEE			
Rank	Yr	Flow (cfs)	Position
1	1990	141,539	1.56
2	1961	110,134	3.13
3	1979	105,151	4.69
4	1998	94,503	6.25
5	1982	90,444	7.81
6	1972	88,444	9.38
7	1949	86,388	10.94
8	1947	83,795	12.50
9	1943	82,894	14.06
10	1971	82,819	15.63
11	1996	81,797	17.19
12	1945	80,460	18.75
13	1989	80,397	20.31
14	1964	76,642	21.88
15	1957	74,277	23.44
16	1942	68,845	25.00
17	1993	68,811	26.56
18	1977	68,758	28.13
19	1956	66,795	29.69
20	1983	66,675	31.25
21	1944	65,447	32.81
22	1962	64,983	34.38
23	1946	64,372	35.94
24	1970	63,390	37.50
25	1984	61,706	39.06
26	1976	61,570	40.63
27	2001	60,689	42.19
28	1939	57,914	43.75
29	1997	57,896	45.31
30	1981	57,289	46.88
31	1988	57,066	48.44
32	1995	54,693	50.00
33	1940	52,149	51.56
34	1975	51,901	53.13
35	1952	50,454	54.69
36	1978	49,799	56.25
37	1966	48,602	57.81
38	1969	44,609	59.38
39	1968	43,783	60.94
40	1960	43,543	62.50
41	1954	42,352	64.06
42	1965	42,196	65.63
43	1987	41,707	67.19
44	1980	40,861	68.75
45	1963	40,024	70.31
46	1973	38,130	71.88
47	1955	38,074	73.44
48	1953	38,070	75.00
49	1994	37,181	76.56
50	1958	37,050	78.13
51	1948	36,454	79.69
52	1974	36,224	81.25
53	1992	35,362	82.81
54	1985	32,747	84.38
55	1951	32,668	85.94
56	1967	28,240	87.50
57	1991	26,611	89.06
58	1950	24,683	90.63
59	2000	22,225	92.19
60	1999	21,282	93.75
61	1986	20,949	95.31
62	1959	19,474	96.88
63	1941	18,183	98.44

TALLASSEE - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	351,594	1.56
2	1961	267,574	3.13
3	1979	245,692	4.69
4	1949	220,988	6.25
5	1998	205,876	7.81
6	1971	204,555	9.38
7	1964	192,245	10.94
8	1982	191,808	12.50
9	1972	190,730	14.06
10	1977	179,639	15.63
11	1989	175,042	17.19
12	1943	171,452	18.75
13	1957	171,248	20.31
14	1996	165,495	21.88
15	1947	164,540	23.44
16	1942	163,844	25.00
17	1956	163,413	26.56
18	1976	160,667	28.13
19	1983	159,213	29.69
20	1962	156,273	31.25
21	1970	154,764	32.81
22	1946	150,064	34.38
23	1997	149,823	35.94
24	1945	147,091	37.50
25	1944	139,308	39.06
26	1993	129,946	40.63
27	1978	126,399	42.19
28	1939	121,506	43.75
29	2001	121,494	45.31
30	1975	120,547	46.88
31	1984	116,359	48.44
32	1995	113,051	50.00
33	1952	111,954	51.56
34	1981	109,317	53.13
35	1966	108,226	54.69
36	1940	104,764	56.25
37	1963	104,235	57.81
38	1965	102,465	59.38
39	1988	102,175	60.94
40	1980	99,935	62.50
41	1974	99,308	64.06
42	1953	99,112	65.63
43	1973	93,054	67.19
44	1968	92,231	68.75
45	1987	90,368	70.31
46	1948	90,142	71.88
47	1960	88,441	73.44
48	1969	87,328	75.00
49	1955	85,626	76.56
50	1958	83,010	78.13
51	1992	82,266	79.69
52	1985	79,068	81.25
53	1951	77,022	82.81
54	1994	73,648	84.38
55	1954	66,416	85.94
56	1991	64,264	87.50
57	1967	62,769	89.06
58	2000	58,646	90.63
59	1959	52,348	92.19
60	1950	51,365	93.75
61	1986	49,974	95.31
62	1999	49,524	96.88
63	1941	38,591	98.44

TALLASSEE - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	431,496	1.56
2	1961	355,353	3.13
3	1949	309,955	4.69
4	1979	307,886	6.25
5	1998	256,048	7.81
6	1964	253,885	9.38
7	1971	252,832	10.94
8	1977	249,167	12.50
9	1982	248,563	14.06
10	1962	246,209	15.63
11	1972	243,909	17.19
12	1989	224,965	18.75
13	1957	224,553	20.31
14	1943	222,142	21.88
15	1996	215,385	23.44
16	1946	207,887	25.00
17	1976	207,644	26.56
18	1956	207,597	28.13
19	1970	206,089	29.69
20	1947	204,971	31.25
21	1942	203,164	32.81
22	1983	201,688	34.38
23	1997	194,189	35.94
24	1984	183,674	37.50
25	1944	175,546	39.06
26	1945	175,411	40.63
27	1966	174,160	42.19
28	1993	168,313	43.75
29	1975	160,495	45.31
30	1939	160,435	46.88
31	1978	158,866	48.44
32	2001	150,996	50.00
33	1952	148,590	51.56
34	1995	145,816	53.13
35	1974	141,068	54.69
36	1981	138,746	56.25
37	1980	134,734	57.81
38	1948	132,704	59.38
39	1953	129,877	60.94
40	1963	128,250	62.50
41	1958	126,336	64.06
42	1987	125,475	65.63
43	1973	124,928	67.19
44	1940	123,930	68.75
45	1960	123,618	70.31
46	1965	122,631	71.88
47	1955	113,858	73.44
48	1969	112,976	75.00
49	1988	112,773	76.56
50	1992	112,718	78.13
51	1968	112,493	79.69
52	1985	100,617	81.25
53	1994	94,878	82.81
54	1951	94,729	84.38
55	1967	82,222	85.94
56	1991	81,025	87.50
57	2000	78,734	89.06
58	1959	76,039	90.63
59	1954	73,698	92.19
60	1999	71,771	93.75
61	1950	65,807	95.31
62	1986	63,341	96.88
63	1941	52,230	98.44

Table TAL-2: Summary of FFA Results for Tallassee

TALLASSEE DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
162,000	169,000	0.20	203,000	136,000
150,000	156,000	0.40	186,000	127,000
146,000	152,000	0.50	180,000	125,000
134,000	138,000	1.00	163,000	115,000
122,000	124,000	2.00	146,000	106,000
109,000	110,000	4.00	128,000	95,300
104,000	106,000	5.00	123,000	91,900
90,600	91,500	10.00	104,000	80,700
75,800	76,100	20.00	85,500	68,300
70,600	70,800	25.00	79,100	63,800
66,200	66,400	30.00	73,800	60,100
58,800	58,900	40.00	65,100	53,500
52,500	52,500	50.00	57,800	47,700
46,700	46,600	60.00	51,300	42,300
41,100	40,900	70.00	45,200	36,900
35,200	35,000	80.00	39,000	31,200
28,200	27,800	90.00	31,700	24,400
23,300	22,800	95.00	26,700	19,700
6,950	5,890	99.99	9,120	4,840
MEAN	4.7101		HISTORIC EVENTS	0
STANDARD DEV	0.1985		HIGH OUTLIERS	0
COMPUTED SKEW	-0.3361		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.3000		SYSTEM EVENTS	63

TALLASSEE 3-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
408,000	431,000	0.20	519,000	339,000
371,000	389,000	0.40	466,000	312,000
360,000	376,000	0.50	449,000	303,000
324,000	335,000	1.00	398,000	276,000
289,000	296,000	2.00	349,000	249,000
254,000	258,000	4.00	301,000	222,000
242,000	246,000	5.00	285,000	213,000
207,000	209,000	10.00	239,000	184,000
171,000	171,000	20.00	192,000	154,000
158,000	159,000	25.00	177,000	143,000
148,000	148,000	30.00	165,000	134,000
131,000	131,000	40.00	145,000	119,000
117,000	117,000	50.00	129,000	106,000
104,000	104,000	60.00	114,000	94,100
91,700	91,400	70.00	101,000	82,400
79,100	78,600	80.00	87,700	70,200
64,300	63,500	90.00	72,300	55,700
54,000	53,000	95.00	61,700	45,700
19,200	16,800	99.99	24,600	13,900
MEAN	5.0641		HISTORIC EVENTS	0
STANDARD DEV	0.1982		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1454		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

TALLASSEE 5-DAY DSS DATA 1939-2001				
Computed Curve (cfs)	Expected Probability (cfs)	% Chance Exceedance	Confidence Limits 5% (cfs)	Confidence Limits 95% (cfs)
530,000	560,000	0.20	673,000	441,000
483,000	505,000	0.40	605,000	406,000
468,000	488,000	0.50	583,000	395,000
422,000	436,000	1.00	517,000	360,000
376,000	386,000	2.00	453,000	325,000
331,000	337,000	4.00	391,000	289,000
316,000	321,000	5.00	372,000	278,000
270,000	273,000	10.00	311,000	241,000
223,000	224,000	20.00	251,000	201,000
207,000	208,000	25.00	232,000	188,000
194,000	194,000	30.00	216,000	176,000
172,000	172,000	40.00	190,000	156,000
153,000	153,000	50.00	168,000	139,000
136,000	136,000	60.00	150,000	124,000
120,000	120,000	70.00	133,000	108,000
104,000	103,000	80.00	115,000	92,300
84,600	83,600	90.00	95,100	73,300
71,200	69,900	95.00	81,200	60,300
25,500	22,300	99.99	32,600	18,400
MEAN	5.1817		HISTORIC EVENTS	0
STANDARD DEV	0.1969		HIGH OUTLIERS	0
COMPUTED SKEW	-0.1730		LOW OUTLIERS	0
REGIONAL SKEW	0.0000		ZERO OR MISSING	0
ADOPTED SKEW	-0.1000		SYSTEM EVENTS	63

Figure TAL-4: Exceedence Curve for Unregulated 1 Day Volume at Tallasee

(1939-2001)

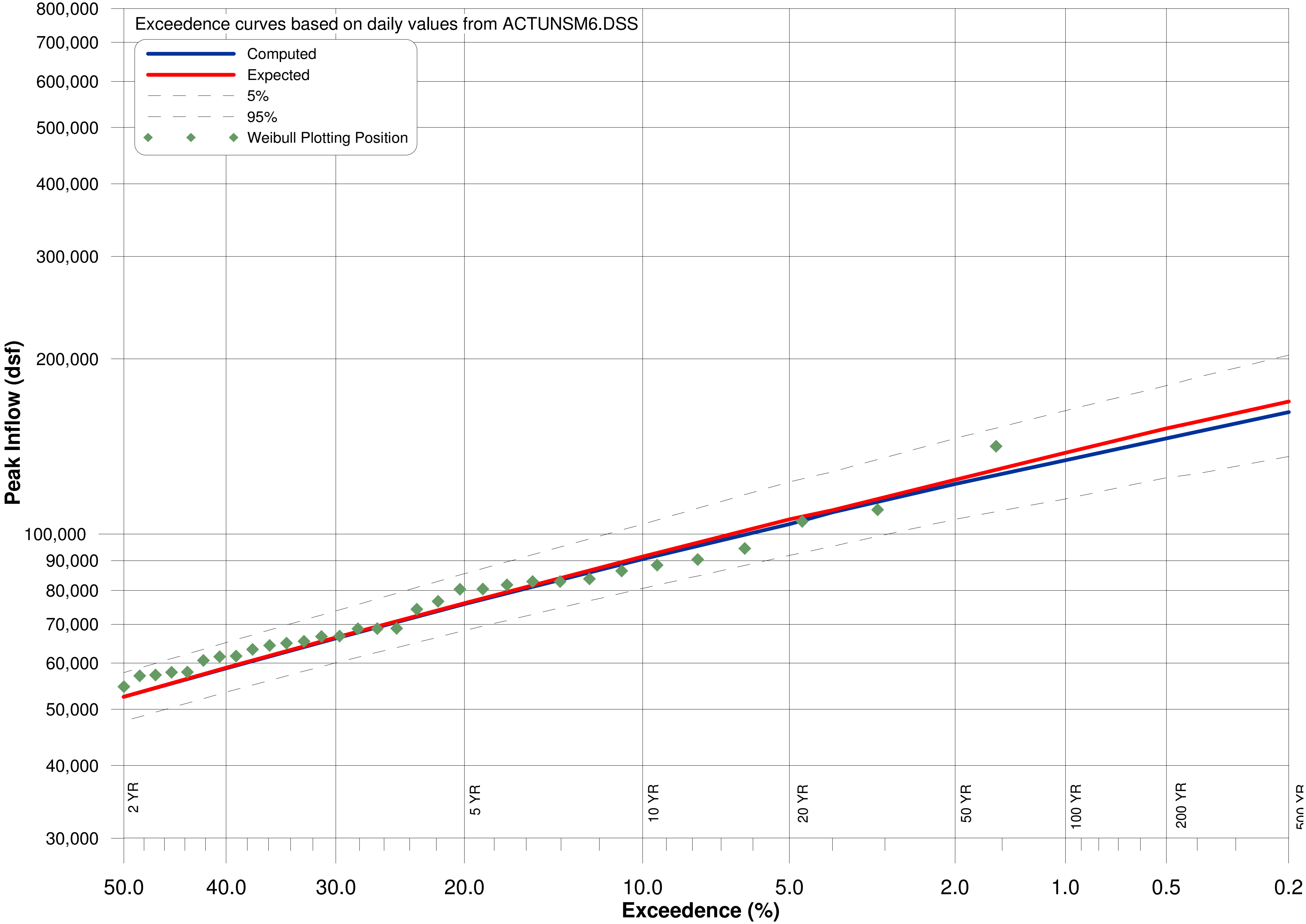

Figure TAL-5: Exceedence Curve for Unregulated 3 Day Volume at Tallassee

(1939-2001)

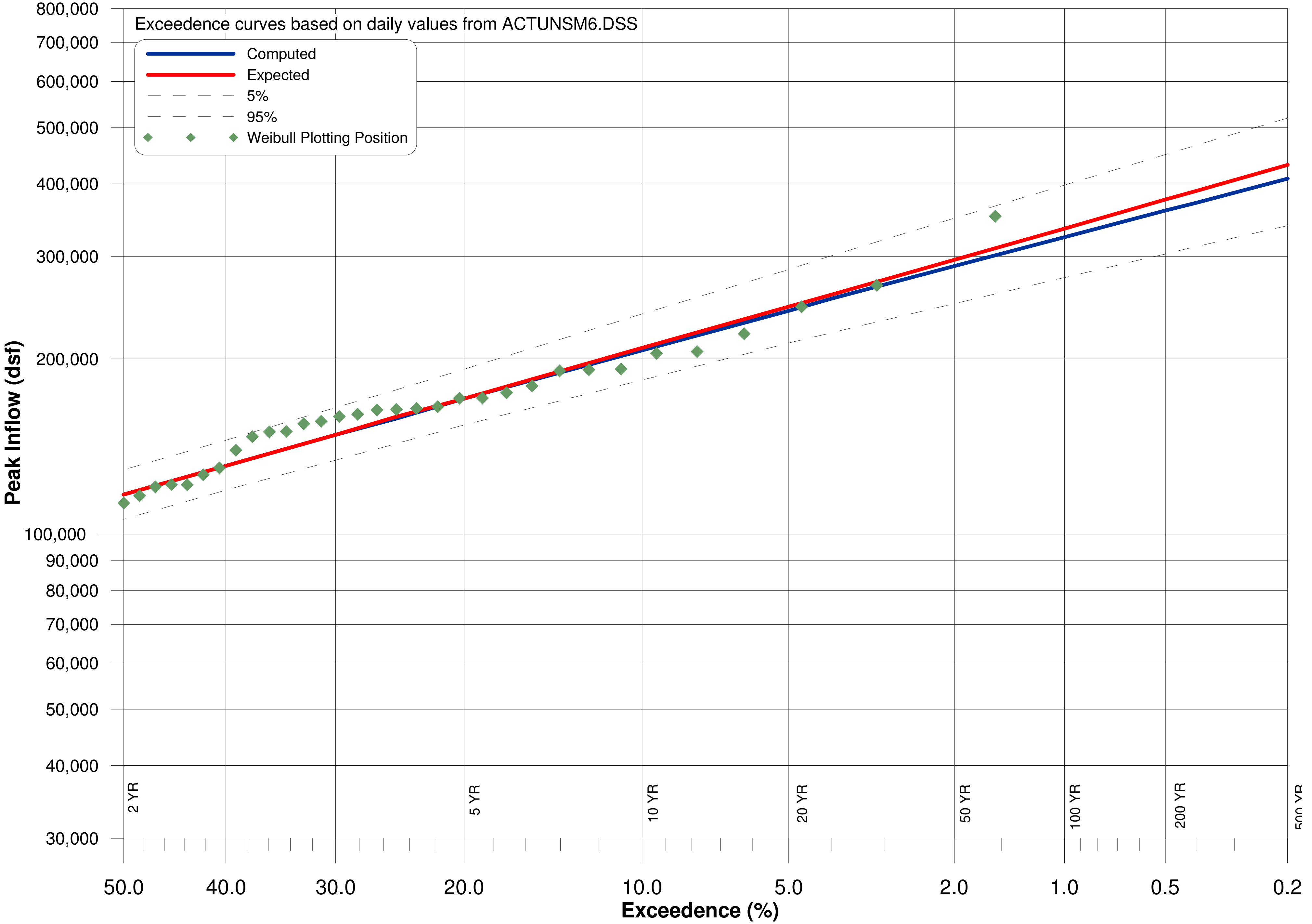

Figure TAL- 6: Exceedence Curve for Unregulated 5 Day Volume at Tallassee

(1939-2001)

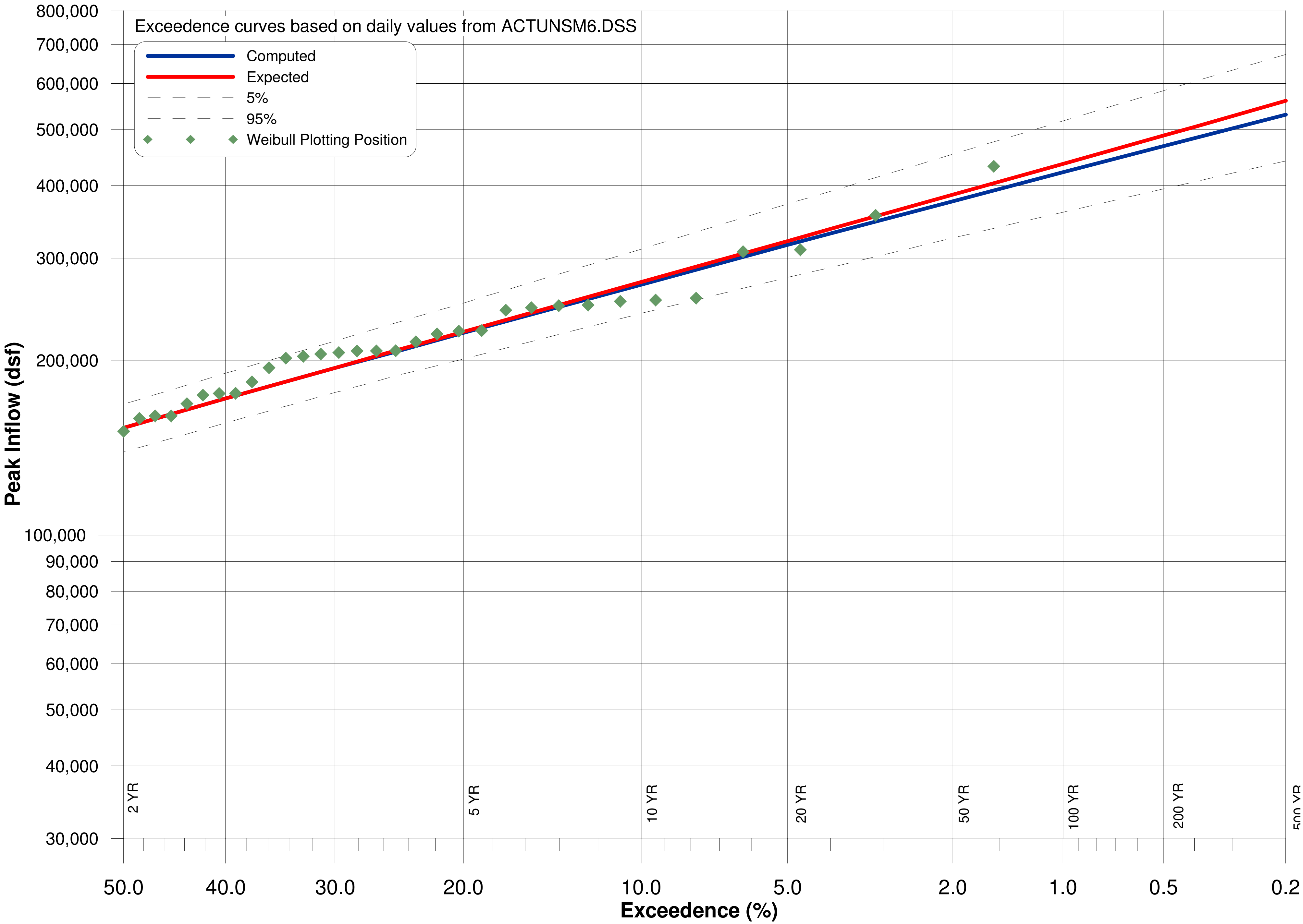

Table TAL-3: Regulation Impact on Flood Recurrences at Tallasse

Water Yr	Date of Event	Unregulated Flow (cfs)	Recurrence Interval	Regulated Discharge (cfs)	Recurrence Interval
1976		61,496	2	36182	1
1977		68,373	2	63815	2
1978		49,734	1	21769	1
1979		104,491	10	109340	10
1980		40,755	1	35188	1
1981		57,217	2	13121	1
1982	4/26/82	90,354	5	32603	1
1983	4/9/83	66,556	2	38269	1
1984	8/2/84	61,419	2	47613	1
1985	2/6/85	32,686	1	10338	1
1986	12/1/86	20,932	1	10139	1
1987	1/22/87	41,662	1	10238	1
1988	9/18/88	57,018	2	16003	1
1989	6/20/89	80,063	5	69978	2
1990	3/18/90	140,790	110	124250	50
1991	6/27/91	26,571	1	17494	1
1992	12/22/92	35,303	1	17097	1
1993	3/31/93	68,746	2	10934	1
1994	7/7/94	37,144	1	16250	1
1995	10/6/95	54,694	2	36229	1
1996	2/3/96	81,798	5	25854	1
1997	6/18/97	57,921	2	21249	1
1998	3/10/98	94,513	10	40842	1
1999	6/29/99	21,303	1	20923	1
2000	4/5/00	22,217	1	11411	1
2001	4/5/01	60,638	2	36057	1

APPENDIX C

FLOW DURATION CURVES

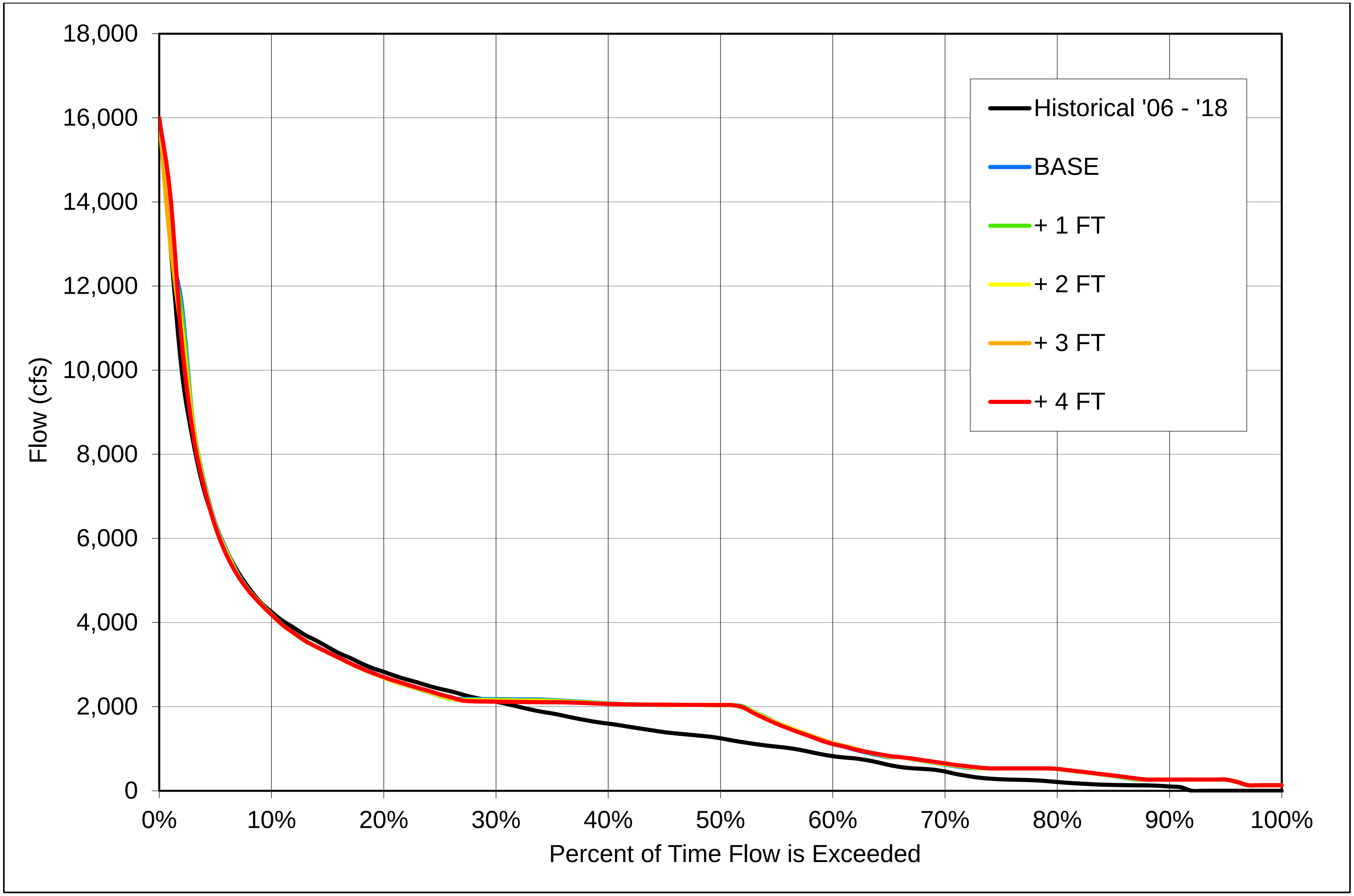

FIGURE C–1 HARRIS RESERVOIR ANNUAL FLOW DURATION CURVE

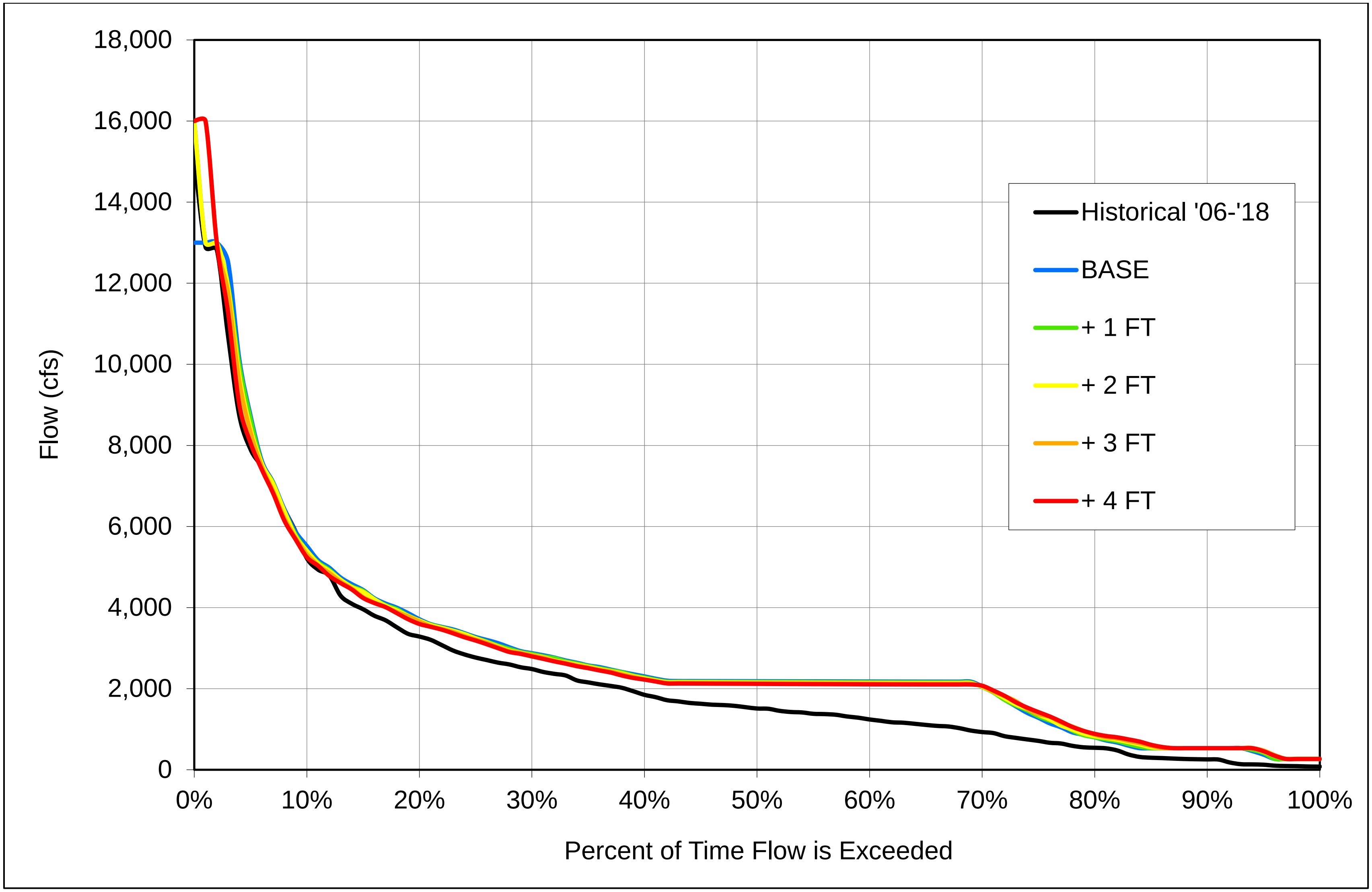

FIGURE C–2 HARRIS RESERVOIR -JANUARY FLOW DURATION CURVE

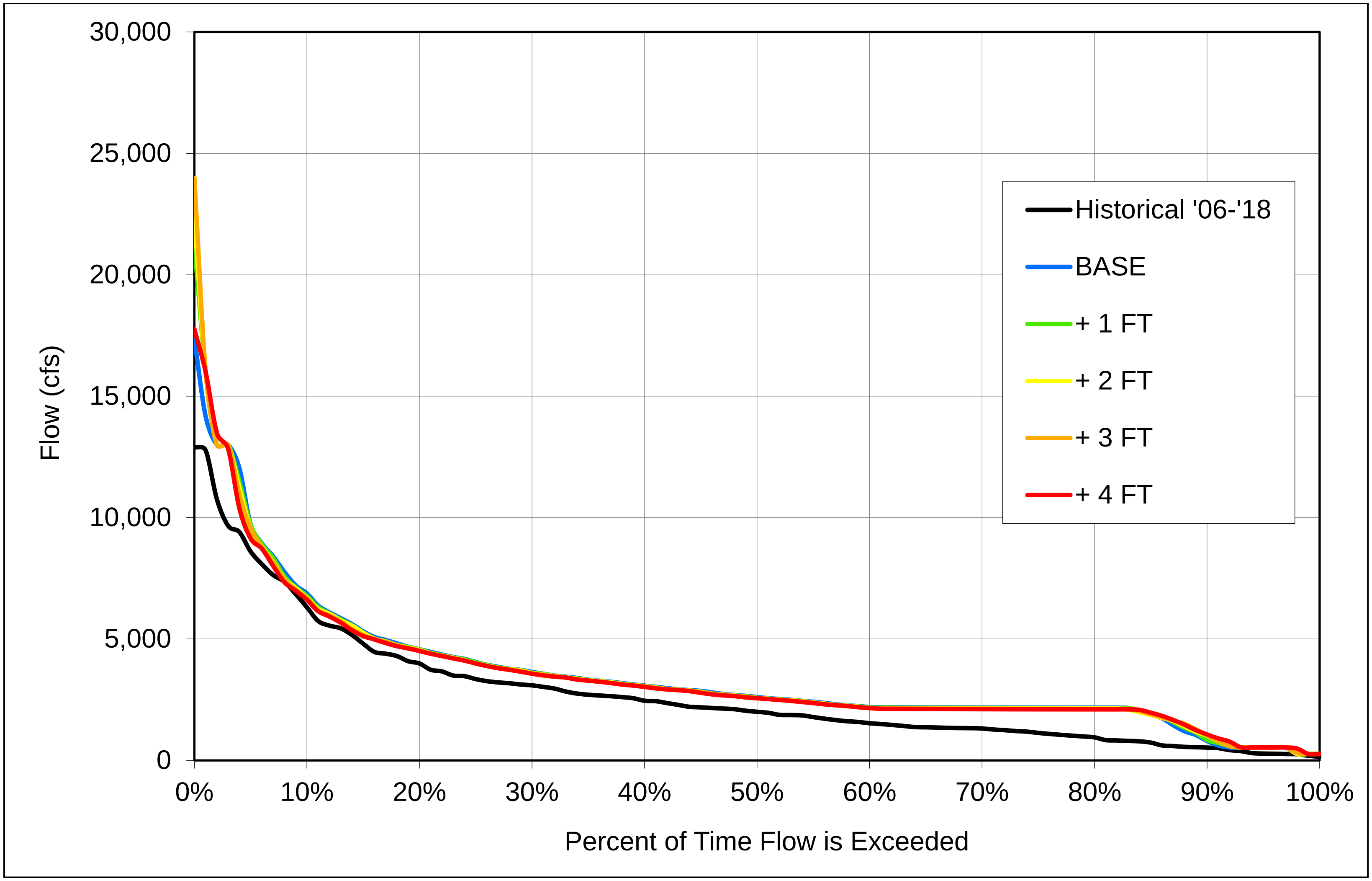

FIGURE C–3 HARRIS RESERVOIR -FEBRUARY FLOW DURATION CURVE

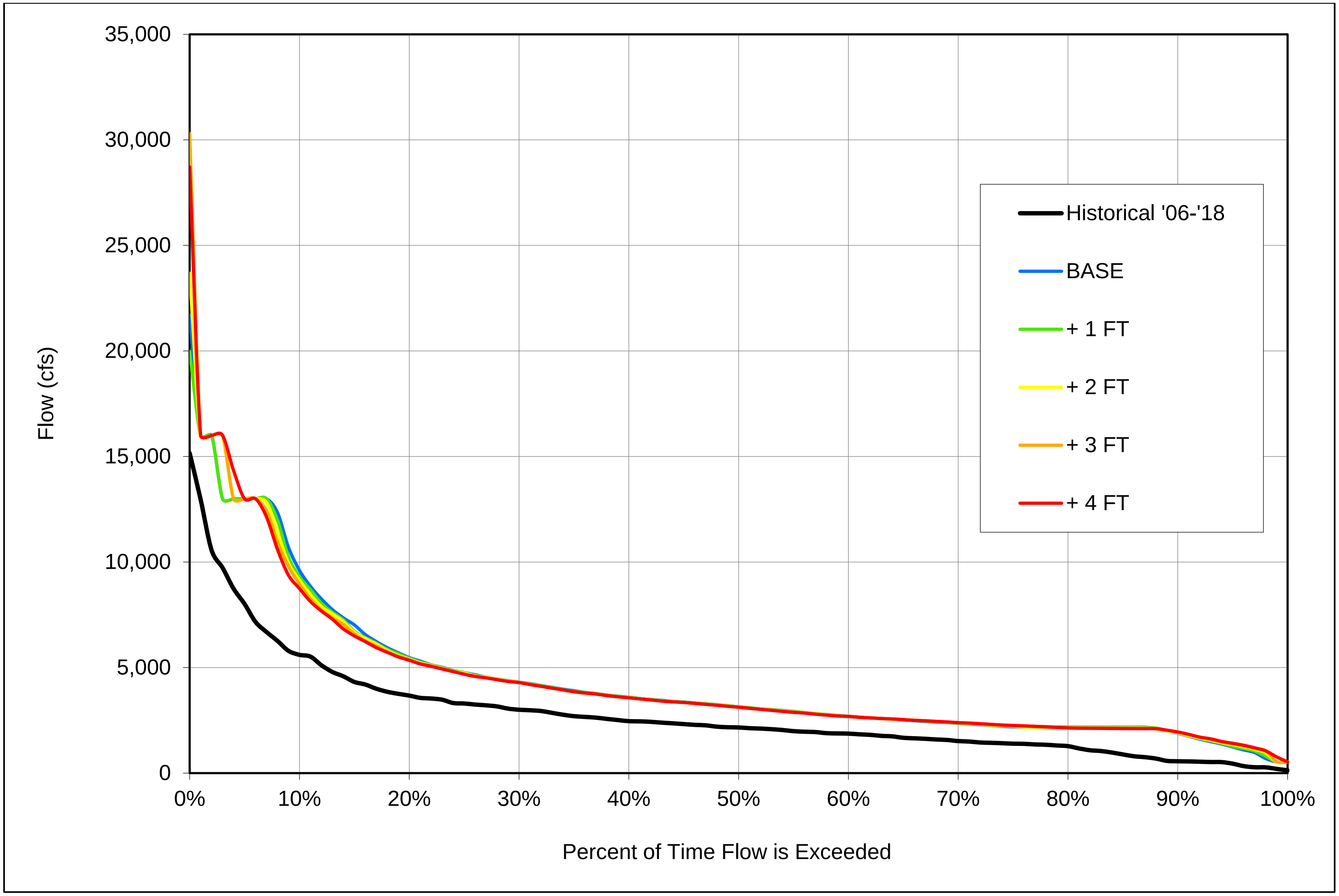

FIGURE C–4 HARRIS RESERVOIR -MARCH FLOW DURATION CURVE

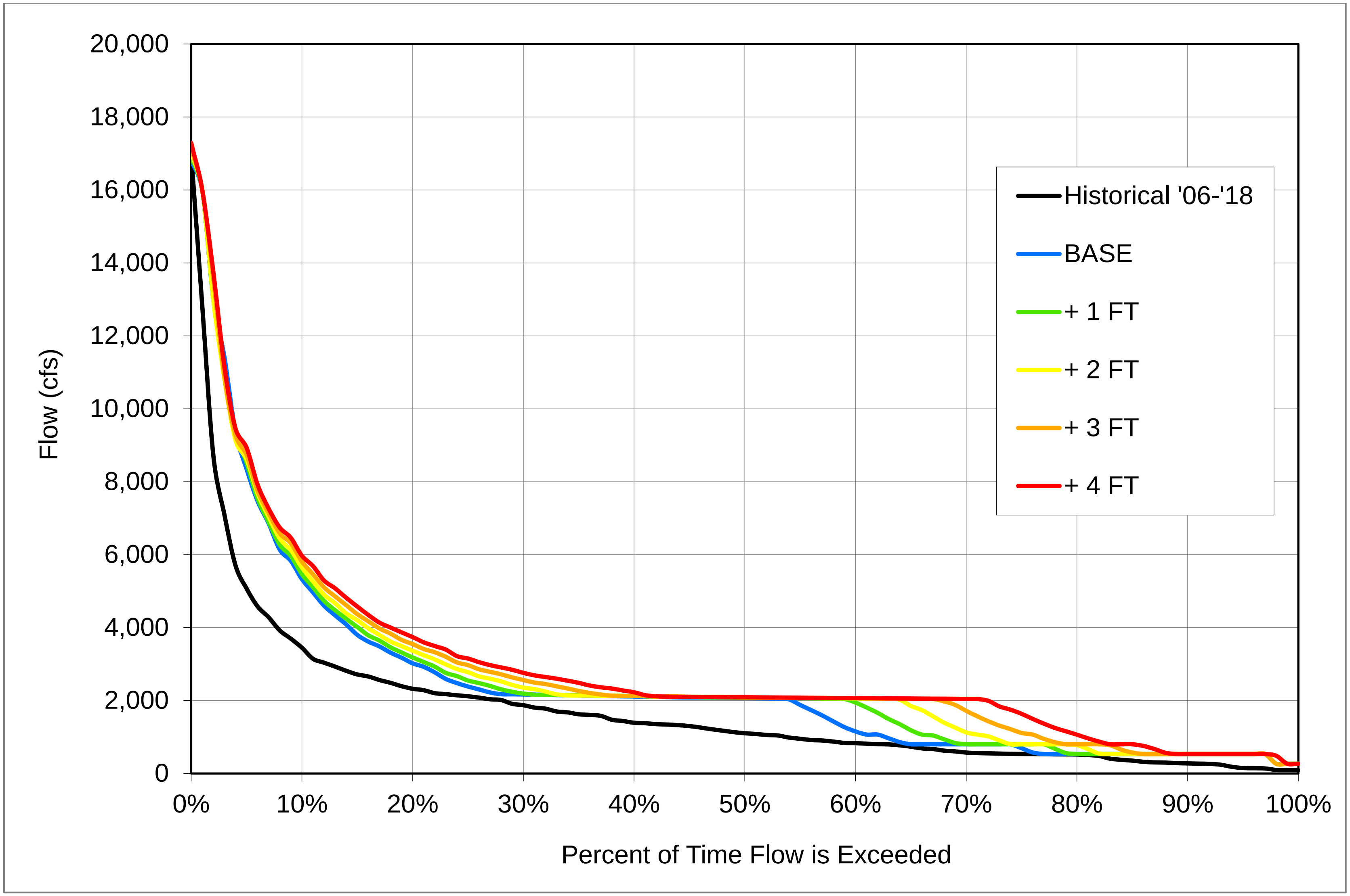

FIGURE C–5 HARRIS RESERVOIR -APRIL FLOW DURATION CURVE

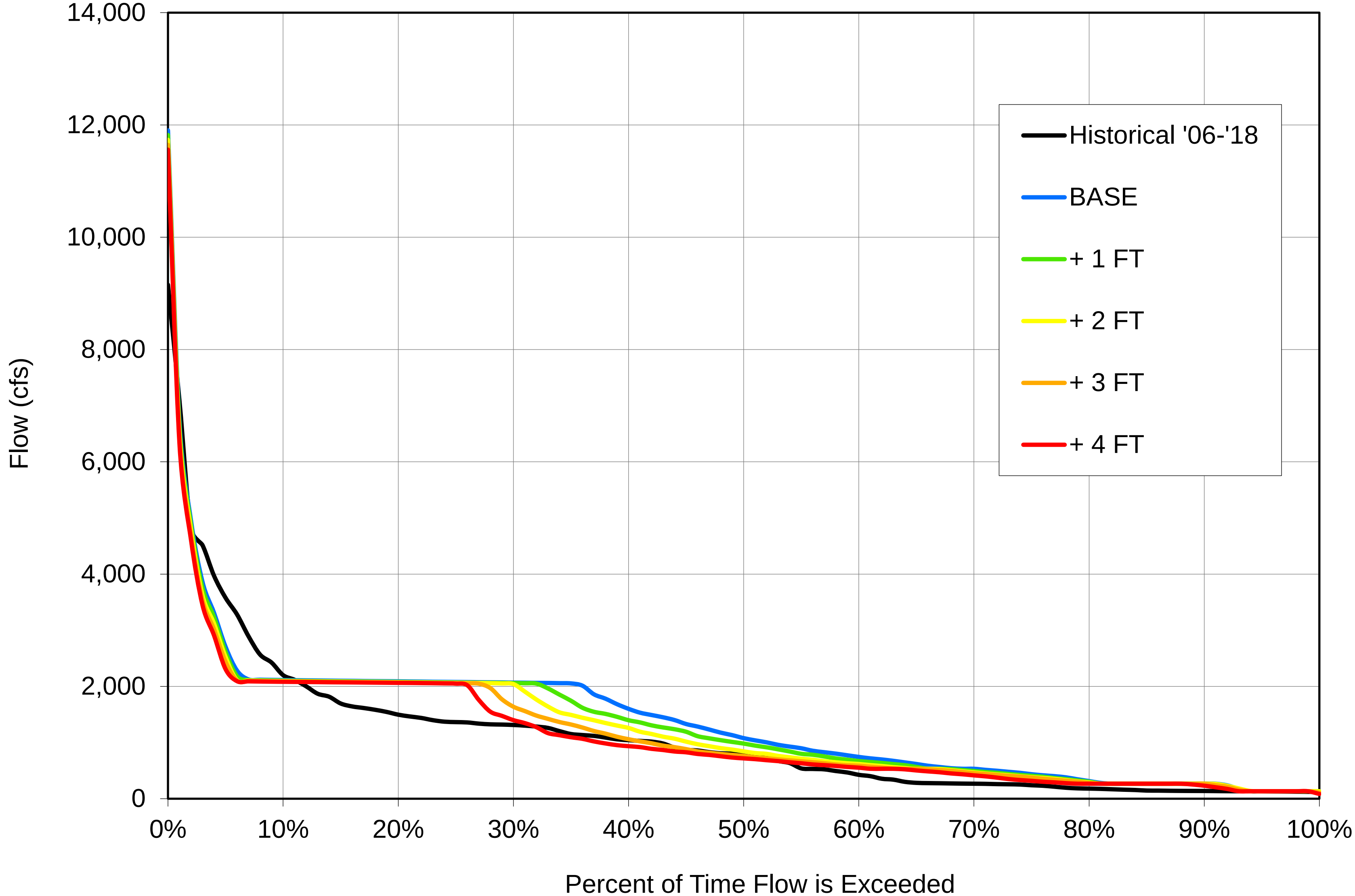

FIGURE C–6 HARRIS RESERVOIR -OCTOBER FLOW DURATION CURVE

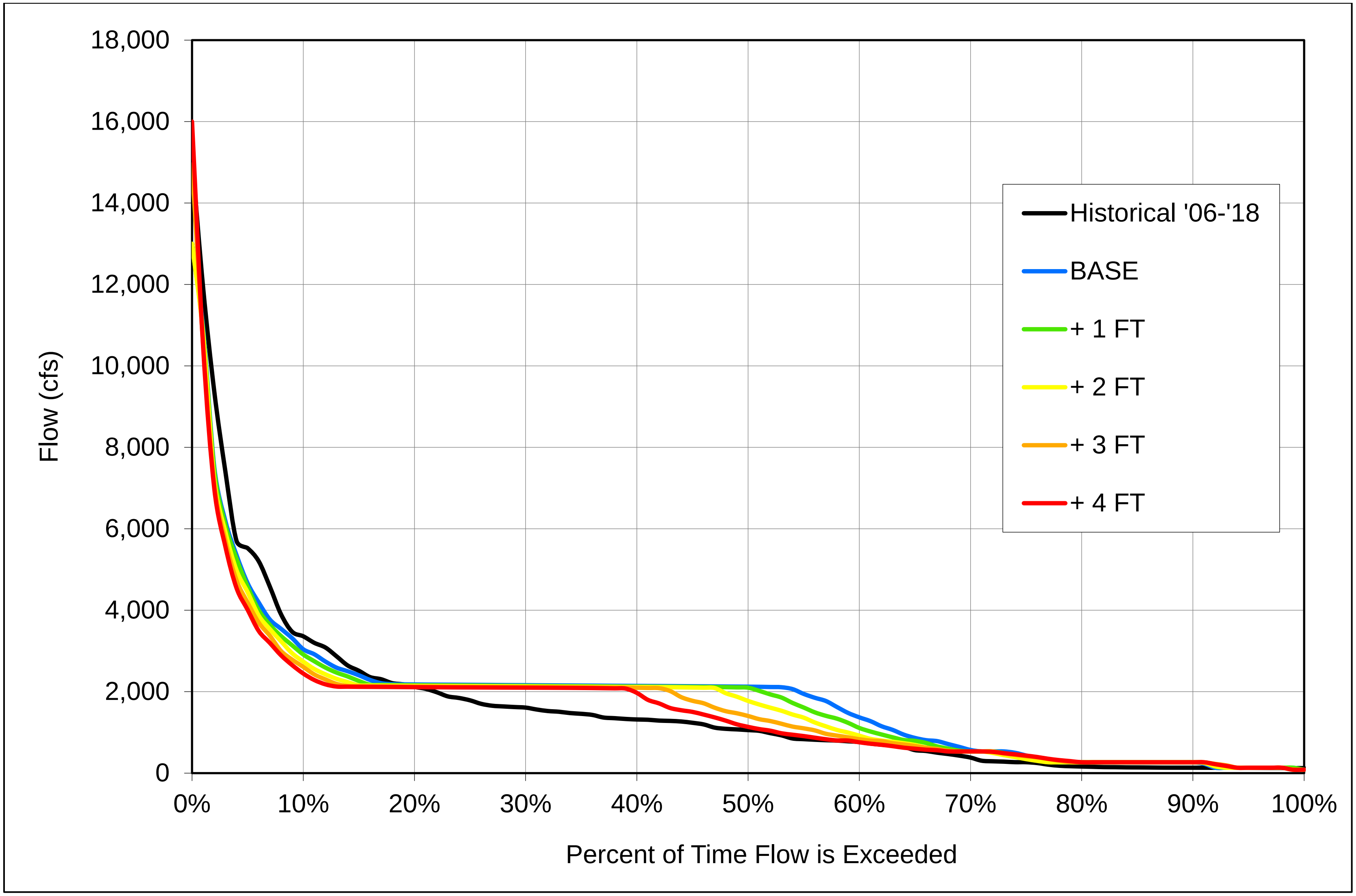

FIGURE C–7 HARRIS RESERVOIR - NOVEMBER FLOW DURATION CURVE

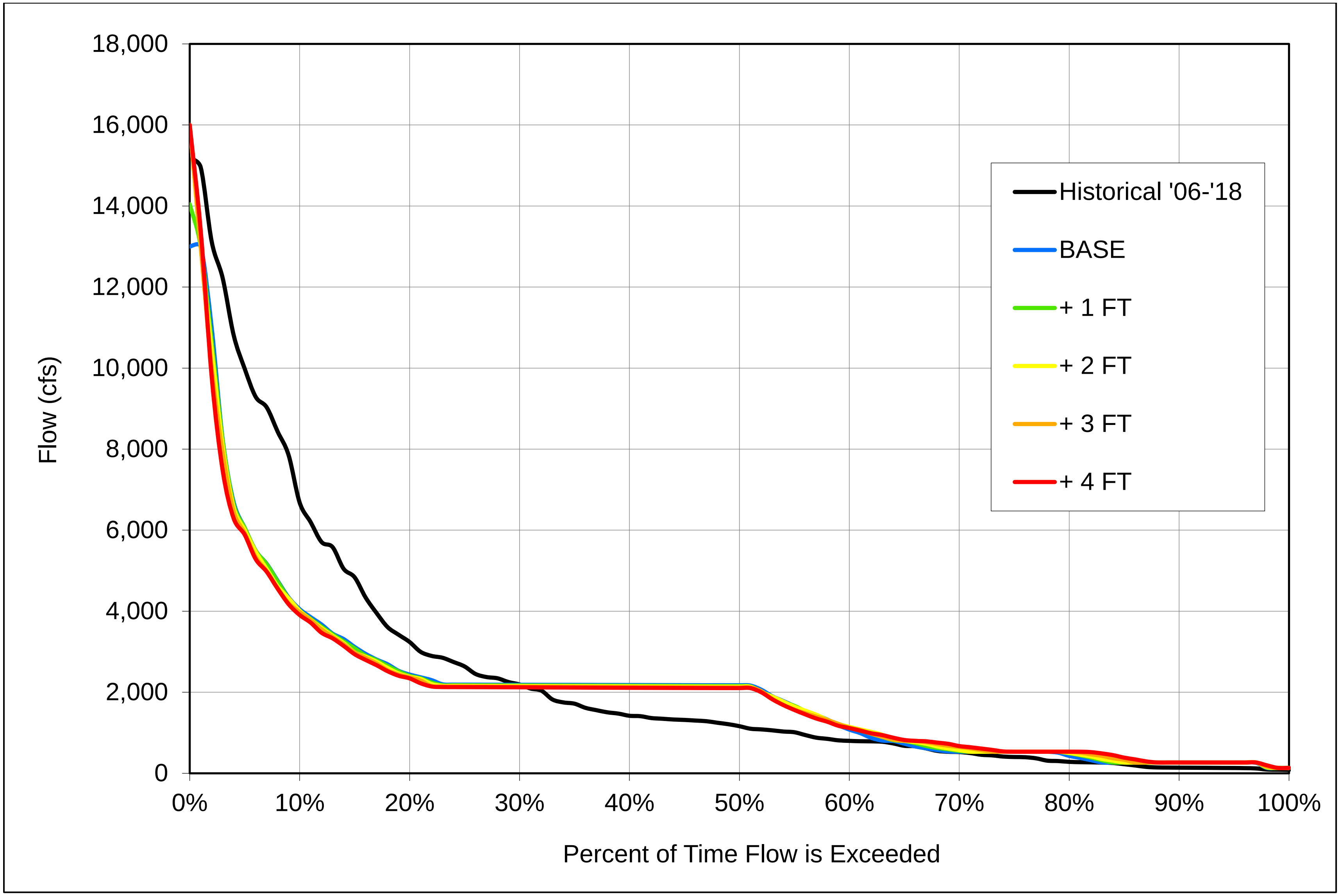

FIGURE C–8 HARRIS RESERVOIR - DECEMBER FLOW DURATION CURVE

Attachment 2
Operating Curve Change Feasibility Analysis Consultation Record (May 2019-March 2020)

Benjamin M Bennett, Wadley, AL.
I have spent most of my life on the river. But it is sad to see the banks and the old trees falling in the river. 25 foot of the banks gone in some places . Places where the water was 10 to 20 foot deep now 5 foot . And I know there are a lot of Native American burial grounds up and down the river either gone or will be within 2 years because of erosion. Something has to be done soon. Why cant we let what water comes in the lake come out ?

HAT 1 meeting - September 11, 2019

Anderegg, Angela Segars

Tue 8/13/2019 6:18 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Bcc damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>;
steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov
<stan.cook@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>;
chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov
<keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>;
evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; nick.nichols@dcnr.alabama.gov
<nick.nichols@dcnr.alabama.gov>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>;
tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; jhaslbauer@adem.alabama.gov
<jhaslbauer@adem.alabama.gov>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>;
mlen@adem.alabama.gov <mlen@adem.alabama.gov>; fal@adem.alabama.gov <fal@adem.alabama.gov>;
djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; arsegars@southernco.com
<arsegars@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>;
jefbaker@southernco.com <jefbaker@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>;
kechandl@southernco.com <kechandl@southernco.com>; mcoker@southernco.com <mcoker@southernco.com>;
cggoodma@southernco.com <cggoodma@southernco.com>; sgraham@southernco.com
<sgraham@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>;
tlmills@southernco.com <tlmills@southernco.com>; cmnix@southernco.com <cmnix@southernco.com>;
kodom@southernco.com <kodom@southernco.com>; alpeeple@southernco.com <alpeeple@southernco.com>;
dpreston@southernco.com <dpreston@southernco.com>; scsmith@southernco.com <scsmith@southernco.com>;
twstjohn@southernco.com <twstjohn@southernco.com>; dawhatle@southernco.com
<dawhatle@southernco.com>; cchaffin@alabamarivers.org <cchaffin@alabamarivers.org>;
clowry@alabamarivers.org <clowry@alabamarivers.org>; gjobsis@americanrivers.org
<gjobsis@americanrivers.org>; kmo0025@auburn.edu <kmo0025@auburn.edu>; devridr@auburn.edu
<devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>;
lgallen@balch.com <lgallen@balch.com>; jhancock@balch.com <jhancock@balch.com>; allan.creamer@ferc.gov
<allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; sarah.salazar@ferc.gov
<sarah.salazar@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; gene@wedoweelakehomes.com
<gene@wedoweelakehomes.com>; kate.cosnahan@kleinschmidtgroup.com
<kate.cosnahan@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com
<colin.dinken@kleinschmidtgroup.com>; amanda.fleming@kleinschmidtgroup.com
<amanda.fleming@kleinschmidtgroup.com>; chris.goodell@kleinschmidtgroup.com
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<henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com
<jason.moak@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com
<kelly.schaeffer@kleinschmidtgroup.com>; jessecunningham@msn.com <jessecunningham@msn.com>;
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sforehand@russelllands.com <sforehand@russelllands.com>; 1942jthompson420@gmail.com
<1942jthompson420@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>;
sandnfrench@gmail.com <sandnfrench@gmail.com>; lgarland68@aol.com <lgarland68@aol.com>;
rbmorris222@gmail.com <rbmorris222@gmail.com>; Ira Parsons (irapar@centurytel.net) <irapar@centurytel.net>;
mitchell.reid@tnc.org <mitchell.reid@tnc.org>; richardburnes3@gmail.com <richardburnes3@gmail.com>;
eilandfarm@aol.com <eilandfarm@aol.com>; athall@fujifilm.com <athall@fujifilm.com>; ebt.drt@numail.org
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beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; dbronson@charter.net <dbronson@charter.net>;
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HAT 1,

Alabama Power Company will be hosting a series of HAT meetings on **Wednesday, September 11, 2019 at the Oxford Civic Center,** 401 Mccullars Ln, Oxford, AL 36203. The HAT 1 meeting will be from **9:00 to 11:00**. The purpose of the HAT 1 meeting is to review the models, model assumptions, inputs and scenarios, and to review the schedule for deliverables and respond to stakeholder questions on the models. This is for both the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives studies. Note that Alabama Power will not be presenting results of any of the modeling efforts at this meeting; however we will be explaining how the analyses will provide results.

Please RSVP by Friday, September 6, 2019. Lunch will be provided (~11:45) so please indicate any food allergies or vegetarian preferences on or before September 6, 2019. I encourage everyone to attend in person. If this is not feasible, we are also offering a Skype option (info below). It would be ideal to join on your computer as we will be viewing presentations and maps.

If you have any questions about the agenda or meeting, please email or call me at ARSEGARS@southernco.com or (205) 257-2251.

Join Skype Meeting [meet.lync.com]

Trouble Joining? Try Skype Web App [meet.lync.com]

Join by phone

Toll number: +1 (207) 248-8024

Find a local number [dialin.lync.com]

Conference ID: 892052380

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

HAT 1 (Project Operations) Stakeholder Meeting Summary
September 11, 2019
9 am to 11 am
Oxford Civic Center, Oxford, AL

Participants:
See Attachment A

Participants by Phone:
Chuck Denman – Downstream Property Owner
Sarah Salazar – FERC
Monte TerHaar – FERC
Kyrstin Wallach – FERC

Action Items:

- Alabama Power will post the HAT 1 meeting summary and all meeting materials to the Harris Relicensing website (www.harrisrelicensing.com)

Summary
The following summarizes the September 11, 2019 Harris Action Team (HAT) 1 (Project Operations) meeting. The meeting presentation is included in Attachment B; therefore, this meeting summary focuses on the overall meeting purpose, highlights of the presentation, and stakeholders' questions/comments and Alabama Power's responses.

Introduction – Angie Anderegg (Alabama Power)
Angie introduced the HAT 1 meeting purpose, reviewed the safety procedures, and introduced participants in the meeting room and by phone. The purpose of the HAT 1 meeting was to discuss all the models, the methods, and the model inputs and outputs (how the model will be used) for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives Studies.

Operating Curve Change Feasibility Analysis – Kenneth Odom (Alabama Power)
Kenneth presented a detailed overview of the three models: Hydrologic Engineering Center (HEC) – Statistical Software Package (SSP) (HEC-SSP) and the Flood Frequency Analysis (HEC-FFA); the HEC-Reservoir Simulation (HEC-RES-Sim); and HEC-River Analysis System (HEC-RAS). Kenneth explained how each of the tools were used in the process and how Alabama Power will use these tools in evaluating the baseline condition (existing winter pool elevation) and the four alternative winter pool elevations (raising the winter curve by 1, 2, 3, and 4 feet). Kenneth also explained that the 100-year flood is a high streamflow event that has a 1 percent chance of being equaled or exceeded in any year. Barry Morris (Lake Wedowee Property Owners Association-LWPOA) asked Kenneth to explain the difference between peak and inflow volume. Kenneth responded that the peak inflow is the maximum inflow – like the instantaneous peak. Inflow volume is the volume (acre-feet) that occurs over the full duration of the storm, which provides a better picture of the area occupied in the reservoir. This volume is cumulative over a flow event.

Barry asked about other data inputs in addition to the U.S. Geological Survey (USGS) that Alabama Power would consider during a flood event. Kenneth noted that Alabama Power uses a network of rainfall gages in addition to the stream flow gages. Additionally, Alabama Power knows the amount of water going through the forebay and spillway, which allows inflow as well as outflow to be calculated.

Barry Morris asked about the forebay water quality modeling. Jason Moak (Kleinschmidt) noted that the forebay water quality modeling would be used to address effects of the alternative winter pool elevations on water quality and temperature in the reservoir. Barry asked if the forebay modeling focused on temperature and dissolved oxygen; Kenneth stated that while the focus of the study is evaluating impacts to DO and temperature, the Environmental Fluid Dynamics Code (EFDC) model does incorporate other water quality/chemistry data.

Downstream Release Alternatives Study – Kenneth Odom

Kenneth also reviewed the tools for the Downstream Alternatives Study. Taconya Goar (Alabama Department of Conservation and Natural Resources – ADCNR) asked if this study would also include flood flows downstream. Angie Anderegg clarified that Alabama Power would review high, normal, and low flow operations in the Downstream Release Alternatives Study.

FERC staff asked if Alabama Power had determined what the modified Green Plan would entail. Jason Moak responded that Alabama Power is working to complete the habitat study and, based on the results of that study, Alabama Power will better define modifications to the existing Green Plan. A stakeholder asked about the difference between the continuous minimum flow alternative and the Green Plan and whether the Green Plan would have a minimum flow. Angie Anderegg responded that the Green Plan does not have a continuous minimum flow; however, the minimum flow alternative is the same daily volume (150 cfs) as the Green Plan pulses and the modified Green Plan would likely include changes to the timing of those pulses. Angie provided an example of how Alabama Power could modify the Green Plan to include shifting the pulses to occur in the early morning hours (e.g., 3 am) to support kayaking/boating activity later in the day.

Alabama Power discussed the cross-section data used to develop the HEC-RAS model. Jason Moak noted that this data will be available as x, y, and z points, and currently there are over 200 between the dam and Jaybird Landing. Donna Matthews asked if any of the 200 transects were monitoring real time data. Jason Moak responded that the transects are not monitors but are necessary to build the downstream HEC-RAS model. Alabama Power has deployed 20 level logger monitors in the Tallapoosa River below Harris Dam that are collecting data (elevation and temperature). Jason also noted that the USGS has recently installed a gage at Malone. Albert Eiland (downstream property owner) shared his experience with the high flow events in the Tallapoosa River and its effect on his property. He is concerned that raising the winter curve at Lake Harris will reduce any flood protection he may have on his property downstream of the Harris Dam. Barry Morris asked at what point in a rain event does the U.S. Army Corps of Engineers (USACE) intervene. Alan Peeples (Alabama Power) noted that Alabama Power and the USACE are in constant communication during high flow events and that Alabama Power's flood control operations are dictated by the USACE Harris Reservoir Regulation Manual. Barry asked if Alabama Power can override the Harris Reservoir Regulation Manual. Alan noted that it is possible to ask the USACE for a variance; however, Alabama Power would be required to do additional modeling prior to that variance request. Mr. Eiland asked about operations in 2003, including why Alabama Power did not release water when they knew a rain event was coming to the Harris area. Alabama Power does not pre-evacuate the reservoir because weather forecasts are often inaccurate, and Alabama Power must abide by the USACE flood control procedures specified in the Harris Reservoir Regulation Manual.

Angie Anderegg reviewed the next steps for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives studies. Alabama Power will file a Progress Update on all the studies before the end of October 2019. Between October and the first quarter (Q1) of 2020, Alabama Power will be modeling the alternatives in each study plan and will prepare an Initial Study Report that must be filed with FERC in April 2020. The Phase 1 Modeling report will be part of the Initial Study Report and will include effects on downstream flooding, generation, navigation, and drought management. Phase 2 of these studies will address effects on other resources. Additional HAT 1 meetings will be held in Q1 2020.

ATTACHMENT A
HARRIS ACTION TEAM 1 MEETING ATTENDEES

HARRIS DAM RELICENSING

HARRIS PROJECT RELICENSING

HAT 1 SIGN-IN SHEET

September 11, 2019 9:00 AM

	Name/ Affiliation or Organization	Email
1	*John Smith/ Stakeholder*	*jsmith@email.com*
2	Kelly Yates, Env. Affairs	kayates @ southernco.com
3	Stacy Thompson APC Env. Affairs	sthompso @southernco.com
4	DAVID Smith	inspector_003 @ yahoo. com
5	Glenell Smith	gardenergirl07 @ yahoo. com
6	Trey Stevens	trsteven@southernco.com
7	Joel Stevens	tjsteven@southernco.com
8	Jason Moak	jason.moak @kleinschmidtgroup.com
9	Kelly Schaeffer	Kelly.Schaeffer@ Kleinschmidtgroup.com
10	Barry Morris	rbmorris 333 @ gmail.com
11	Mike Holley	mike.holley @ dcnr.alabama.gov
12	Tina Freeman	tpfreema @ southernco .com

HARRIS DAM RELICENSING

HARRIS PROJECT RELICENSING

HAT 1 SIGN-IN SHEET

September 11, 2019 9:00 AM

Name/ Affiliation or Organization	Email
13 Sheila Smith APC	scsmith@southernco.com
14 ALBERT EILAND	EILANDFARM@AOL.COM
15 Nathan Aycock	Nathan.Aycock@dcnr.alabama.gov
16 Butch Jackson	~~Keller~~ lakebutch@KW.com
17 Taconya Goar	taconya.goar@dcnr.alabama.gov
18 Sylvia French	sandnfrench@gmail.com
19 TOM GARLAND	jfcrew@southernco.com
20 Jim Crew	
21 Alan Peeples	alpeeple@southernco.com
22 Kenneth Odom	kodom@southernco.com
23 Mitch Reid	mitchell.reid@tnc.org
24 TINA L Mills	tlmills@southernco.com

HARRIS DAM RELICENSING

HARRIS PROJECT RELICENSING

HAT 1 SIGN-IN SHEET

September 11, 2019 9:00 AM

	Name/ Affiliation or Organization	Email
25	Fred Leslie/ADEM Field Ops	fal@adem.alabama.gov
26	Chris Goodman	cggoodma@southernco.com
27	Keith Chandler	
28	Curt Chaffin	cchaffin@alabama.org
29	Jason Carlee	jcarlee@southernco.com
30	Ashley McVicar	ammcvica@southernco.com
31	Donna Matthews	donnamat@aol.com
32	Kristie Coffman / ALCFWRU	kmo0025@auburn.edu
33	Jennifer Rasberry / APC	
34	HARRY E. MERRILL	HARRY.Merrill47@gmail.com
35	FERC Staff on phone	Sarah Salazar
36		

ATTACHMENT B
SEPTEMBER 11, 2019 HAT 1 PRESENTATION

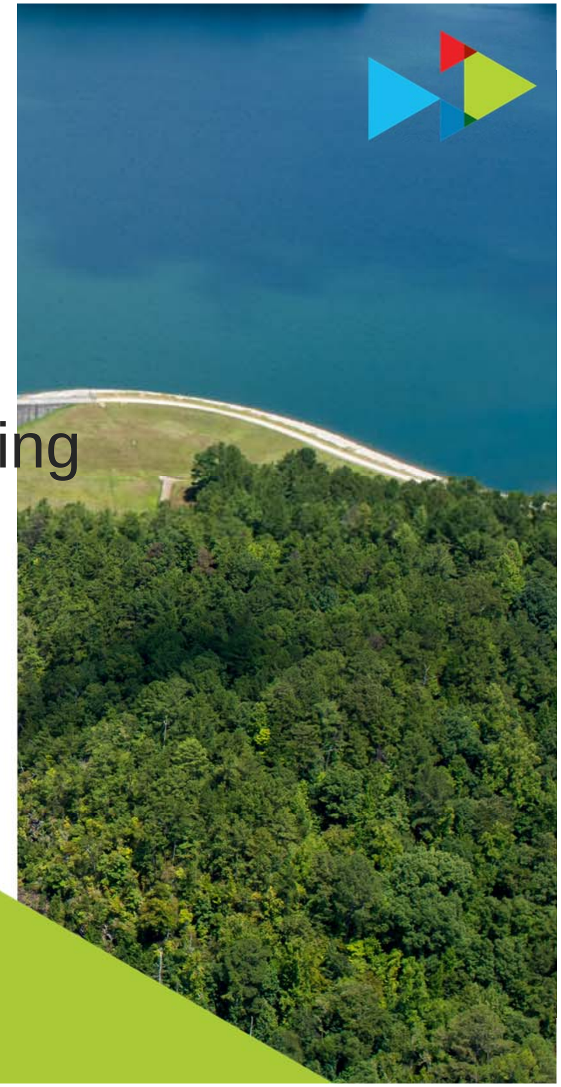
Alabama Power

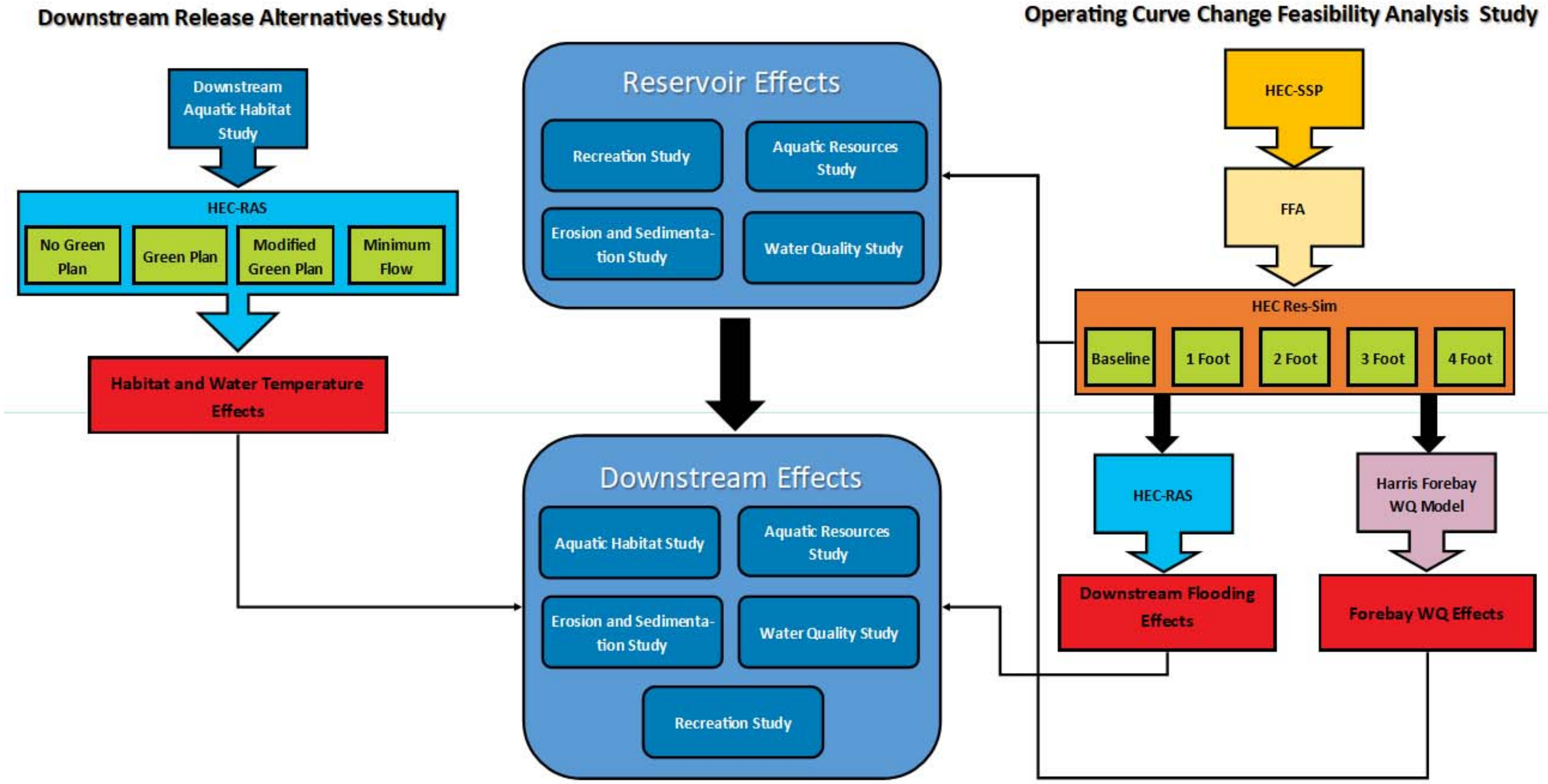
R.L. Harris Project Relicensing

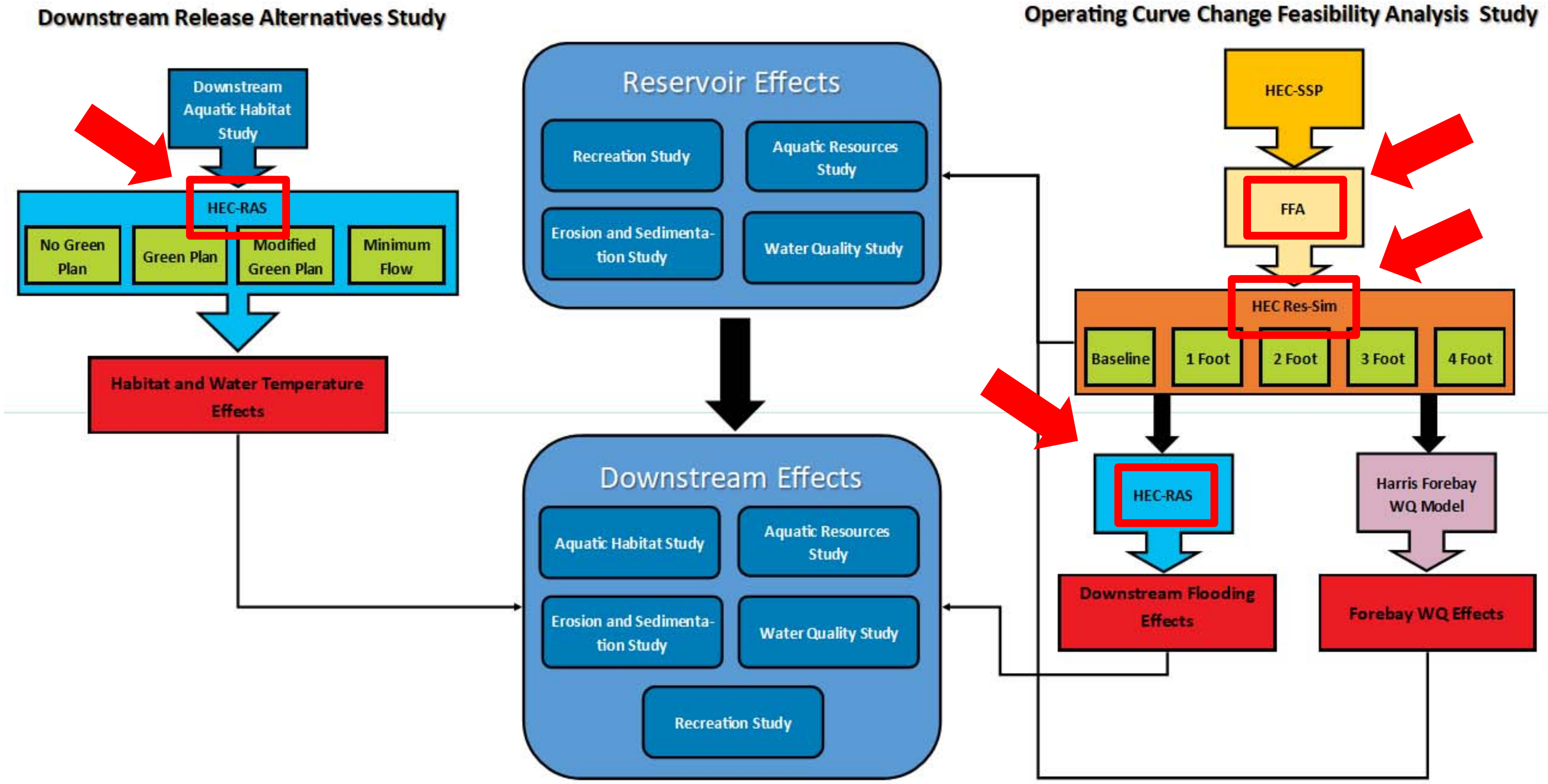
Project Operations – HAT 1

Model Inputs and Methodologies for Operating Curve Change Analysis and Downstream Release Alternatives

September 11, 2019




Downstream Release Alternatives Study
Downstream Aquatic Habitat Study
HEC-RAS
No Green Plan
Green Plan
Modified Green Plan
Minimum Flow
Habitat and Water Temperature Effects
Reservoir Effects
Recreation Study
Aquatic Resources Study
Erosion and Sedimentation Study
Water Quality Study
Downstream Effects
Aquatic Habitat Study
Aquatic Resources Study
Erosion and Sedimentation Study
Water Quality Study
Recreation Study
Operating Curve Change Feasibility Analysis Study
HEC-SSP
FFA
HEC Res-Sim
Baseline
1 Foot
2 Foot
3 Foot
4 Foot
HEC-RAS
Harris Forebay WQ Model
Downstream Flooding Effects
Forebay WQ Effects


Downstream Release Alternatives Study
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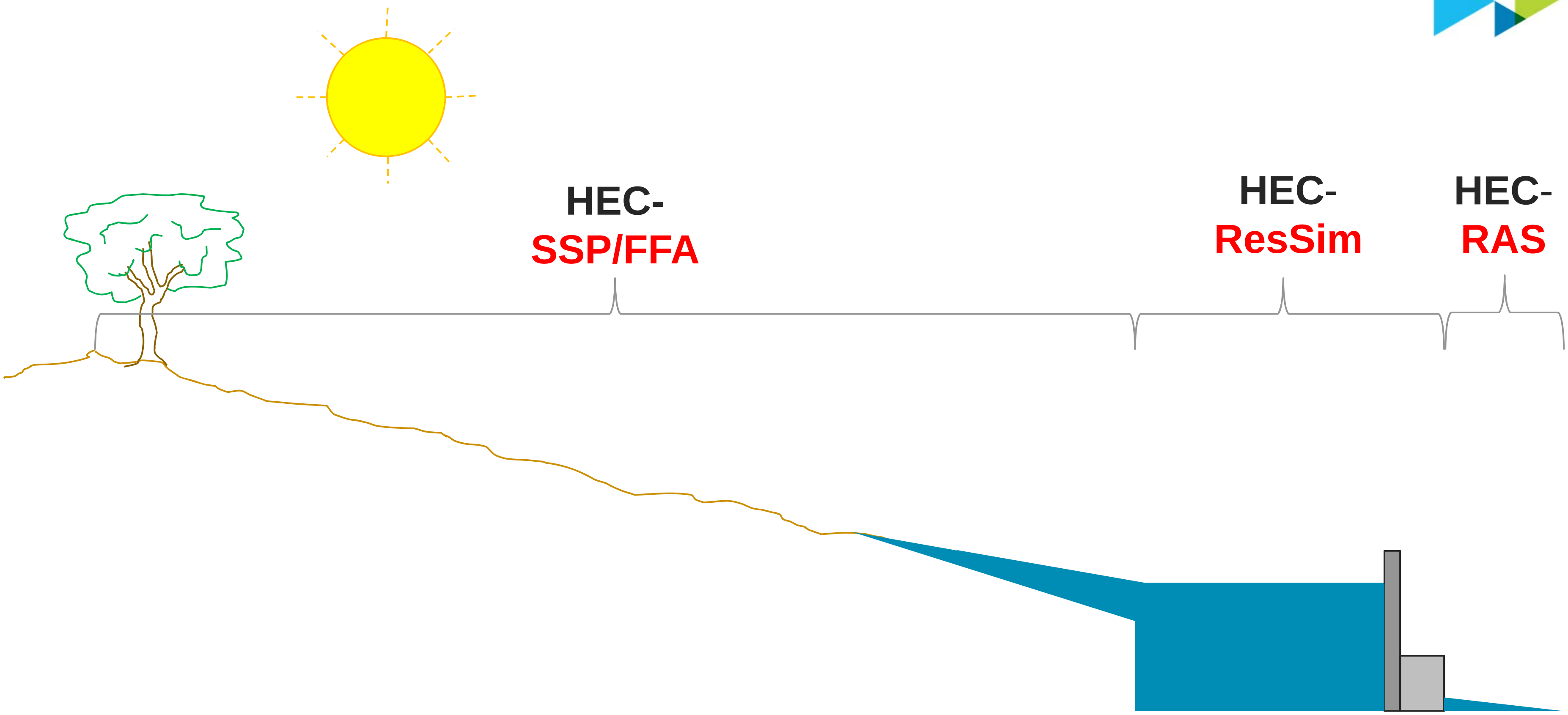
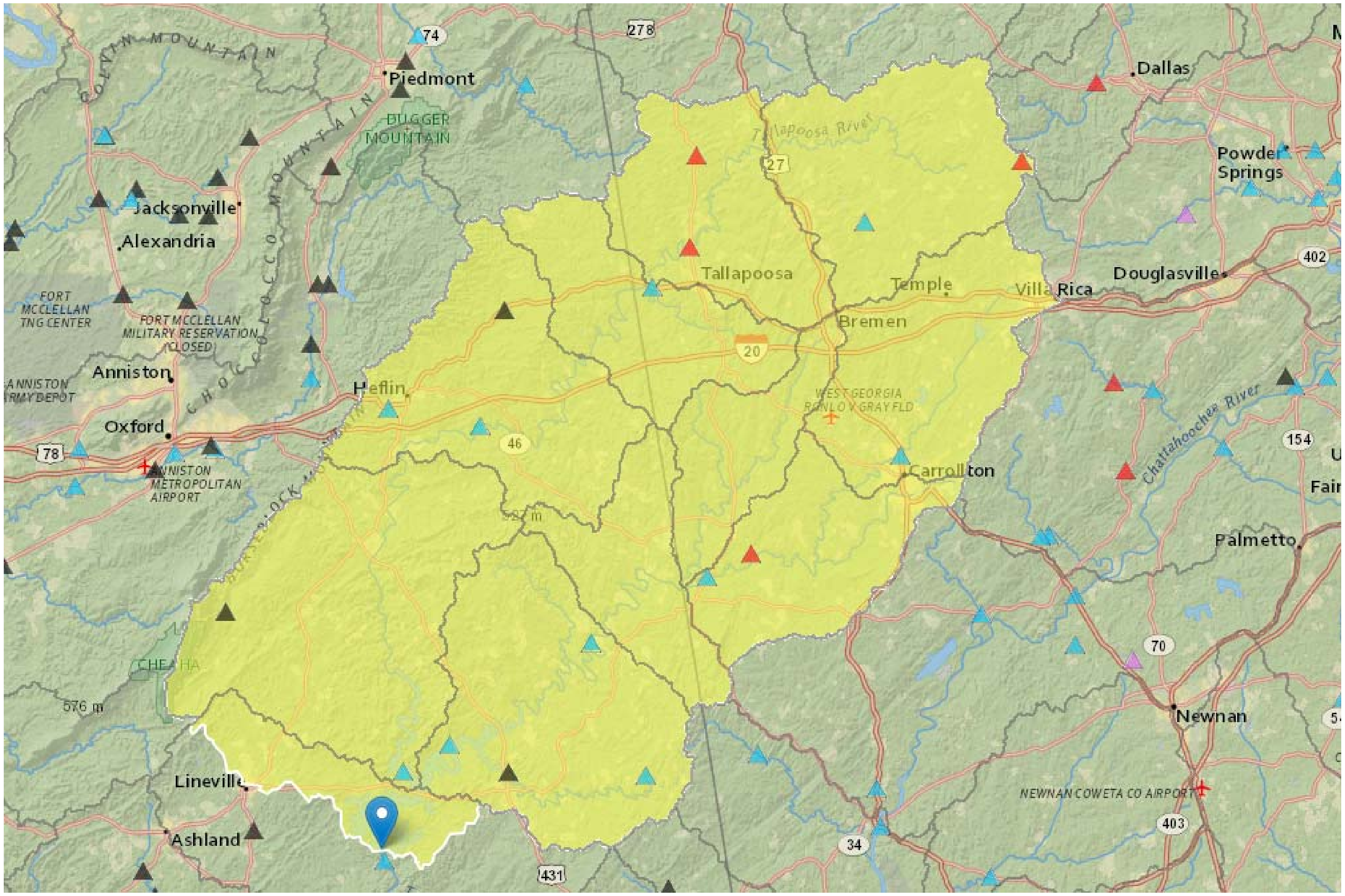
FFA
HEC Res-Sim
Baseline
1 Foot
2 Foot
3 Foot
4 Foot
HEC-RAS
Harris Forebay WQ Model
Downstream Flooding Effects
Forebay WQ Effects

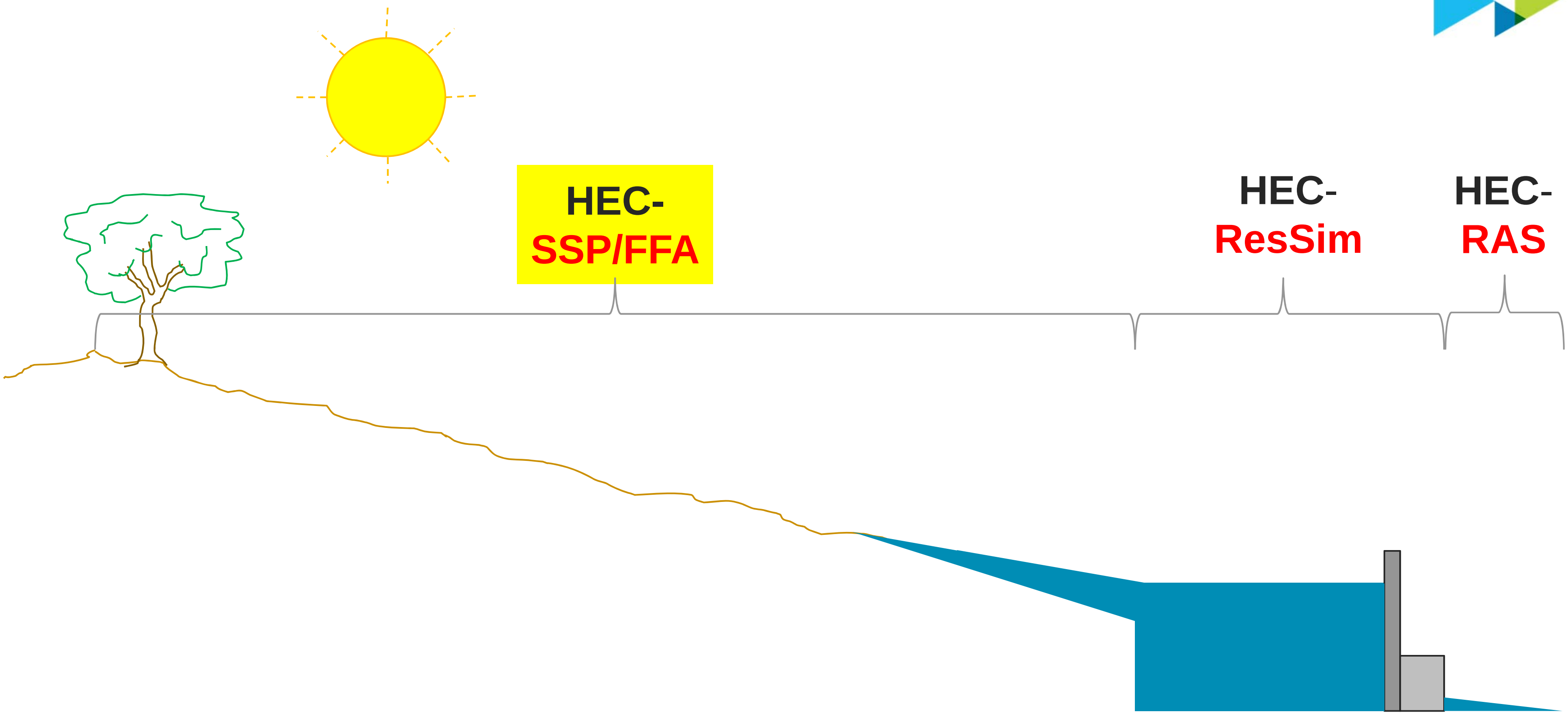
Where the models are used…



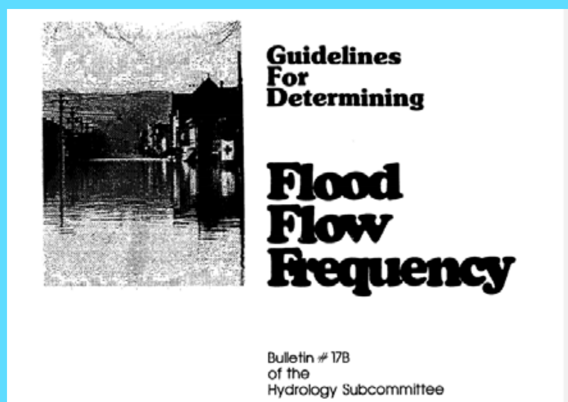
Harris Watershed Boundary



Where the models are used…



HEC-**SSP** (**S**tatistical **S**oftware **P**ackage)



<u>FFA</u>

Flood Frequency Analysis for the Coosa and Tallapoosa Rivers

100-year flood

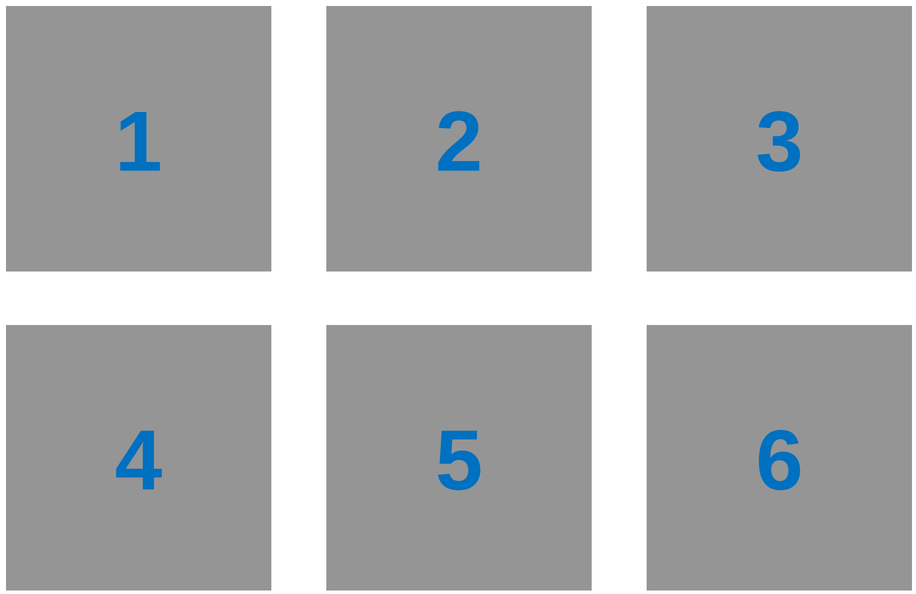
Why the 100-year flood?

- U.S. Government in the 1960’s decided the 100-year flood would be the basis for the National Flood Insurance Program, and it has been the standard since
- This makes the 100-year flood event the base of what MUST be studied

Exactly what do you mean by the “100-year” flood event?

- **It is a high streamflow event that has a 1-percent chance of being equaled or exceeded in any year.**
- The keyword here is “chance”
- Consider the following: if we had 1000 years of annual streamflow data, we would expect to see ten 100-year floods (1-percent chance floods) over the 1000-year record. These ten events could occur at any time during the 1000-year period.

Let’s play a game of “chance.” Pick a number. One card has a dollar sign under it.
What are your chances of picking the right one?



Let’s play a game of “chance.” Pick a number. One card has a dollar sign under it.
What are your chances of picking the right one?

What if we turned the cards back over and shuffled the dollar sign to randomly land on any card and then I, once again, ask you to pick a number?

How many would pick the 4-Card again? Why or Why not?

1	2	3
4	5	6

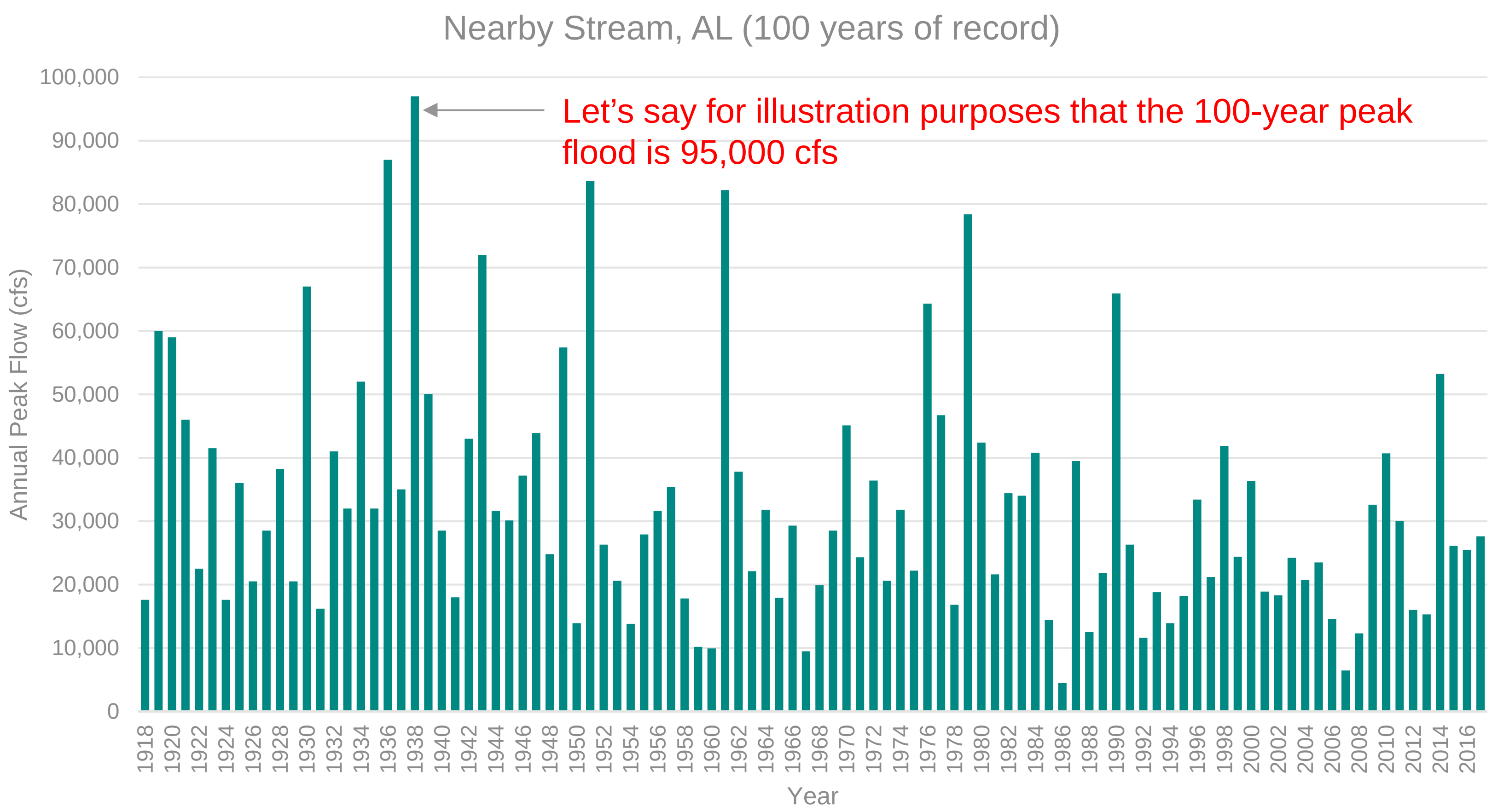
How many would pick a different card because you think that 1, 2, 3, 5, and 6 will have the $ before it can come back around to the 4-Card?

Very Common Misconception

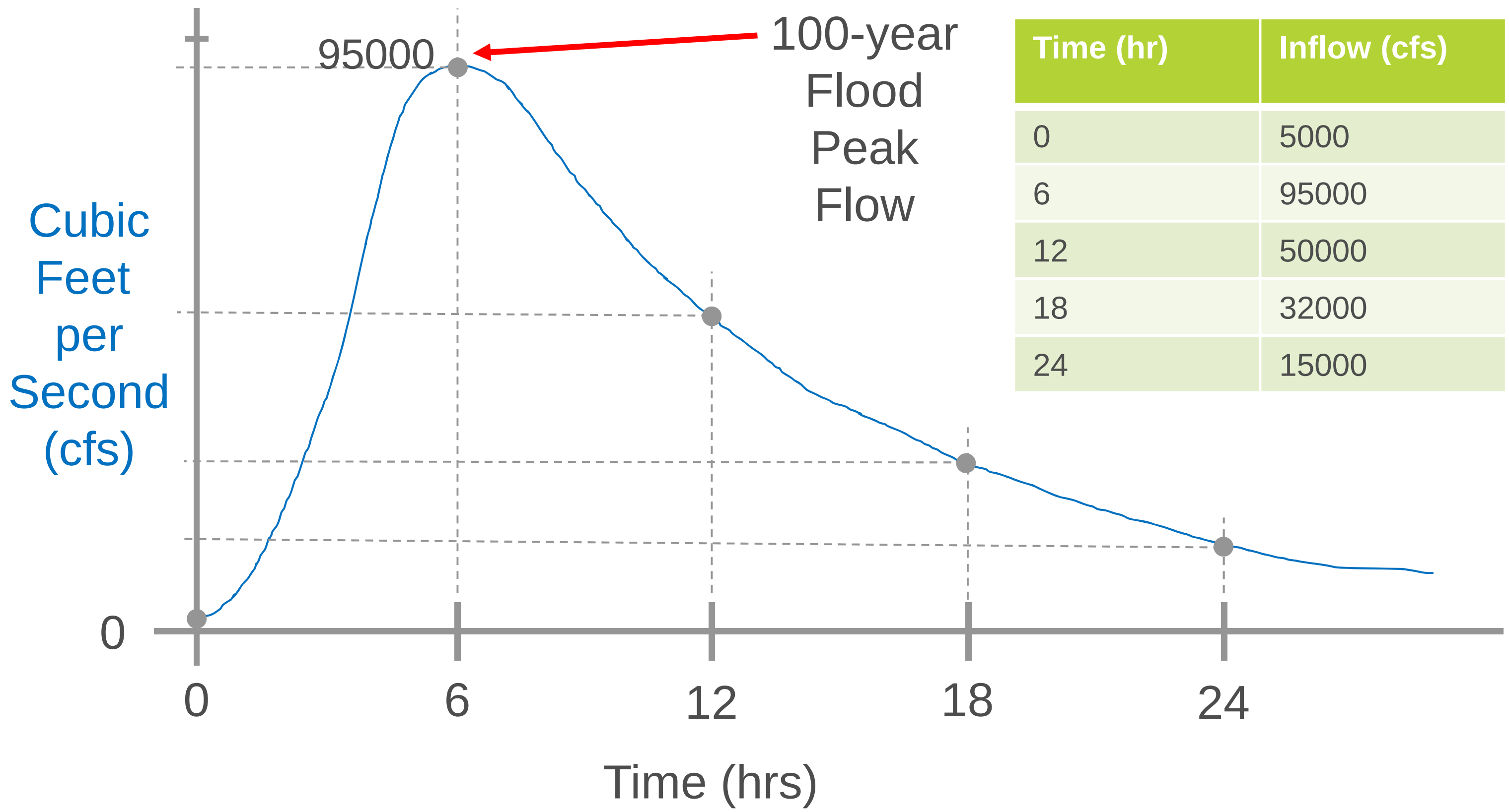
“If the 100-year flood just occurred, then we don’t have to worry about another flood like that for the next 99 years.”

WRONG!!!

(For Illustration Purposes Only)

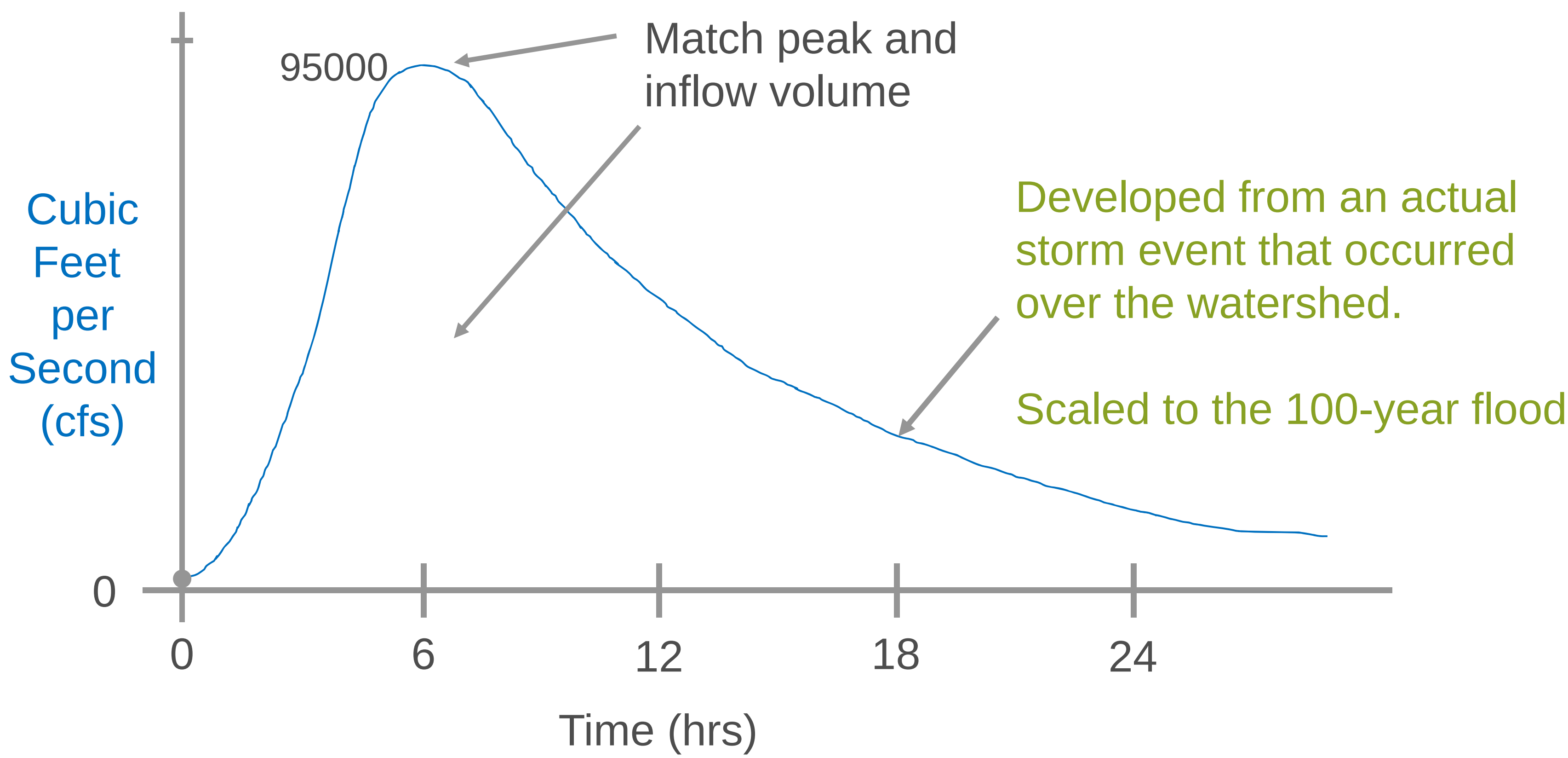


Inflow Hydrograph for Nearby Stream, AL
(**For Illustration Purposes Only)**

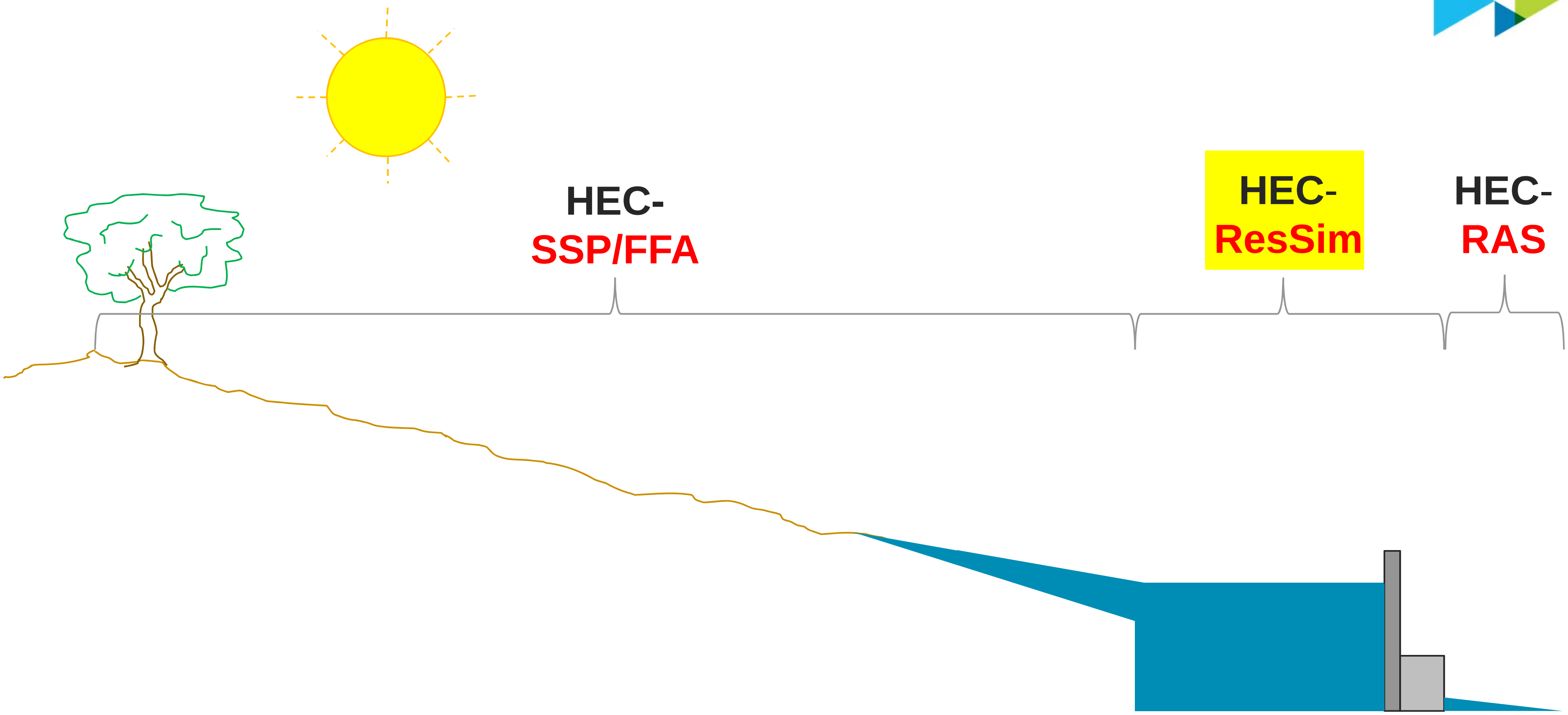


Time (hr)	Inflow (cfs)
0	5000
6	95000
12	50000
18	32000
24	15000

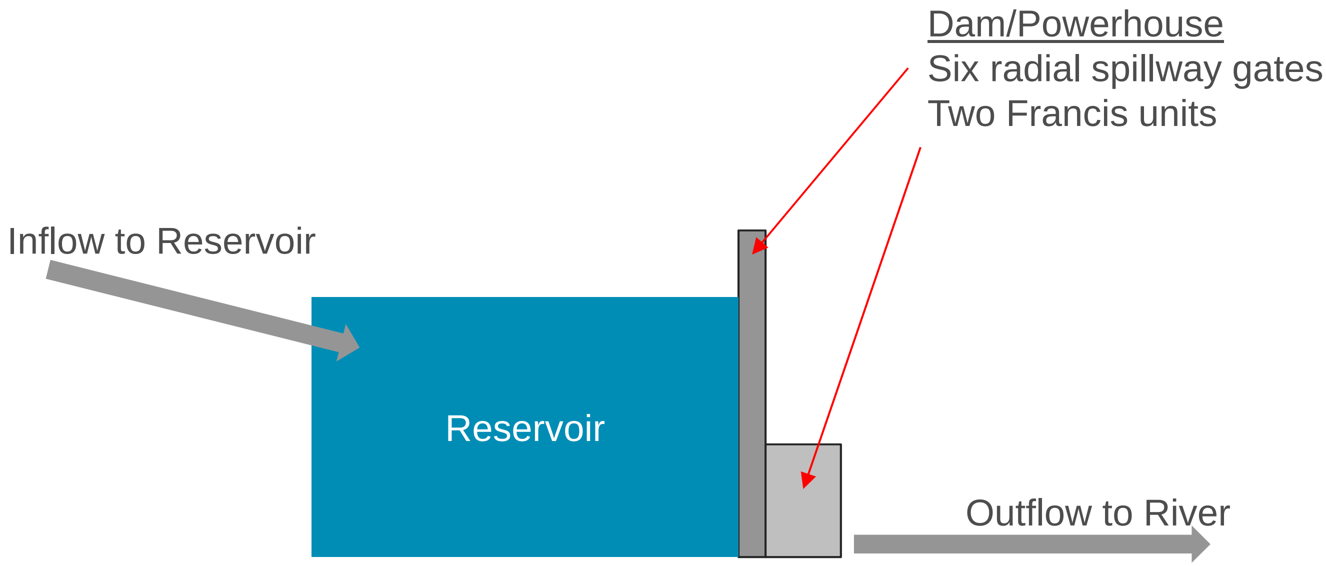
Inflow Hydrograph for Nearby Stream, AL **(For Illustration Purposes Only)**



Where the models are used…

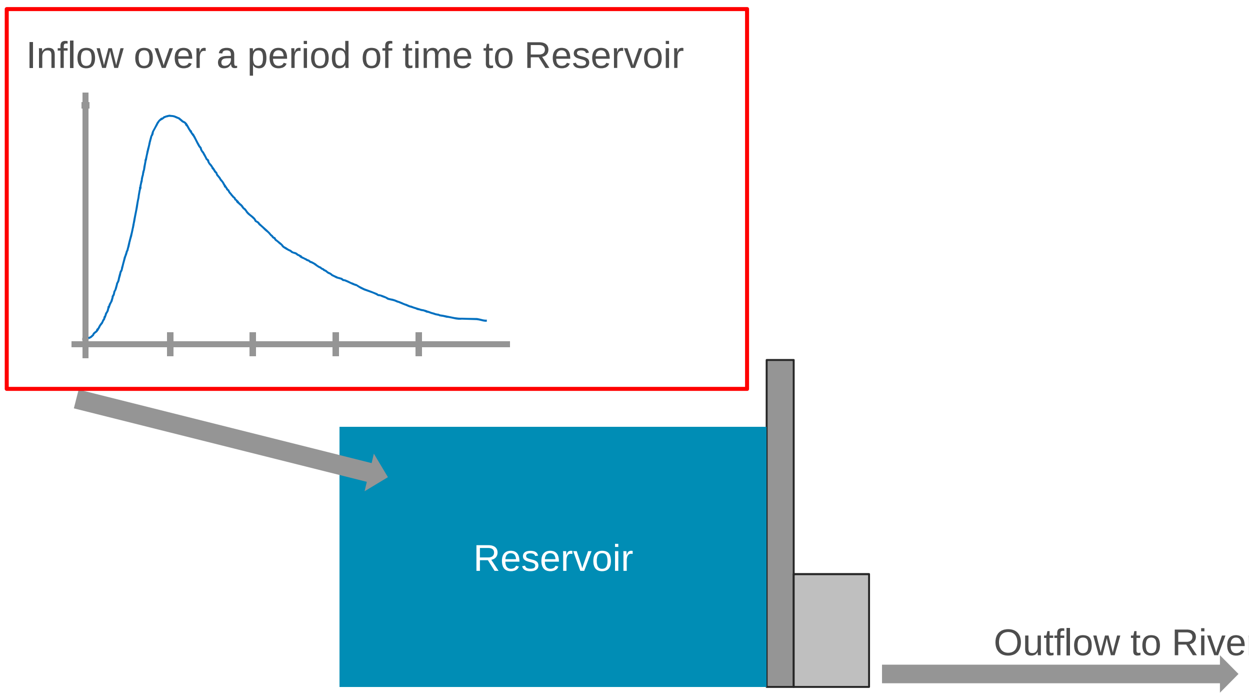


Schematic used to discuss HEC-ResSim



How **HEC**-**ResSim** sees the Reservoir

1. FFA and ”scaled” actual event

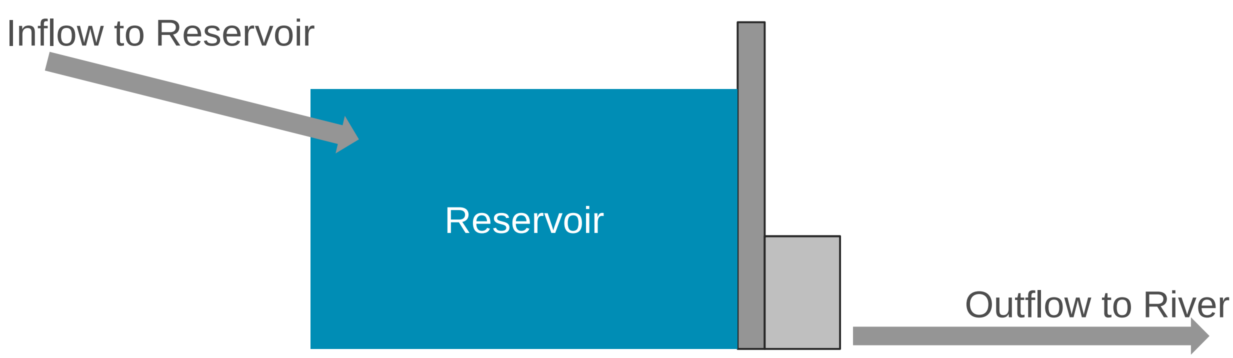


HEC-ResSim

2.

Elevation-Volume Table

Res. Elevation	Volume (ac-ft)
790	394724
791	404840
792	415170
793	425721
794	436495



HEC-**ResSim**

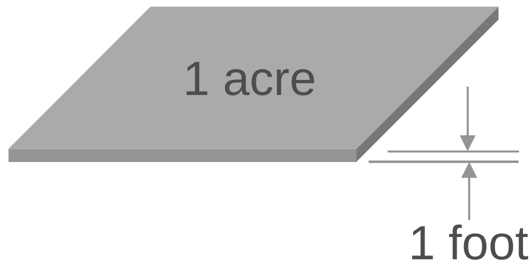
2.

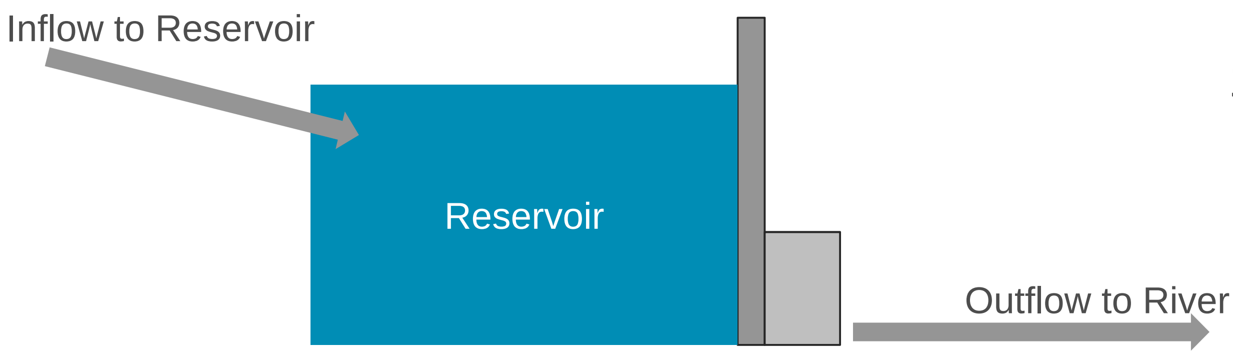
Elevation-Volume Table

Res. Elevation	Volume (ac-ft)
790	394724
791	404840
792	415170
793	425721
794	436495

What is an ac-ft (or acre-foot)?

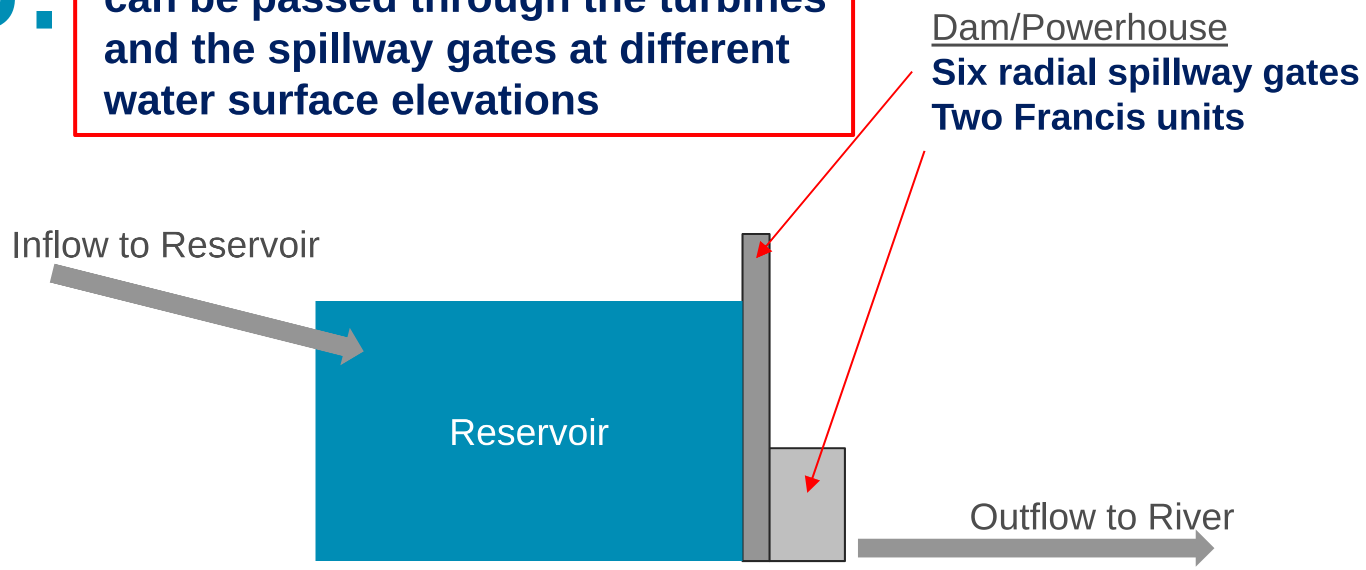
It is a measure of volume where one acre-foot is an area of one acre covered with one foot of water





HEC-ResSim

3. **Information about how much water can be passed through the turbines and the spillway gates at different water surface elevations**



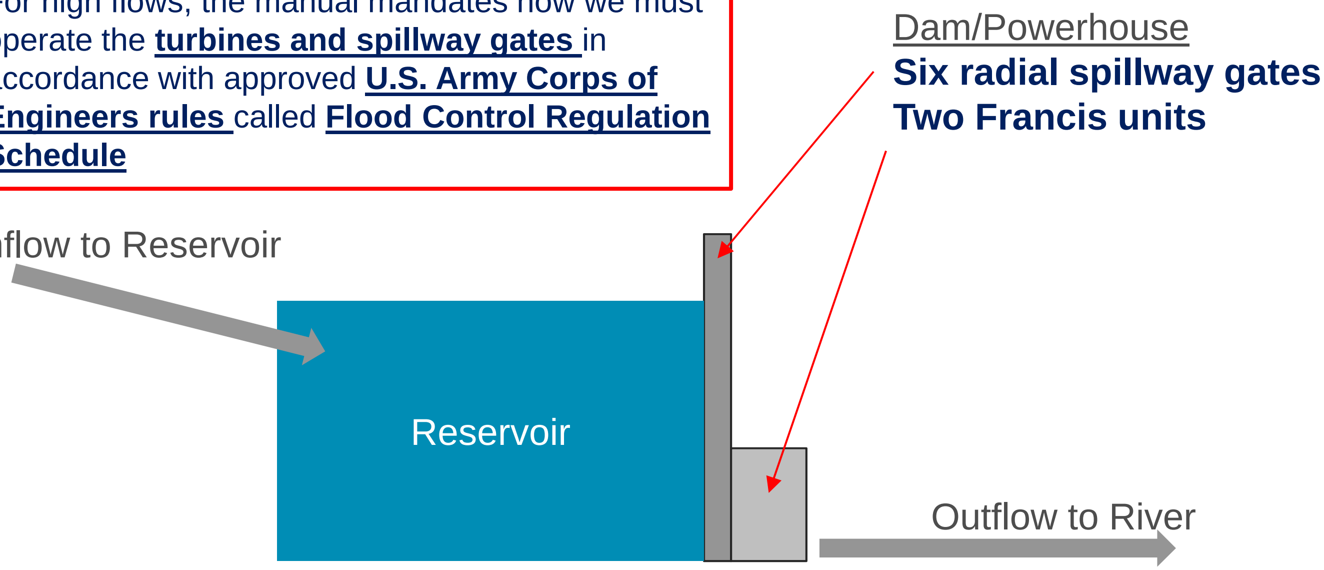
HEC-ResSim

4.

Reservoir Regulation Manual

This tells us how the reservoir must be operated.

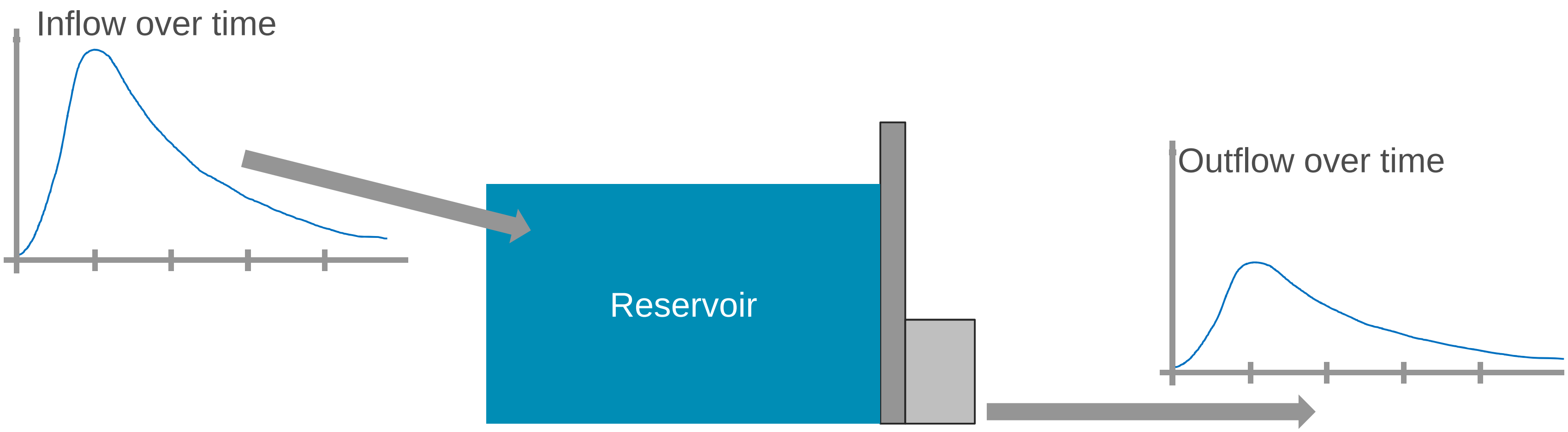
For high flows, the manual mandates how we must operate the **turbines and spillway gates** in accordance with approved **U.S. Army Corps of Engineers rules** called **Flood Control Regulation Schedule**

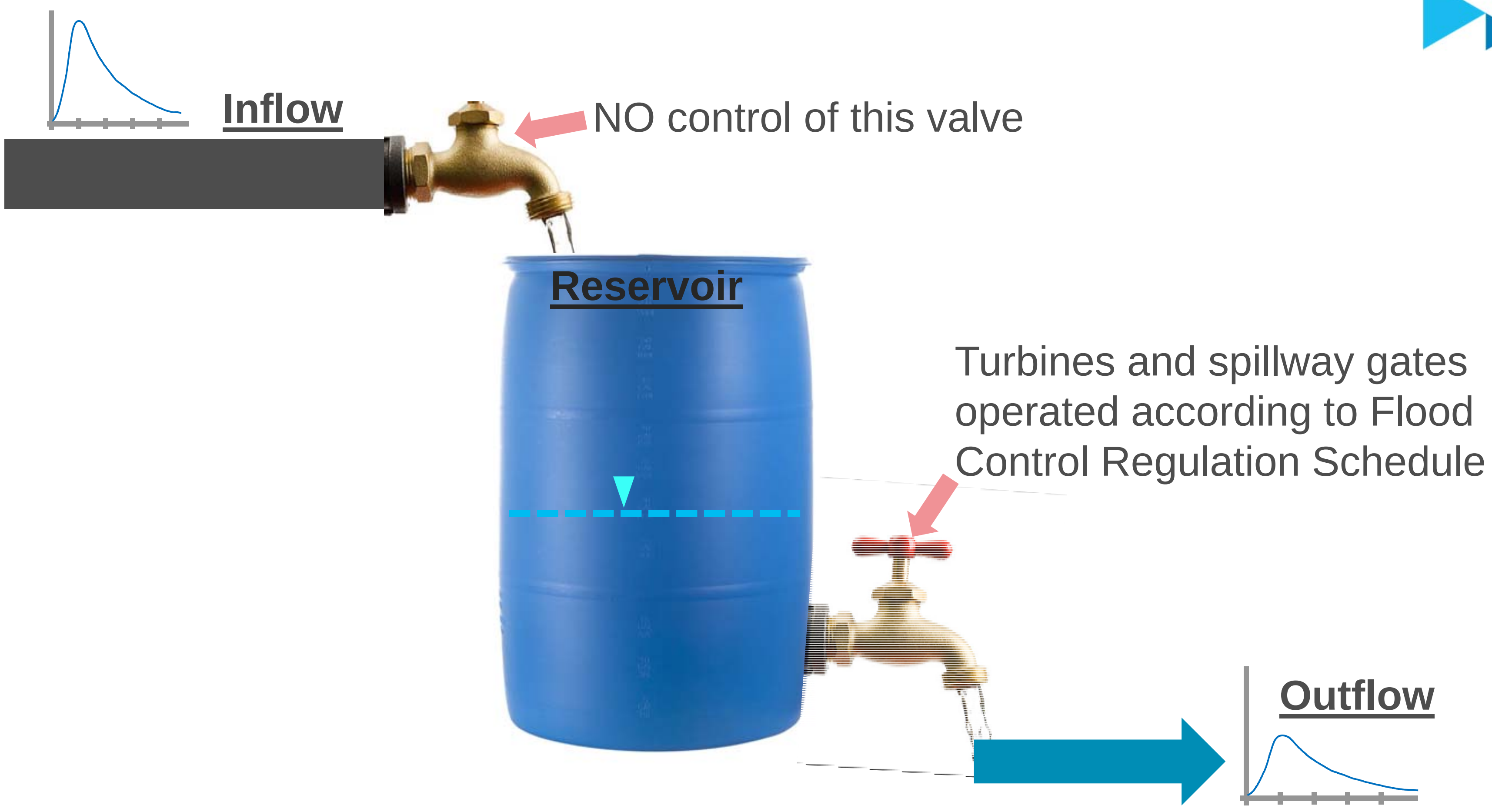


If **INFLOW** is higher than **OUTFLOW**: **ELEVATION** ⬆

If **INFLOW** is less than **OUTFLOW**: **ELEVATION** ⬇

If **INFLOW** is equal to **OUTFLOW**: No Change in ELEVATION




Inflow
NO control of this valve
Reservoir
Turbines and spillway gates operated according to Flood Control Regulation Schedule
Outflow

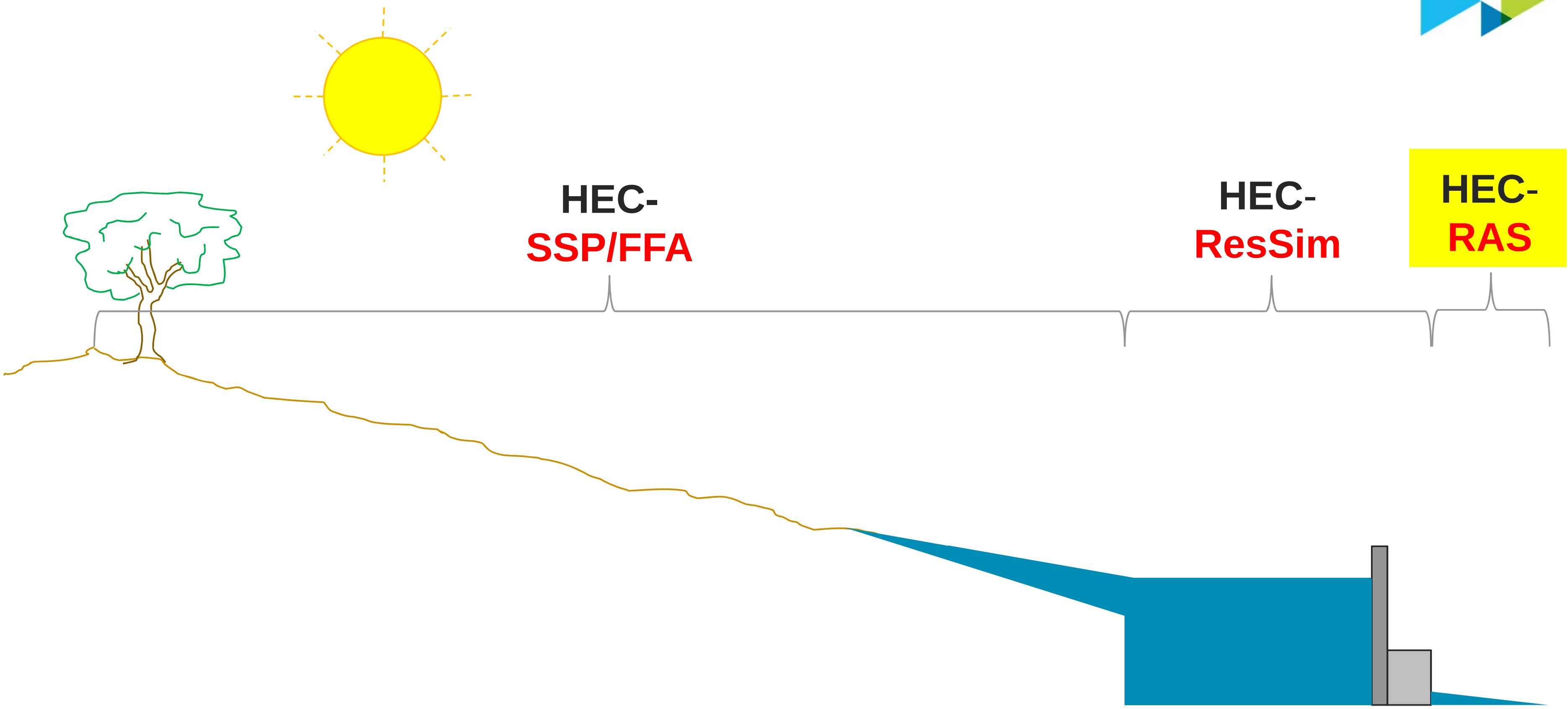
Outputs from HEC-ResSim

- How the reservoir elevation changes over time during a flood event

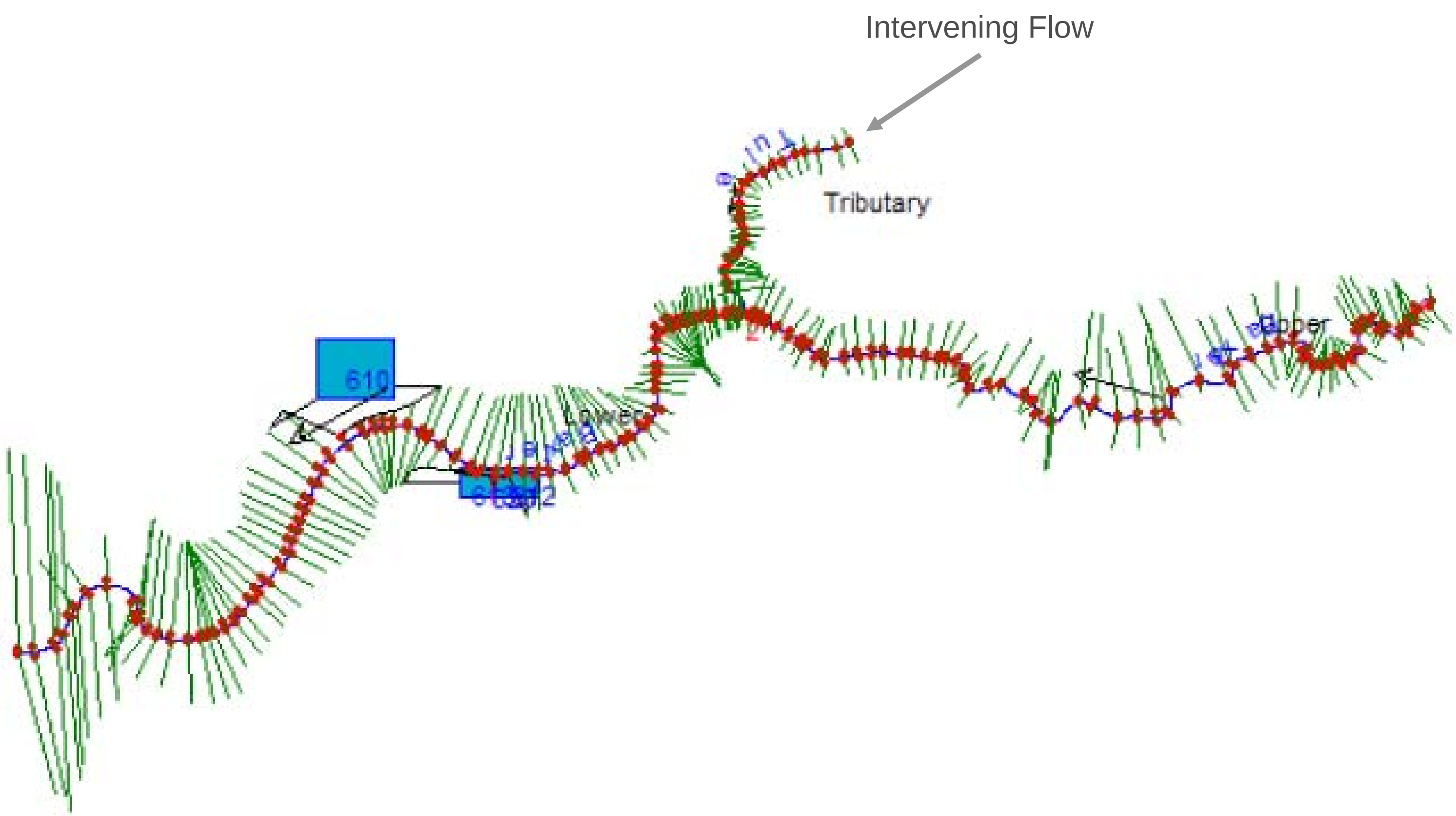
- The outflow hydrograph (turbines + spillway) to be used in **HEC-RAS**

***Both controlled by the Flood Control Regulation Schedule**

Where the models are used…

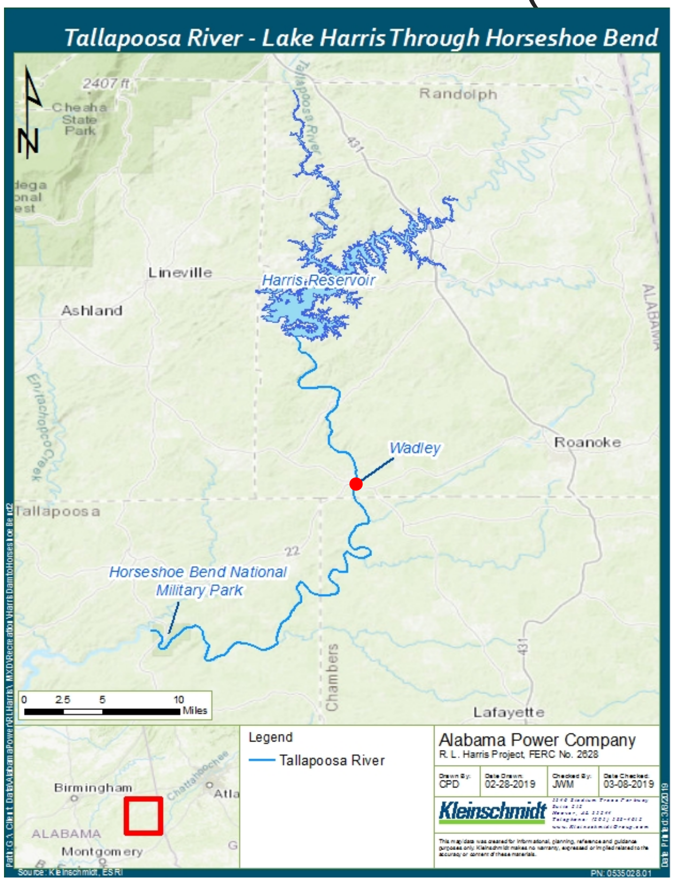


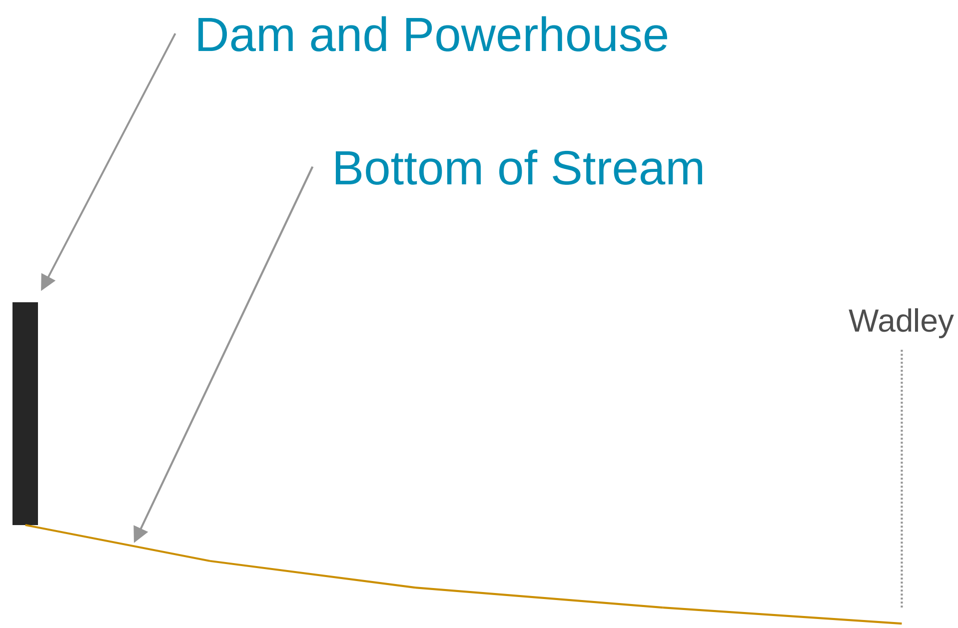
HEC-RAS cross-sections on a river
(For Illustration Purposes Only)



Schematic used to discuss HEC-RAS

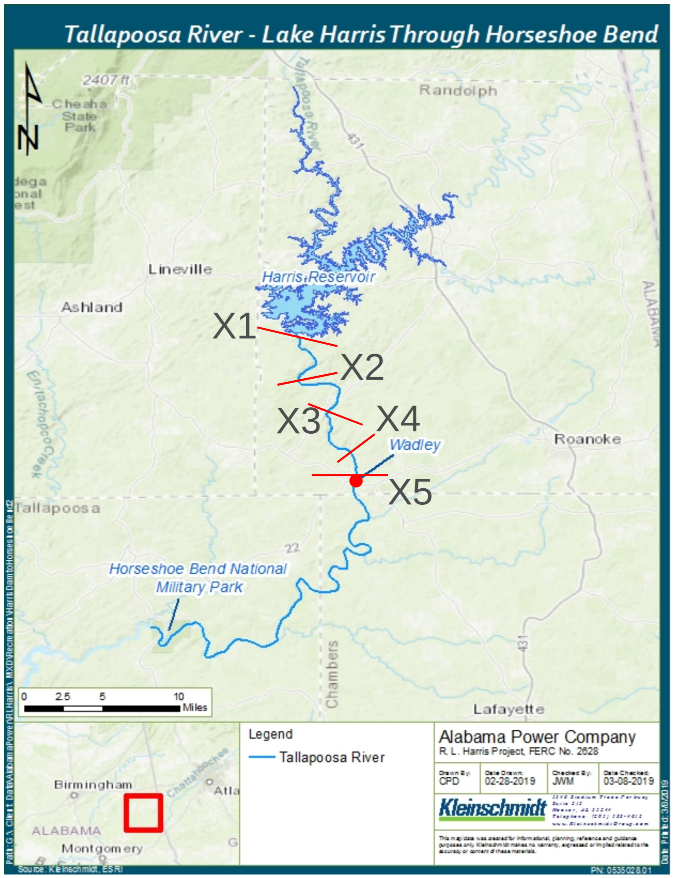
(For Illustrations Purpose Only)



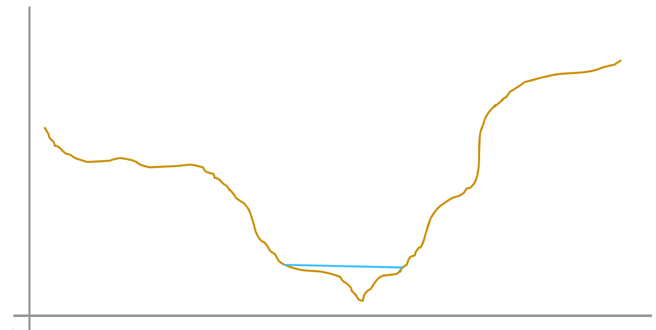


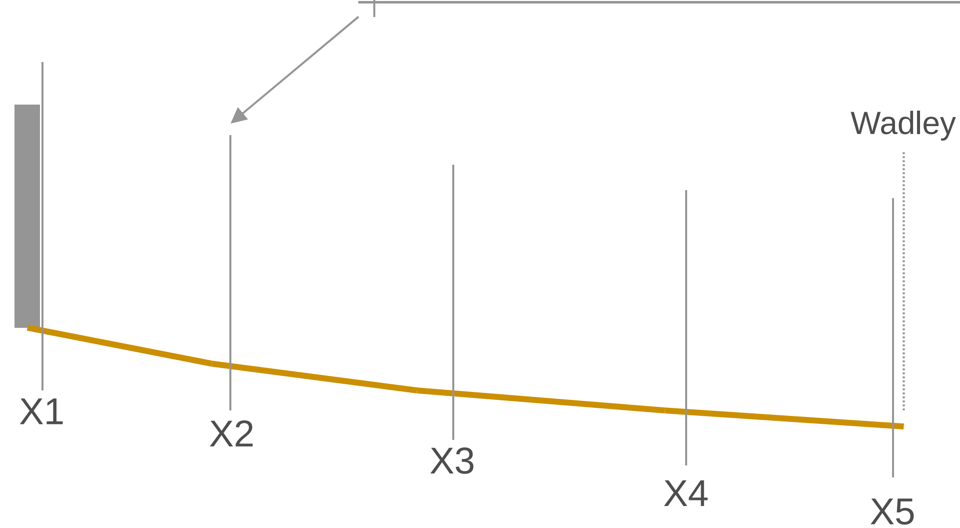
HEC-RAS Stream Cross Sections

(For Illustration Purposes Only)



What is a cross section?





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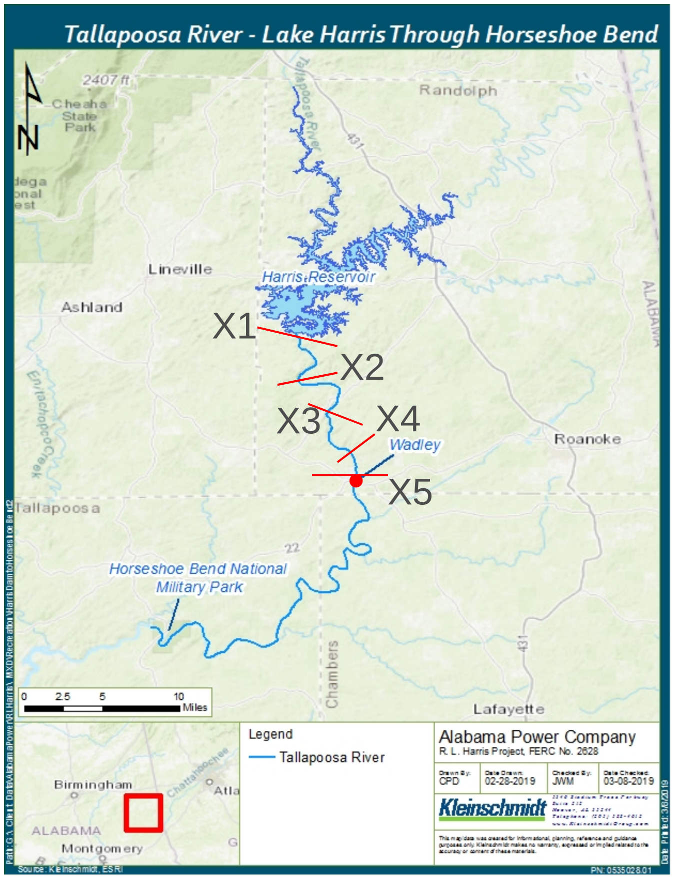

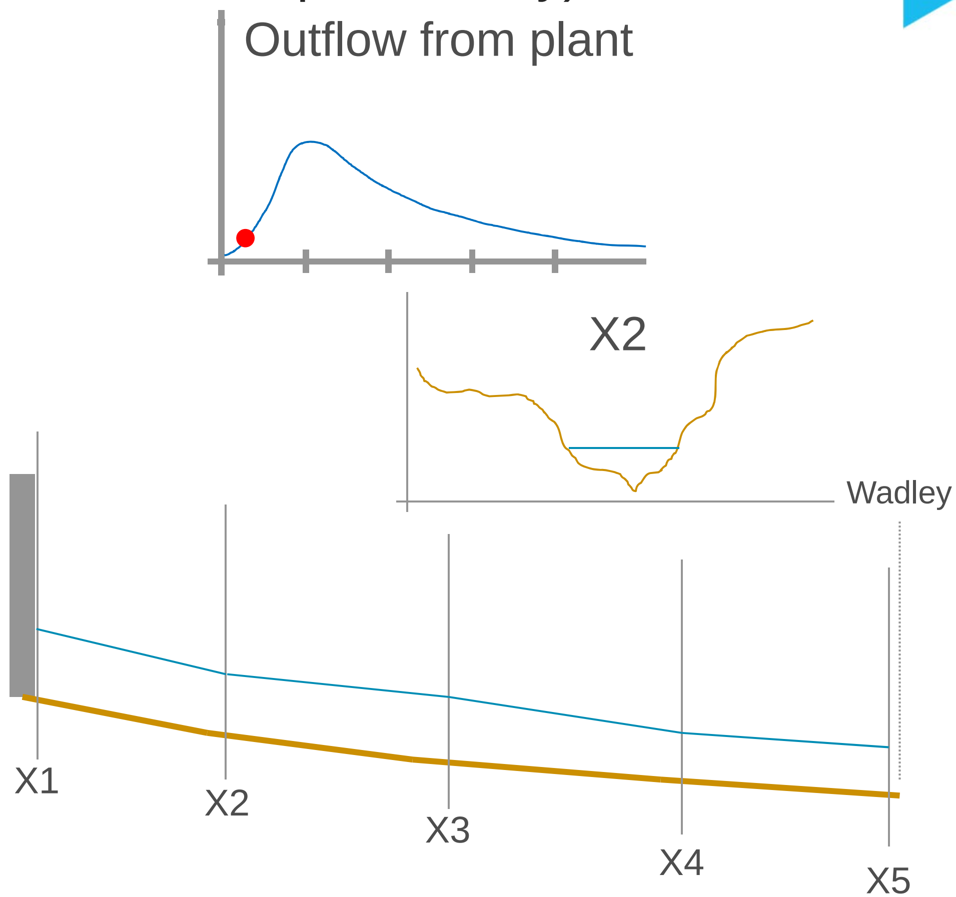

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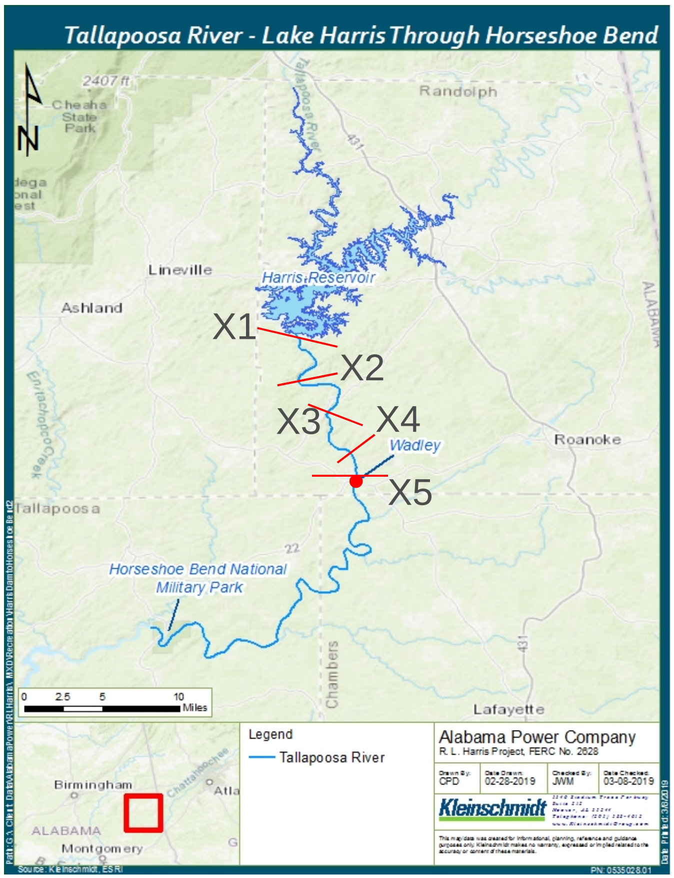

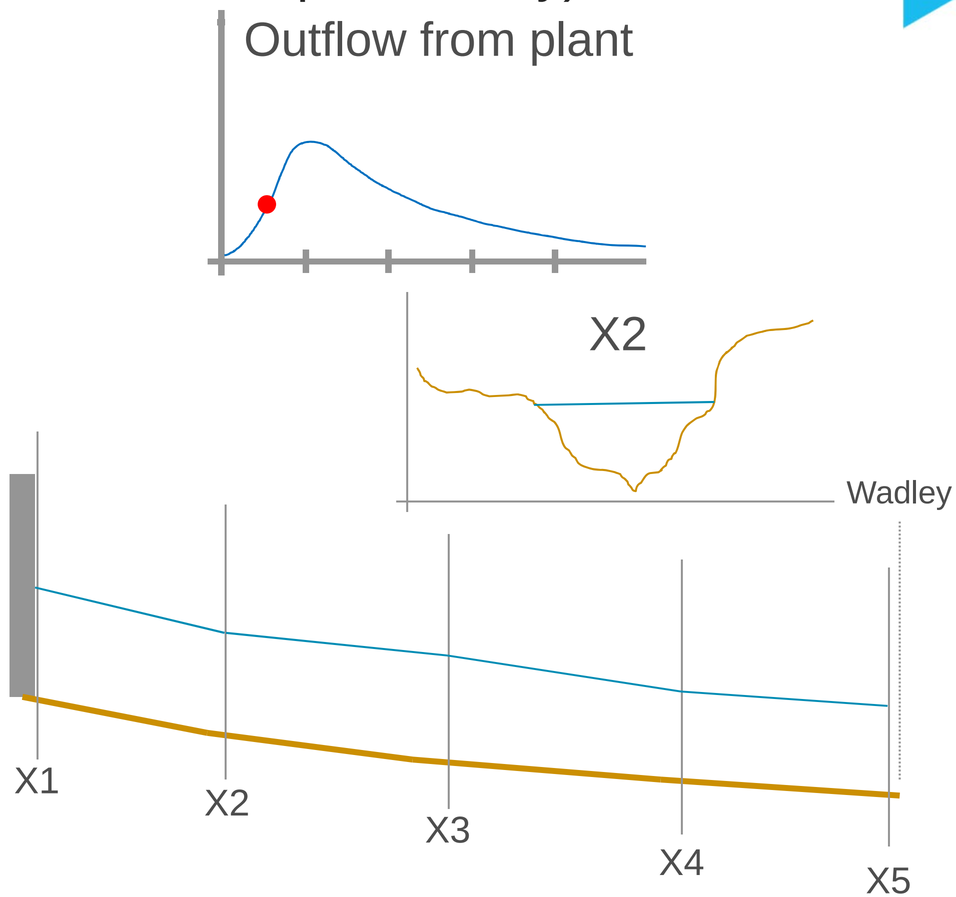

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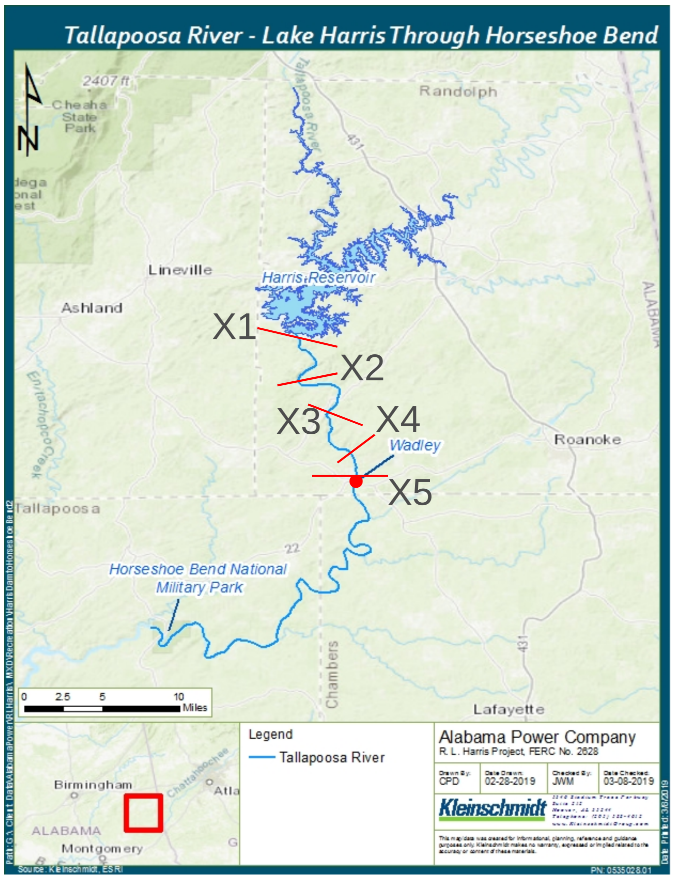

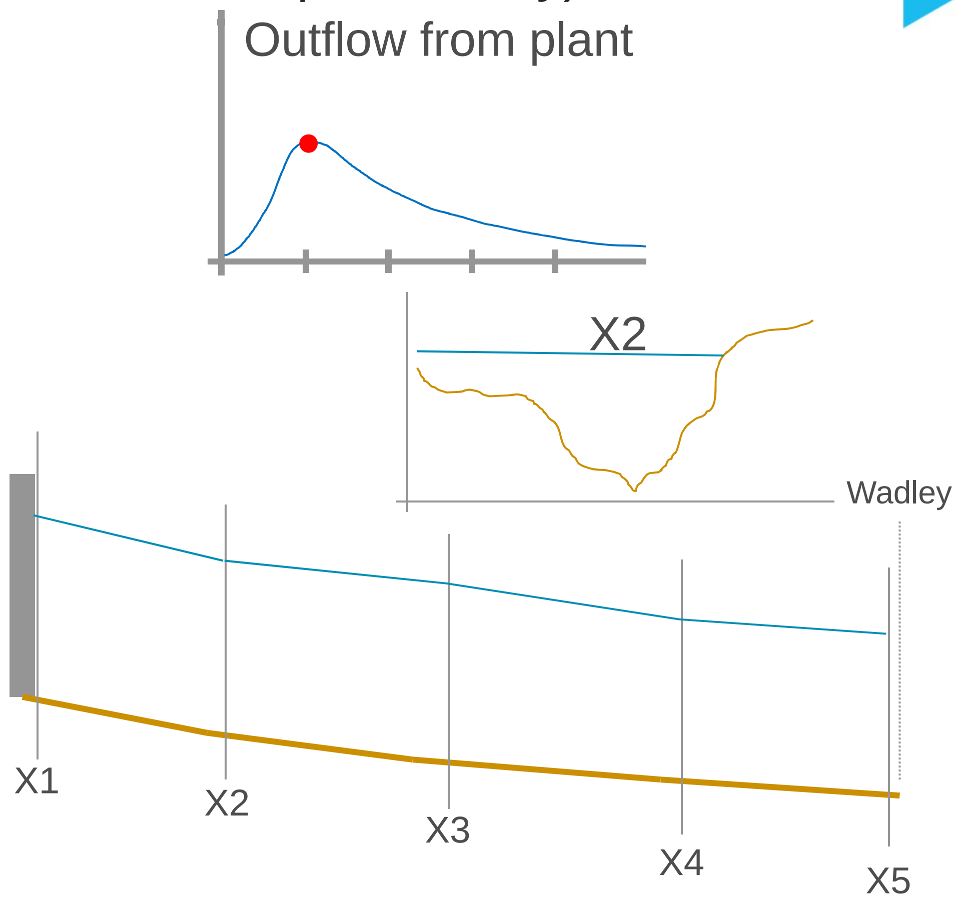

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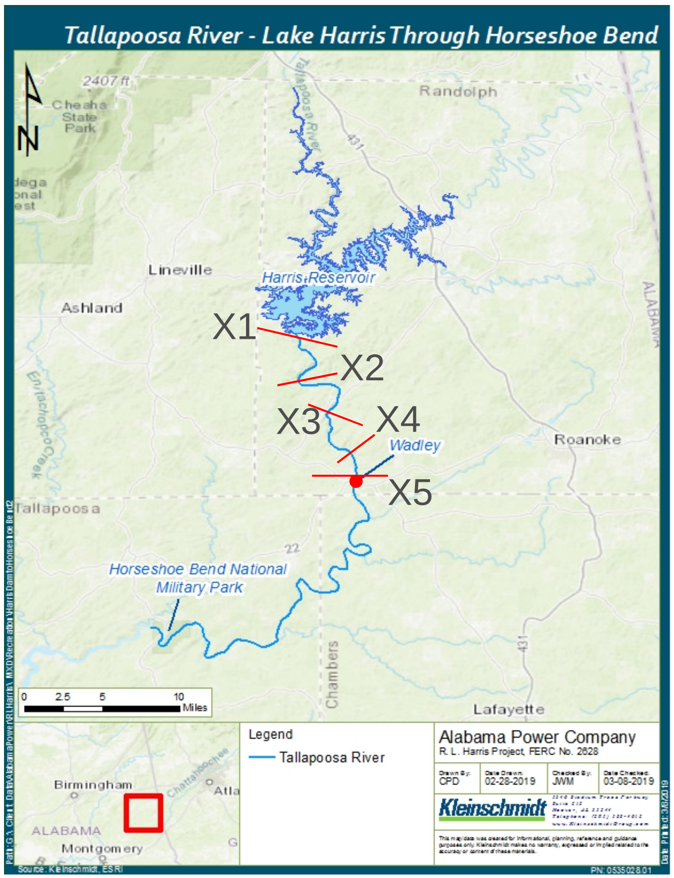

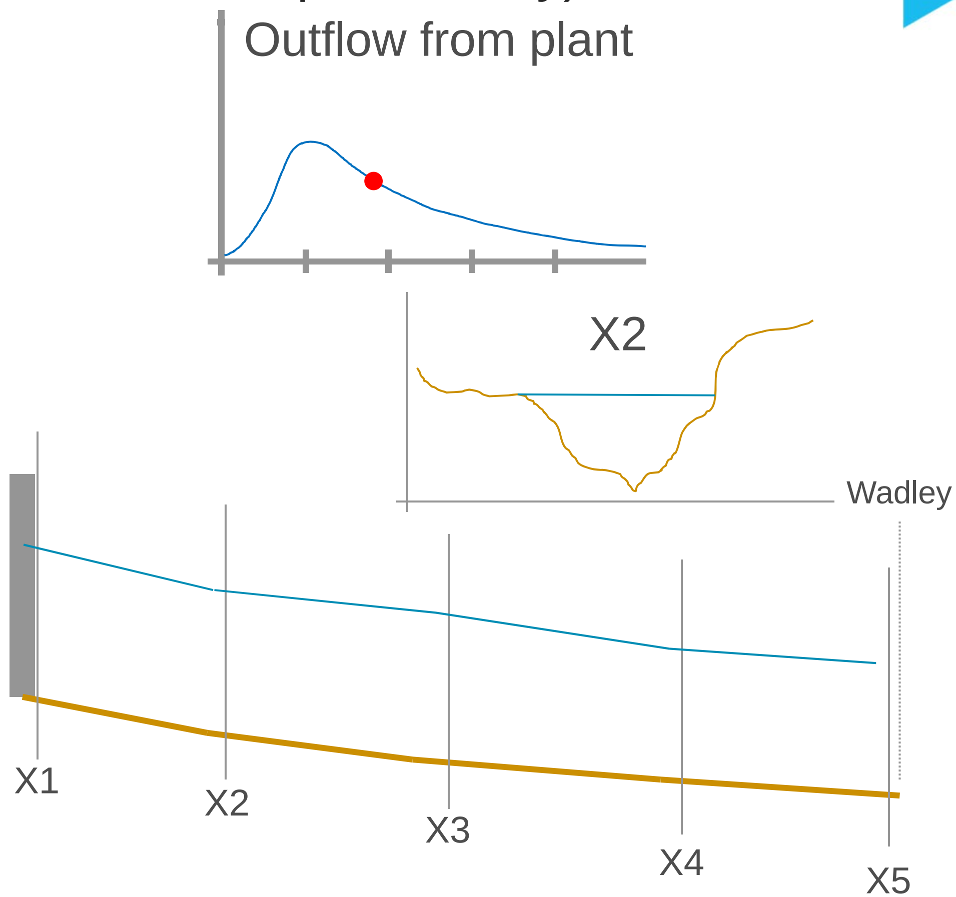

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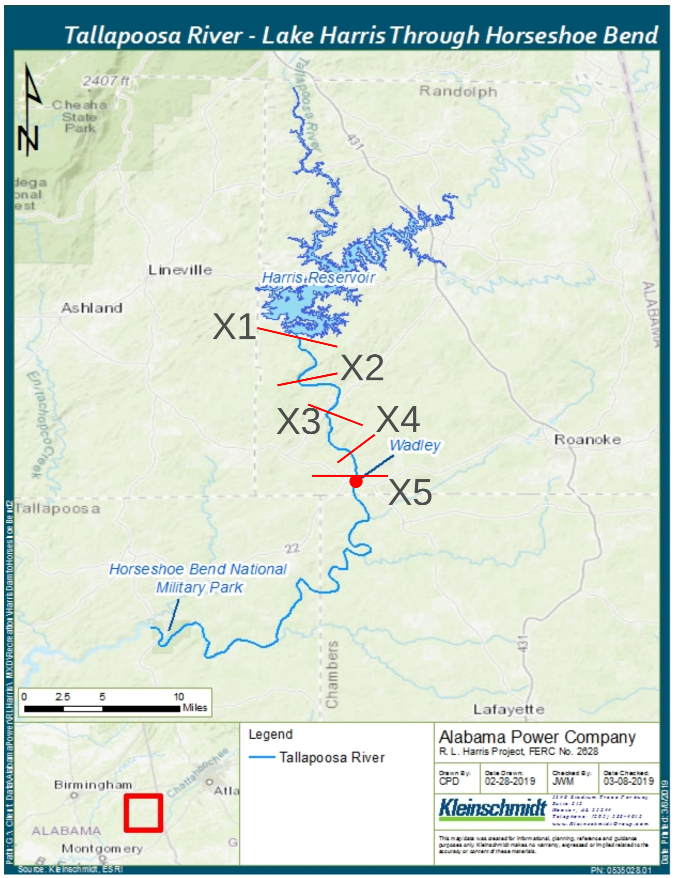

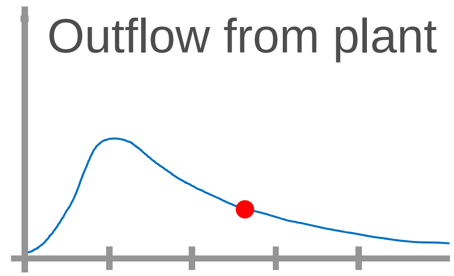

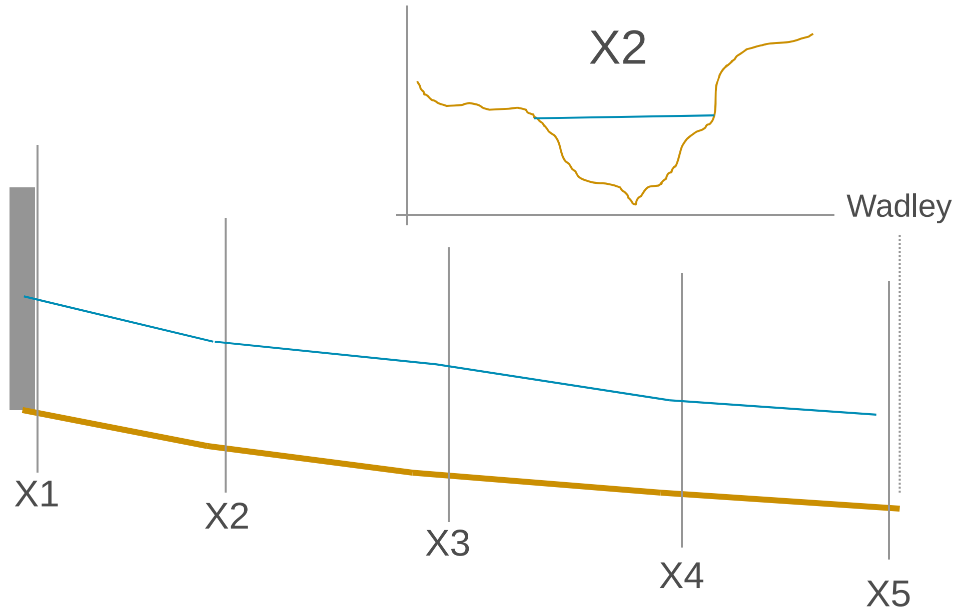

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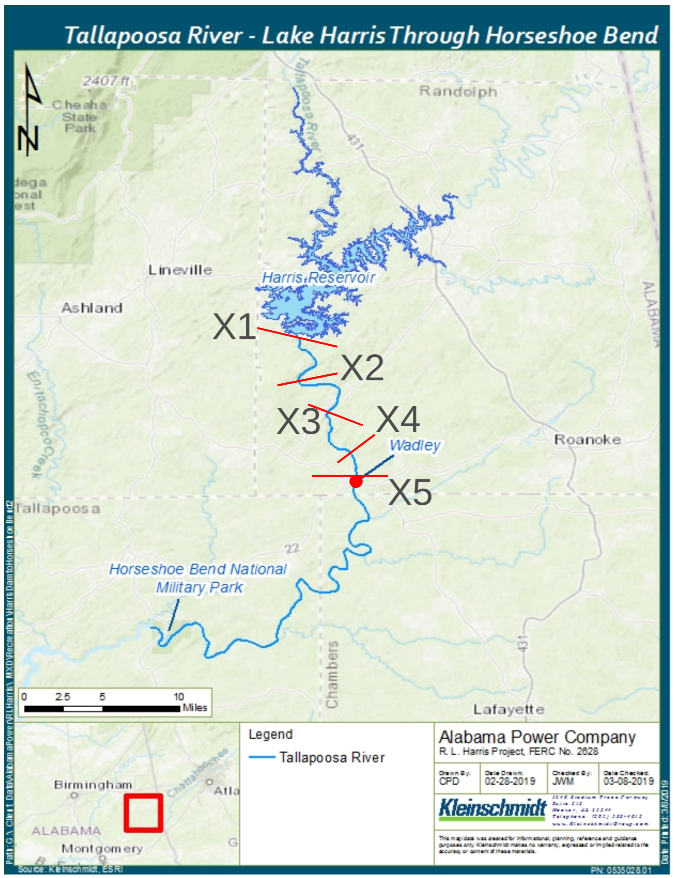
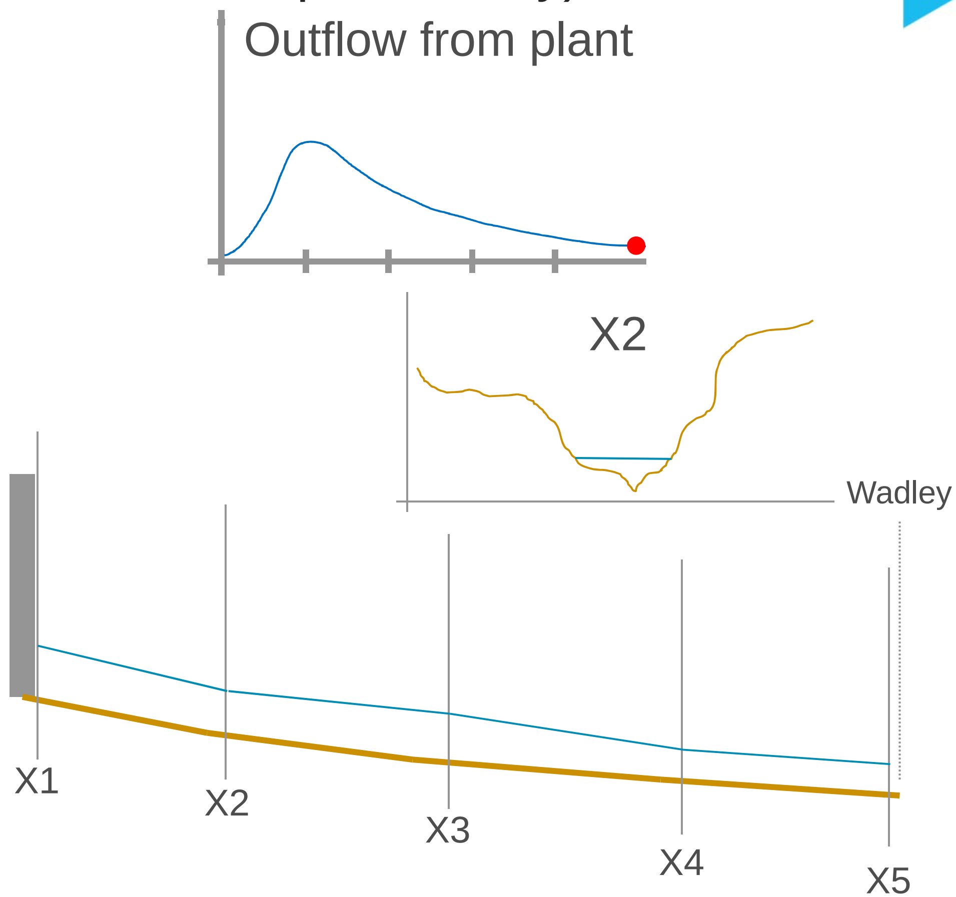
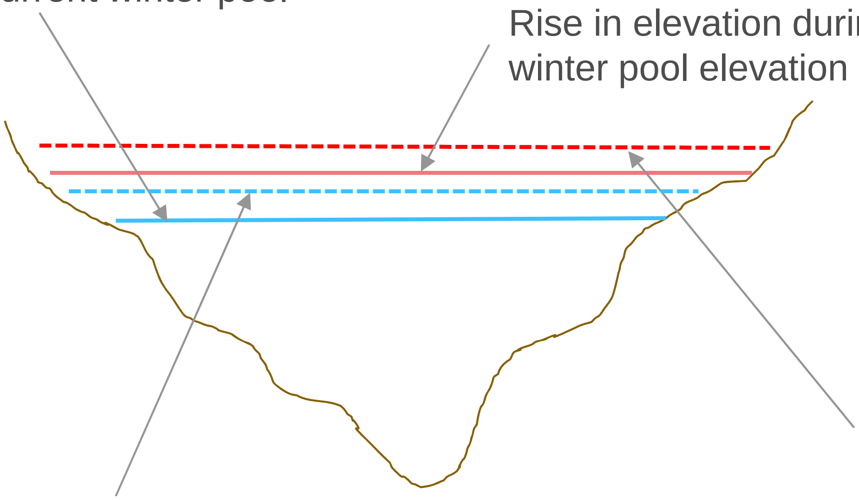




If the winter pool is increased, what happens during a high-flow event?

Current winter pool

Rise in elevation during a high-flow event and current winter pool elevation



Increased winter pool

Increased rise in reservoir elevation (HEC-ResSim)

AND…

What happens when more water is released?
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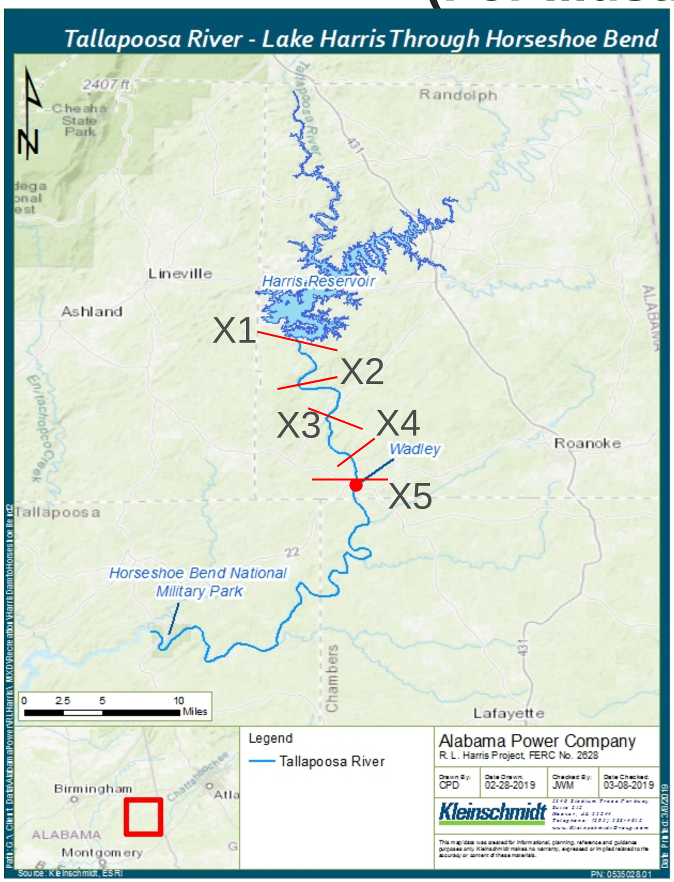
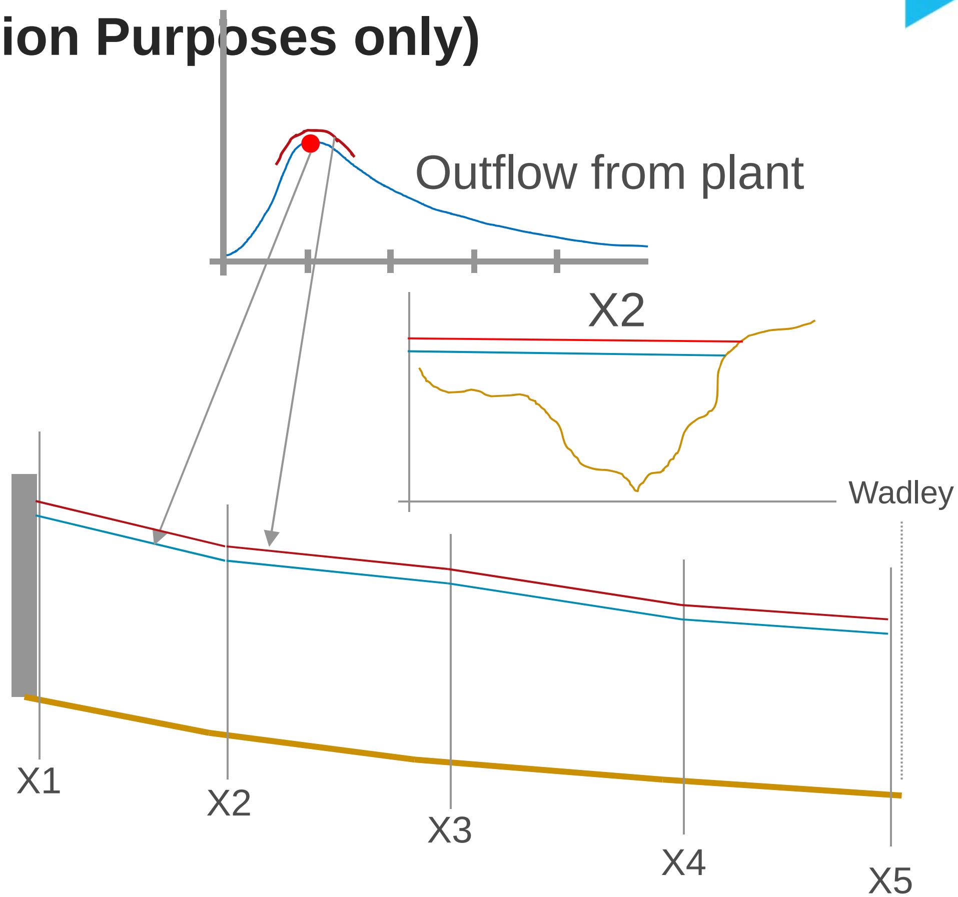
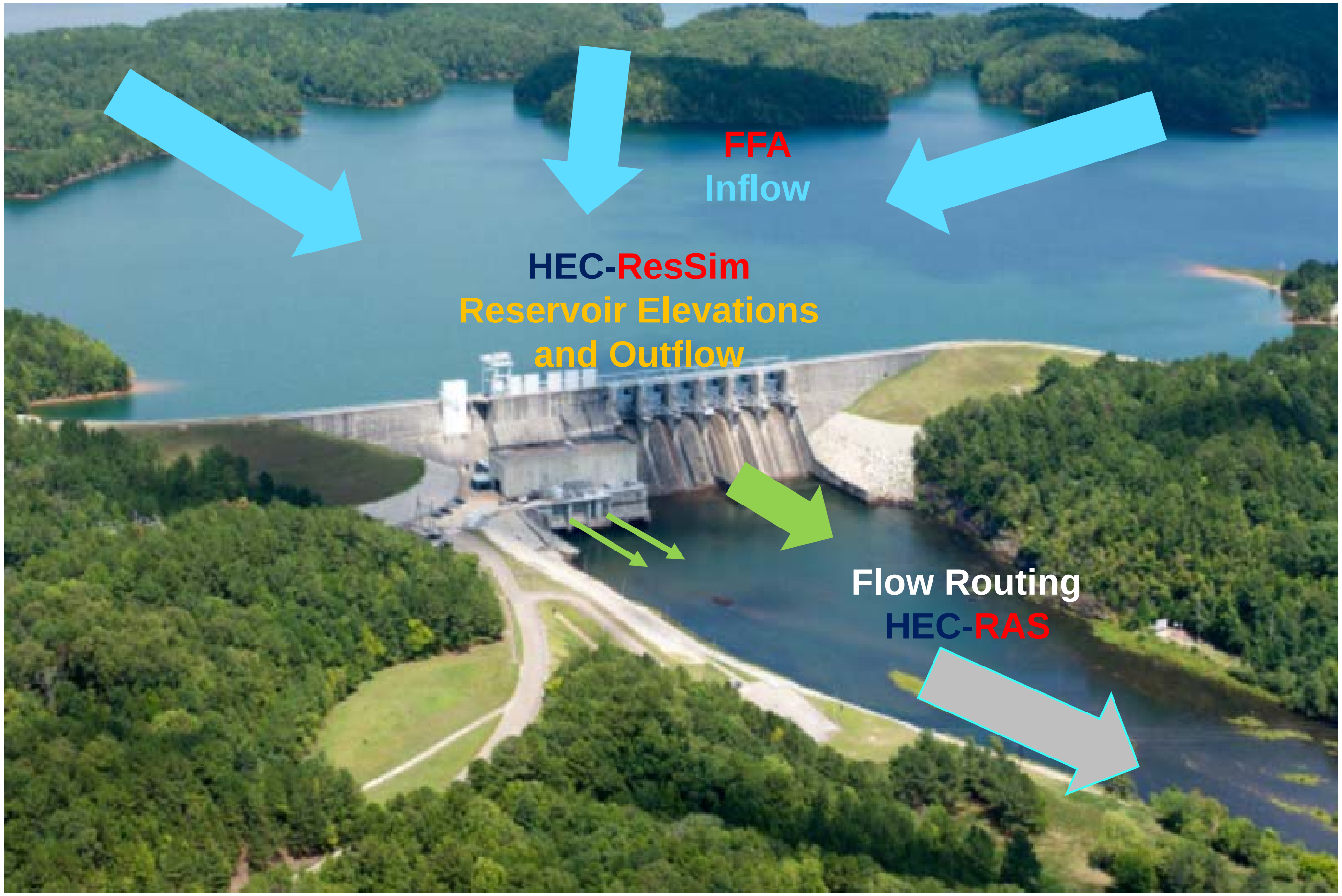
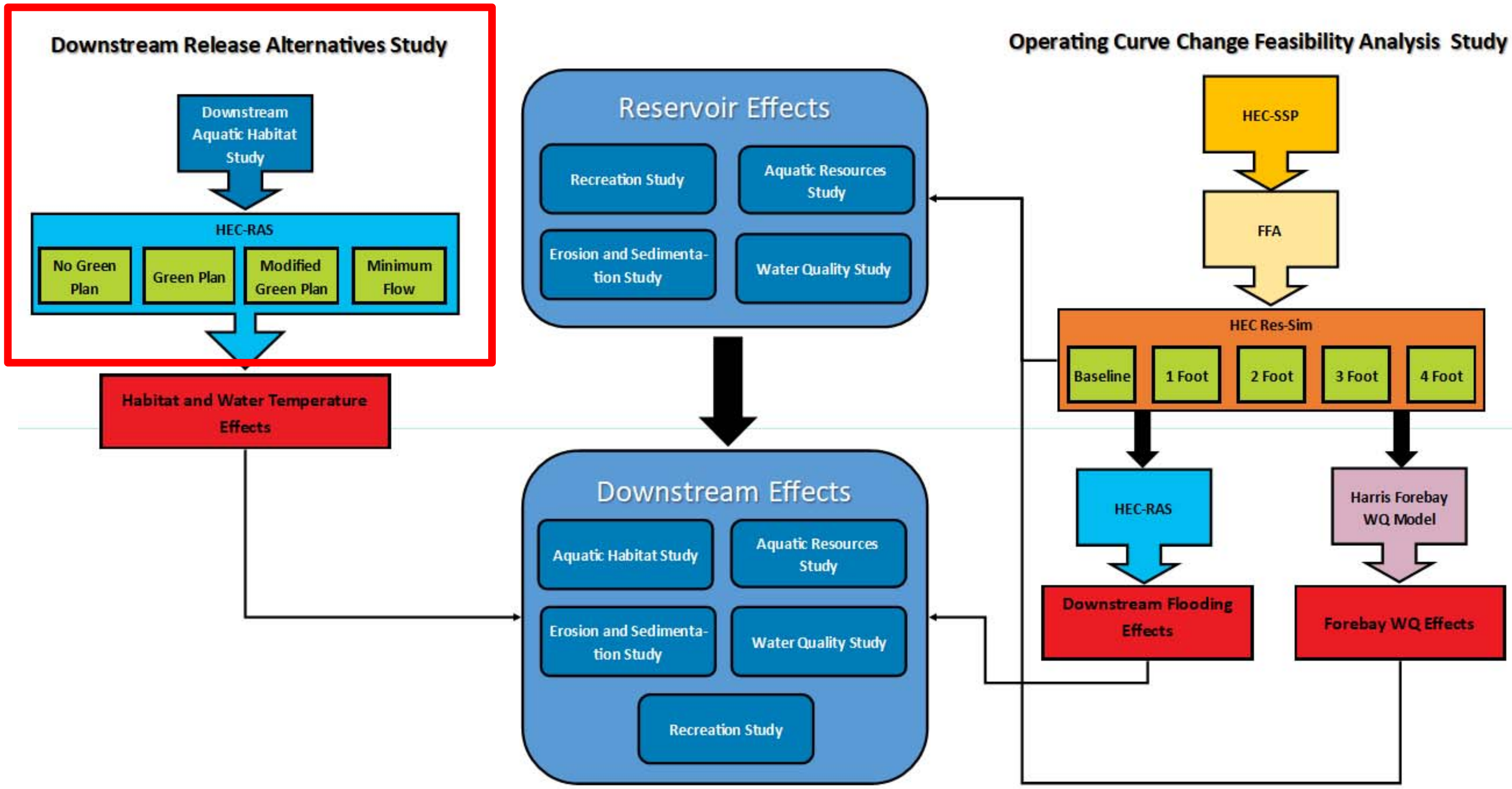




To summarize with a picture…




Downstream Release Alternatives Study
Downstream Aquatic Habitat Study
HEC-RAS
No Green Plan
Green Plan
Modified Green Plan
Minimum Flow
Habitat and Water Temperature Effects
Reservoir Effects
Recreation Study
Aquatic Resources Study
Erosion and Sedimentation Study
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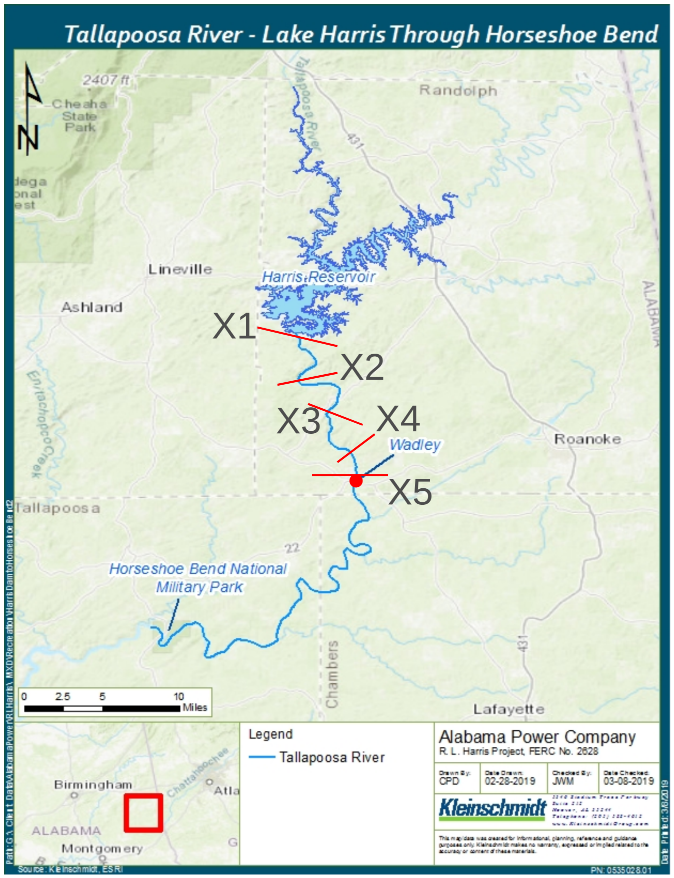
Harris Forebay WQ Model
Downstream Flooding Effects
Forebay WQ Effects

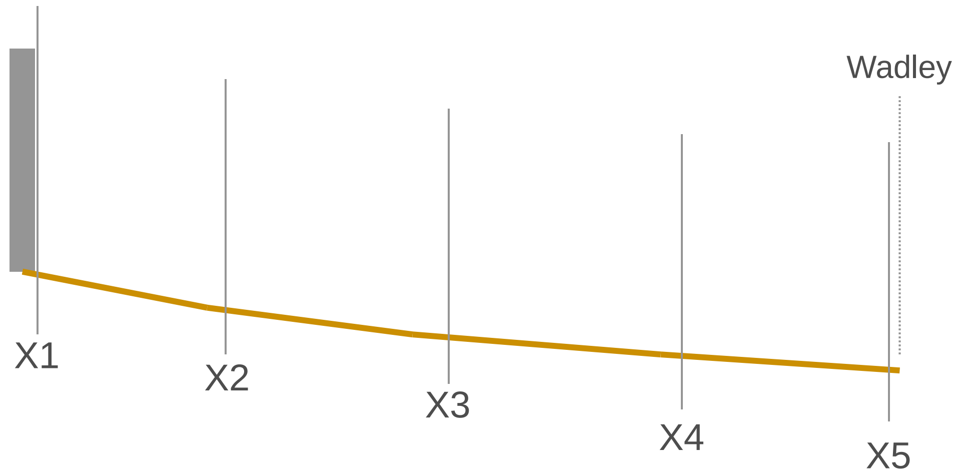
Downstream Release Alternatives Study

HEC-RAS model



Alternatives Studied

- Green Plan
- No Green Plan
- Modified Green Plan
- 150 cfs continuous minimum flow



Downstream Release Alternatives Study

HEC-ResSim model

Alternatives Studied

- Green Plan
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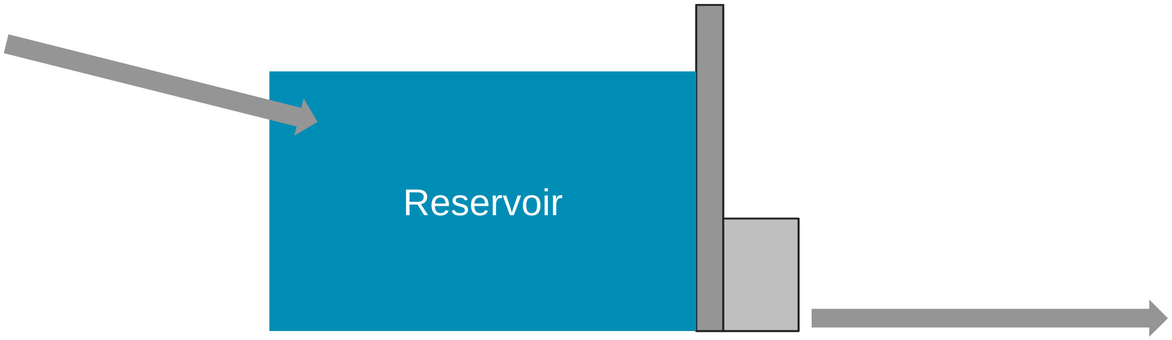
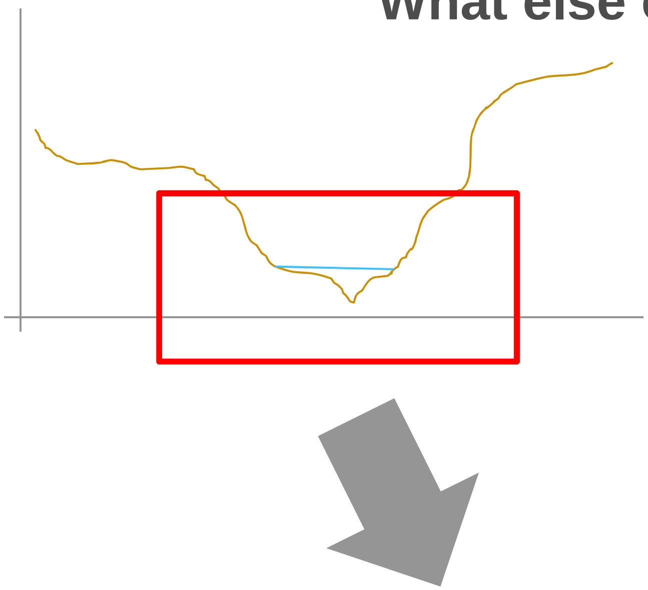
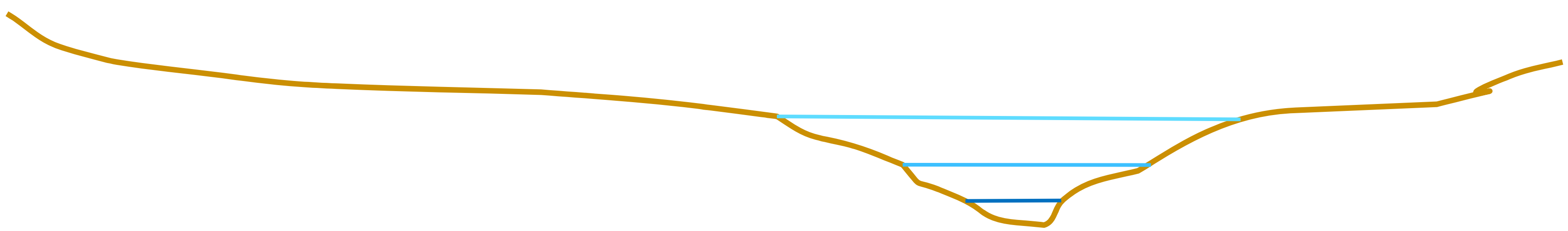


What else can HEC-RAS be used for?



- Downstream release alternatives
- Water quality
- Water Use
- Erosion
- Aquatic Resources
- Wildlife and Terrestrial Resources
- Recreation Resources
- Cultural Resources



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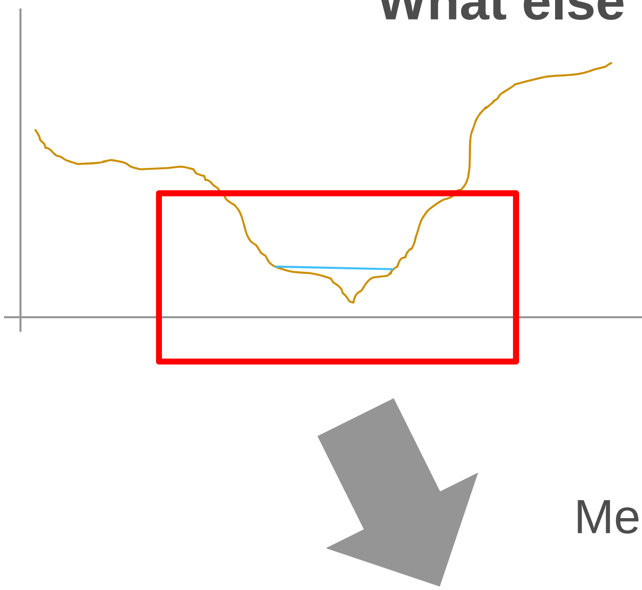
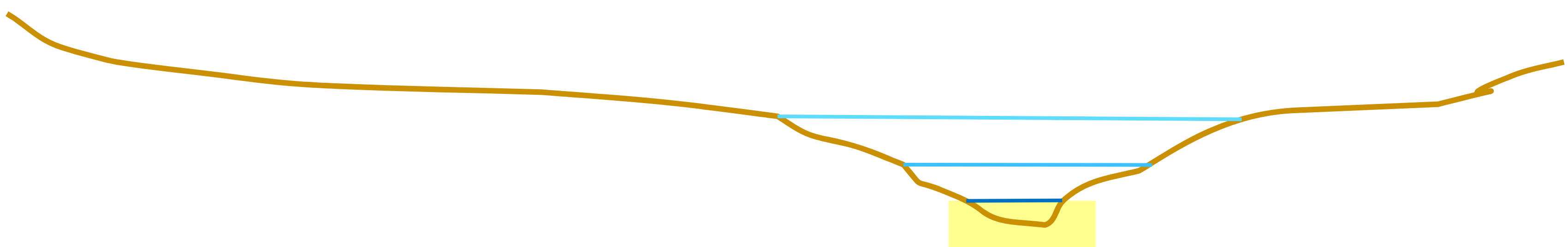


Measure wetted perimeter during low flow scenarios



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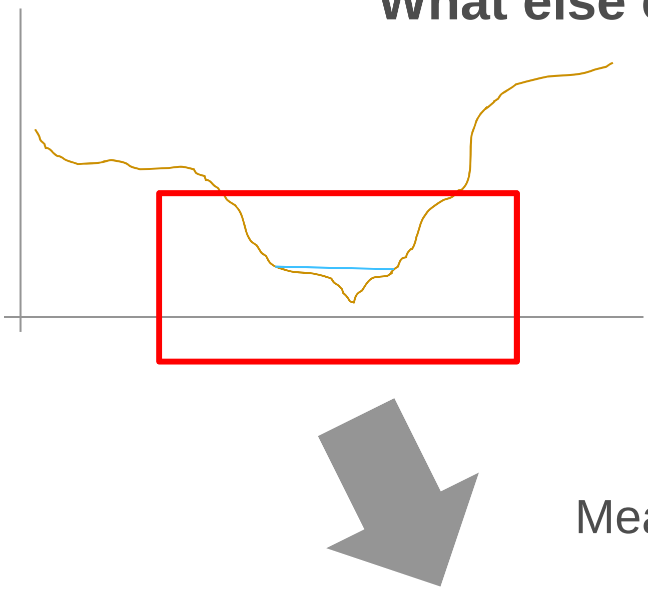

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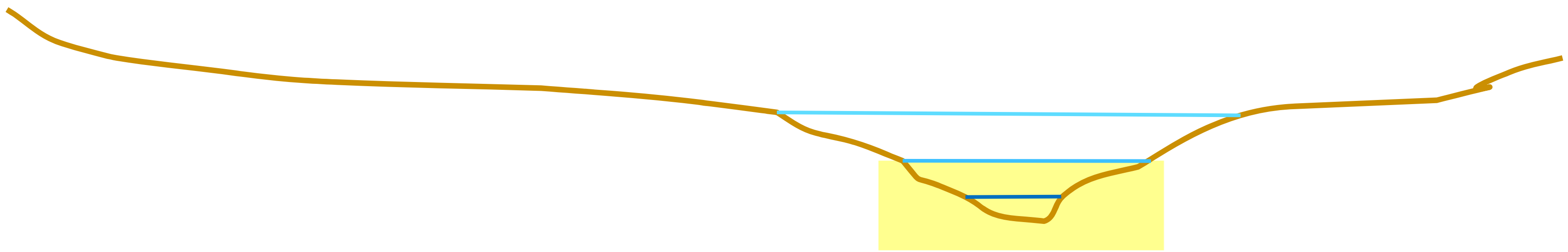

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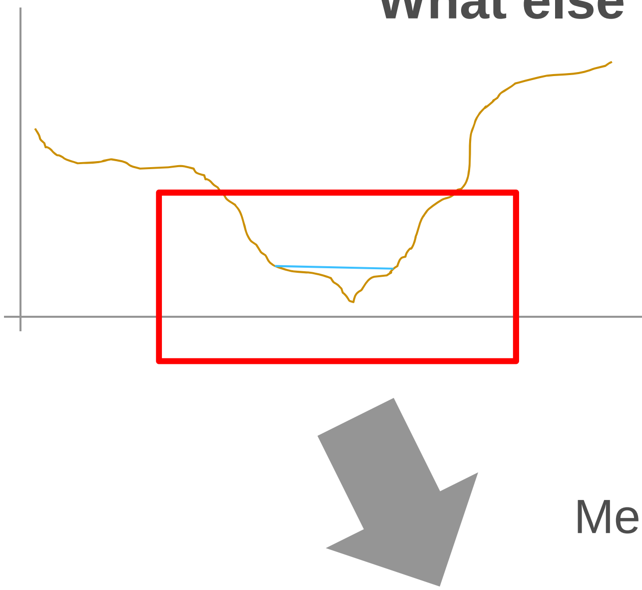

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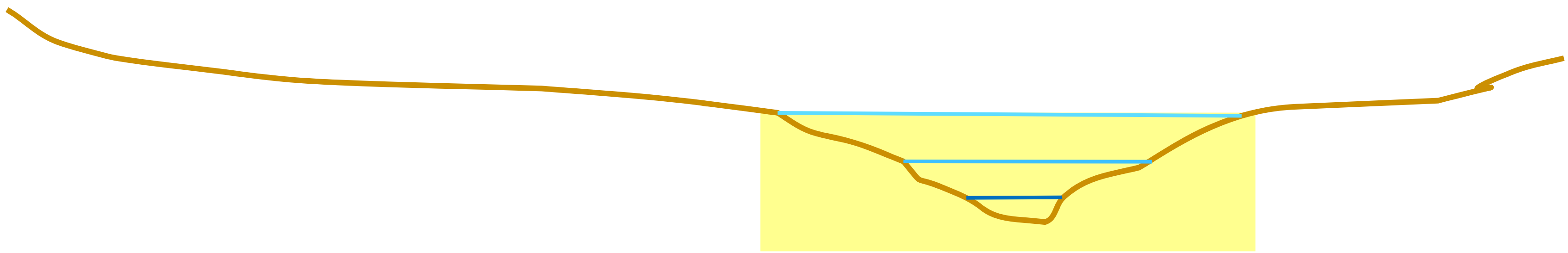

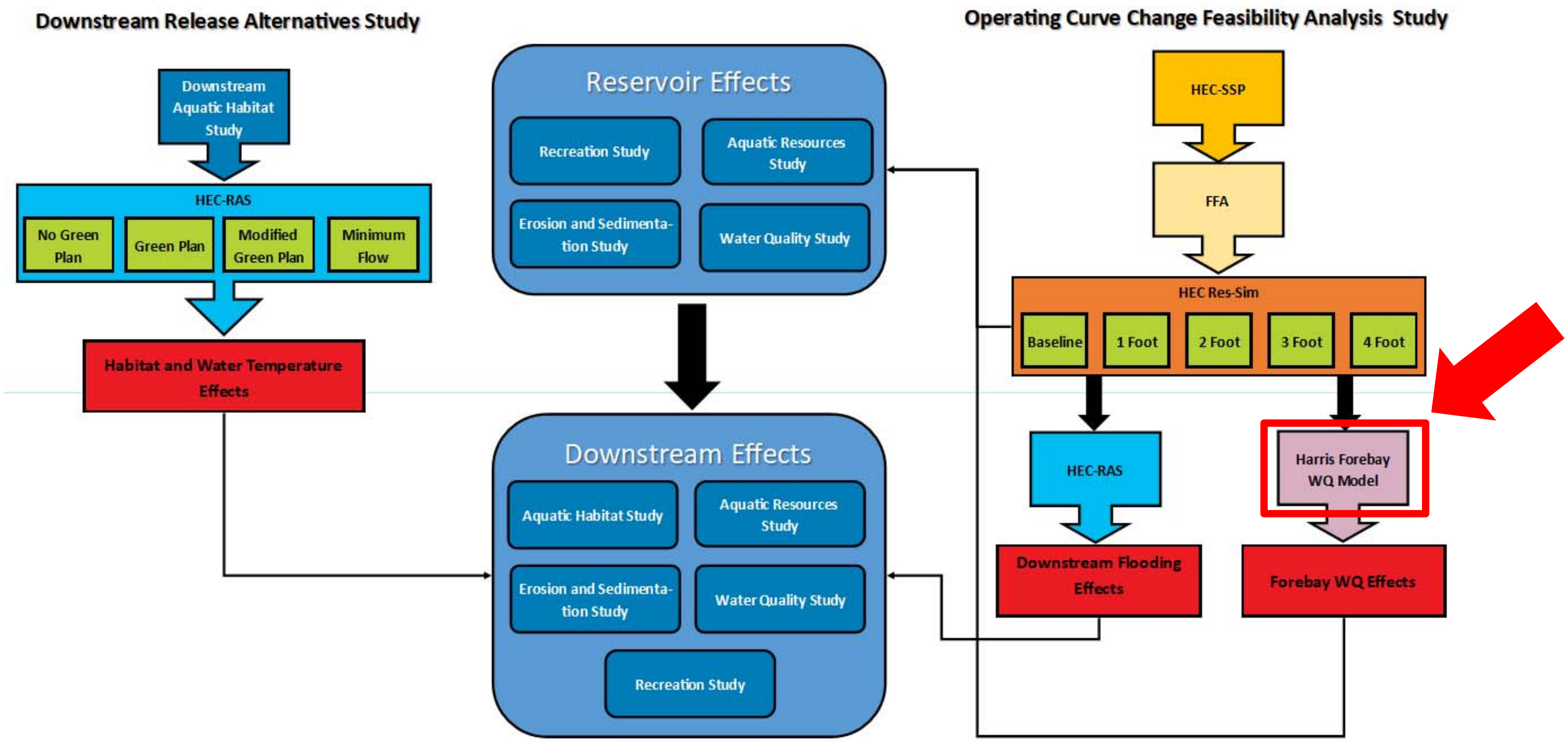

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- Abstract
- Applications and Possible Uses
- Model History
- Technical Support and Training
- Quality Assurance and Quality Control
- Related Sites
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- EFDC Model Download

From:	APC Harris Relicensing
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Bcc:	damon.abernethy@dcnr.alabama.gov; steve.bryant@dcnr.alabama.gov; stan.cook@dcnr.alabama.gov; taconya.goar@dcnr.alabama.gov; chris.greene@dcnr.alabama.gov; keith.henderson@dcnr.alabama.gov; mike.holley@dcnr.alabama.gov; evan.lawrence@dcnr.alabama.gov; brian.atkins@adeca.alabama.gov; tom.littlepage@adeca.alabama.gov; jhaslbauer@adem.alabama.gov; cljohnson@adem.alabama.gov; mlen@adem.alabama.gov; fal@adem.alabama.gov; djmoore@adem.alabama.gov; arsegars@southernco.com; dkanders@southernco.com; jefbaker@southernco.com; jcarlee@southernco.com; kechandl@southernco.com; mcoker@southernco.com; cggoodma@southernco.com; sgraham@southernco.com; ammcvica@southernco.com; tlmills@southernco.com; cmnix@southernco.com; kodom@southernco.com; alpeeple@southernco.com; dpreston@southernco.com; scsmith@southernco.com; twstjohn@southernco.com; cchaffin@alabamarivers.org; clowry@alabamarivers.org; gjobsis@americanrivers.org; kmo0025@auburn.edu; devridr@auburn.edu; irwiner@auburn.edu; wrighr2@aces.edu; lgallen@balch.com; jhancock@balch.com; allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; sarah.salazar@ferc.gov; monte.terhaar@ferc.gov; gene@wedoweelakehomes.com; kate.cosnahan@kleinschmidtgroup.com; colin.dinken@kleinschmidtgroup.com; amanda.fleming@kleinschmidtgroup.com; chris.goodell@kleinschmidtgroup.com; henry.mealing@kleinschmidtgroup.com; jason.moak@kleinschmidtgroup.com; kelly.schaeffer@kleinschmidtgroup.com; jessecunningham@msn.com; mdollar48@gmail.com; drheinzen@charter.net; sforehand@russelllands.com; 1942jthompson420@gmail.com; nancyburnes@centurylink.net; sandnfrench@gmail.com; lgarland68@aol.com; rbmorris222@gmail.com; Ira Parsons (irapar@centurytel.net); mitchell.reid@tnc.org; richardburnes3@gmail.com; eilandfarm@aol.com; athall@fujifilm.com; ebt.drt@numail.org; georgettraylor@centurylink.net; beckyrainwater1@yahoo.com; dbronson@charter.net; wmcampbell218@gmail.com; jec22641@aol.com; sonjaholloman@gmail.com; butchjackson60@gmail.com; donnamat@aol.com; goxford@centurylink.net; mhpwedowee@gmail.com; jerrelshell@gmail.com; bsmith0253@gmail.com; inspector_003@yahoo.com; paul.trudine@gmail.com; lindastone2012@gmail.com; granddadth@windstream.net; trayjim@bellsouth.net; straylor426@bellsouth.net; robert.a.allen@usace.army.mil; randall.b.harvey@usace.army.mil; james.e.hathorn.jr@sam.usace.army.mil; lewis.c.sumner@usace.army.mil; jonas.white@usace.army.mil; gordon.lisa-perras@epa.gov; holliman.daniel@epa.gov; jennifer_grunewald@fws.gov; jeff_powell@fws.gov; jeff_duncan@nps.gov
Subject:	HAT 1 - September 11 meeting notes
Date:	Tuesday, October 1, 2019 1:04:00 PM

HAT 1,

The meeting notes and materials from the HAT 1 meeting held September 11, 2019 can be found on the Harris relicensing website (www.harrisrelicensing.com) under HAT 1 – Project Operations.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

Level logger information

APC Harris Relicensing

Mon 10/14/2019 6:34 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Bcc damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov <stan.cook@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>; tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; jhaslbauer@adem.alabama.gov <jhaslbauer@adem.alabama.gov>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>; mlen@adem.alabama.gov <mlen@adem.alabama.gov>; fal@adem.alabama.gov <fal@adem.alabama.gov>; djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; mcoker@southernco.com <mcoker@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; sgraham@southernco.com <sgraham@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cmnix@southernco.com <cmnix@southernco.com>; kodom@southernco.com <kodom@southernco.com>; alpeeple@southernco.com <alpeeple@southernco.com>; dpreston@southernco.com <dpreston@southernco.com>; scsmith@southernco.com <scsmith@southernco.com>; twstjohn@southernco.com <twstjohn@southernco.com>; cchaffin@alabamarivers.org <cchaffin@alabamarivers.org>; clowry@alabamarivers.org <clowry@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; kmo0025@auburn.edu <kmo0025@auburn.edu>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; lgallen@balch.com <lgallen@balch.com>; jhancock@balch.com <jhancock@balch.com>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; gene@wedoweelakehomes.com <gene@wedoweelakehomes.com>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; chris.goodell@kleinschmidtgroup.com <chris.goodell@kleinschmidtgroup.com>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; jessecunningham@msn.com <jessecunningham@msn.com>; mdollar48@gmail.com <mdollar48@gmail.com>; drheinzen@charter.net <drheinzen@charter.net>; sforehand@russelllands.com <sforehand@russelllands.com>; 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>; sandnfrench@gmail.com <sandnfrench@gmail.com>; lgarland68@aol.com <lgarland68@aol.com>; rbmorris222@gmail.com <rbmorris222@gmail.com>; Ira Parsons (irapar@centurytel.net) <irapar@centurytel.net>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; richardburnes3@gmail.com <richardburnes3@gmail.com>; eilandfarm@aol.com <eilandfarm@aol.com>; athall@fujifilm.com <athall@fujifilm.com>; ebt.drt@numail.org <ebt.drt@numail.org>; georgettraylor@centurylink.net <georgettraylor@centurylink.net>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; dbronson@charter.net <dbronson@charter.net>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; jec22641@aol.com <jec22641@aol.com>; sonjaholloman@gmail.com <sonjaholloman@gmail.com>; butchjackson60@gmail.com <butchjackson60@gmail.com>; donnamat@aol.com <donnamat@aol.com>; goxford@centurylink.net <goxford@centurylink.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; jerrelshell@gmail.com <jerrelshell@gmail.com>; bsmith0253@gmail.com <bsmith0253@gmail.com>; inspector_003@yahoo.com <inspector_003@yahoo.com>; paul.trudine@gmail.com <paul.trudine@gmail.com>; lindastone2012@gmail.com

<lindastone2012@gmail.com>; granddadth@windstream.net <granddadth@windstream.net>; trayjim@bellsouth.net <trayjim@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; robert.a.allen@usace.army.mil <robert.a.allen@usace.army.mil>; randall.b.harvey@usace.army.mil <randall.b.harvey@usace.army.mil>; james.e.hathorn.jr@sam.usace.army.mil <james.e.hathorn.jr@sam.usace.army.mil>; lewis.c.sumner@usace.army.mil <lewis.c.sumner@usace.army.mil>; jonas.white@usace.army.mil <jonas.white@usace.army.mil>; gordon.lisa-perras@epa.gov <gordon.lisa-perras@epa.gov>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov <stan.cook@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>; ken.wills@jcdh.org <ken.wills@jcdh.org>; arsegars@southernco.com <arsegars@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; clowry@alabamarivers.org <clowry@alabamarivers.org>; cchaffin@alabamarivers.org <cchaffin@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; kmo0025@auburn.edu <kmo0025@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; jhancock@balch.com <jhancock@balch.com>; lgallen@balch.com <lgallen@balch.com>; chrisoberholster@birminghamaudubon.org <chrisoberholster@birminghamaudubon.org>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; sforehand@russelllands.com <sforehand@russelllands.com>; lgarland68@aol.com <lgarland68@aol.com>; pace.wilber@noaa.gov <pace.wilber@noaa.gov>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; donnamat@aol.com <donnamat@aol.com>; trayjim@bellsouth.net <trayjim@bellsouth.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; straylor426@bellsouth.net <straylor426@bellsouth.net>; triciastearns@gmail.com <triciastearns@gmail.com>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; decker.chris@epa.gov <decker.chris@epa.gov>; bill_pearson@fws.gov <bill_pearson@fws.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>

Good afternoon,

There have several questions at recent HAT meetings about the location of the level loggers that are collecting elevation and temperature data that will be used in several of the relicensing studies. For your information, here is a link to a map that shows the locations of the 20 level logger monitors: Level Logger Locations. This link will also be placed under HATs 1 and 3 on the Harris relicensing website, www.harrisrelicensing.com.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251

arsegars@southernco.com

From:	Cindy Lowry
To:	Anderegg, Angela Segars
Subject:	Re: Question about Harris dam operations
Date:	Wednesday, February 12, 2020 2:57:58 PM

EXTERNAL MAIL: Caution Opening Links or Files

Yes, I have told Martha that y'alls operations are pretty much prescribed in your license and operations manuals from the ACoE. I didn't know for sure if there was anything new in light of the significant rainfall we have seen lately. I will pass along this link as a reminder. If there are more specifics that this doesn't answer, I'll let you know. Thanks!
Cindy

On Wed, Feb 12, 2020 at 2:32 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Cindy
>
> As always in high flow events, we are just following our prescribed flood control procedures from the USACE. What people are seeing now is no different than what they have seen historically. We've discussed flood control operations at a few of the relicensing meetings to-date, but one in particular that may be helpful is the Operations presentation from January 31, 2018. There is a ppt and a video on our website: http://www.harrisrelicensing.com/_layouts/15/start.aspx#/HAT%201%20%20Project%20Operations/Forms/AllItems.aspx [harrisrelicensing.com].
>
> Can you give me a list of what the specific concerns are, I can certainly ask our water management folks to respond.
>
> Thanks,
>
> **Angie Anderegg**
>
> Hydro Services
>
> (205)257-2251
>
> arsegars@southernco.com
>
> ---
>
> **From:** Cindy Lowry <clowry@alabamarivers.org>
> **Sent:** Wednesday, February 12, 2020 12:38 PM
> **To:** Anderegg, Angela Segars <ARSEGARS@southernco.com>
> **Cc:** Martha Hunter (mhunter@alabamarivers.org) <mhunter@alabamarivers.org>
> **Subject:** Question about Harris dam operations
>
> **EXTERNAL MAIL: Caution Opening Links or Files**
>
> Hi Angie,
>
> We are getting called about concerns from the downstream landowners regarding flooding issues coming from Harris dam. They are very concerned with all the recent rains that the lake levels/dam releases, etc...is not being done as well as it could be to help manage downstream flooding problems. Would you be willing to talk with us and perhaps some downstream landowners about this issue to explain the operations currently? Obviously, we will be talking about this as we go through the relicensing process, but if there is anything you can do to help us better understand and give the

downstream landowners some relief, that would be appreciated.

Thank you,

Cindy

--

Cindy Lowry, MPA

Executive Director

Alabama Rivers Alliance

2014 6th Ave N, Suite 200

Birmingham, AL 35203

205-322-6395 ext. 106

www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

--
Cindy Lowry, MPA
Executive Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395 ext. 106
www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

From:	Anderegg, Angela Segars
To:	james traylor
Subject:	RE: Tallapoosa River Flooding
Date:	Thursday, February 13, 2020 2:42:04 PM

Hey Jimmy, I've asked our water management folk to give you a call.

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

-----Original Message-----
From: james traylor <trayjim@bellsouth.net>
Sent: Thursday, February 13, 2020 1:18 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Re: Tallapoosa River Flooding

EXTERNAL MAIL: Caution Opening Links or Files

____

I'll review the presentation and let you know. As of now APC has opened a flood gate and we are under water within 10 minutes of the water reaching us. The reason I asked the question was for a warning. Why can't APC give advanced warning?

Jimmy Traylor
Sent from iPhone

> On Feb 13, 2020, at 12:54 PM, Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:
>
> Hi Jimmy,
>
> We've discussed flood control operations at a few of the relicensing meetings to-date, but one in particular that may be most helpful in understanding the flood operations is the Operations presentation from January 31, 2018. There is a ppt and a video on our website: https://urldefense.proofpoint.com/v2/url?u=http-3A__www.harrisrelicensing.com_-5Flayouts_15_start.aspx-23_HAT-25201-2520-2520Project-2520Operations_Forms_AllItems.aspx&d=DwIFaQ&c=AgWC6Nl7Slwpc9jE7UoQH1_Cvyci3SsTNfdLP4V1RCg&r=3qWv32MayddUzrbqJnBFwNmttMUUbdCuXZrVDKTC5gg&m=h5_aBVHbDHM0rPAGqe5H9oF-QBys5ibVUggXnd59vAk&s=lgZvsDPWw6AK7r3H9VW2GDhehdcGJyDvNnh42SsihXY&e= .
>
> If you have some specific questions, I can ask our water management folks to get in touch with you.
>
> Angie Anderegg
> Hydro Services
> (205)257-2251
> arsegars@southernco.com
>
> -----Original Message-----
> From: James Traylor <trayjim@bellsouth.net>
> Sent: Thursday, February 13, 2020 9:47 AM
> To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
> Subject: Tallapoosa River Flooding
>
> EXTERNAL MAIL: Caution Opening Links or Files
>
> ________________________________
>
> Angela,
>
> In reference to flooding on the Tallapoosa River below Harris Dam, Can you please tell us what the criteria is for flood gate operations? Before the dam, the river was predictable. We always knew after "x" amount of rain what to expect. Since the dam, when the flood gates open, there is no time to prepare. The river will rise 10-12 feet in a half of an hour. The flooding is very rapid and violent.
>
> Thanks,
>
> Jimmy Traylor
>
>
> Sent from my iPad

From:	APC Harris Relicensing
To:	"harrisrelicensing@southernco.com"
Bcc:	damon.abernethy@dcnr.alabama.gov; steve.bryant@dcnr.alabama.gov; todd.fobian@dcnr.alabama.gov; chris.greene@dcnr.alabama.gov; keith.henderson@dcnr.alabama.gov; mike.holley@dcnr.alabama.gov; evan.lawrence@dcnr.alabama.gov; matthew.marshall@dcnr.alabama.gov; brian.atkins@adeca.alabama.gov; tom.littlepage@adeca.alabama.gov; jhaslbauer@adem.alabama.gov; cljohnson@adem.alabama.gov; mlen@adem.alabama.gov; fal@adem.alabama.gov; djmoore@adem.alabama.gov; arsegars@southernco.com; dkanders@southernco.com; jefbaker@southernco.com; jcarlee@southernco.com; kechandl@southernco.com; mcoker@southernco.com; cggoodma@southernco.com; sgraham@southernco.com; ammcvica@southernco.com; tlmills@southernco.com; cmnix@southernco.com; kodom@southernco.com; alpeeple@southernco.com; scsmith@southernco.com; twstjohn@southernco.com; wtanders@southernco.com; Rasberry, Jennifer S.; mhunter@alabamarivers.org; clowry@alabamarivers.org; gjobsis@americanrivers.org; kmo0025@auburn.edu; devridr@auburn.edu; irwiner@auburn.edu; wrighr2@aces.edu; lgallen@balch.com; jhancock@balch.com; allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; sarah.salazar@ferc.gov; monte.terhaar@ferc.gov; gene@wedoweelakehomes.com; kate.cosnahan@kleinschmidtgroup.com; colin.dinken@kleinschmidtgroup.com; amanda.fleming@kleinschmidtgroup.com; chris.goodell@kleinschmidtgroup.com; henry.mealing@kleinschmidtgroup.com; jason.moak@kleinschmidtgroup.com; kelly.schaeffer@kleinschmidtgroup.com; jessecunningham@msn.com; mdollar48@gmail.com; drheinzen@charter.net; sforehand@russelllands.com; 1942jthompson420@gmail.com; nancyburnes@centurylink.net; sandnfrench@gmail.com; lgarland68@aol.com; rbmorris222@gmail.com; Ira Parsons (irapar@centurytel.net); mitchell.reid@tnc.org; richardburnes3@gmail.com; eilandfarm@aol.com; athall@fujifilm.com; ebt.drt@numail.org; georgettraylor@centurylink.net; beckyrainwater1@yahoo.com; dbronson@charter.net; wmcampbell218@gmail.com; jec22641@aol.com; sonjaholloman@gmail.com; butchjackson60@gmail.com; donnamat@aol.com; goxford@centurylink.net; mhpwedowee@gmail.com; jerrelshell@gmail.com; bsmith0253@gmail.com; inspector_003@yahoo.com; paul.trudine@gmail.com; lindastone2012@gmail.com; granddadth@windstream.net; trayjim@bellsouth.net; straylor426@bellsouth.net; robert.a.allen@usace.army.mil; randall.b.harvey@usace.army.mil; james.e.hathorn.jr@sam.usace.army.mil; lewis.c.sumner@usace.army.mil; jonas.white@usace.army.mil; gordon.lisa-perras@epa.gov; holliman.daniel@epa.gov; jennifer_grunewald@fws.gov; jeff_powell@fws.gov; jeff_duncan@nps.gov
Subject:	Harris relicensing - March 19th HAT 1 meeting
Date:	Friday, February 21, 2020 12:40:41 PM
Attachments:	2020-03-19 HAT Meeting Agenda.doc

HAT 1,

Alabama Power Company will be hosting a series of HAT meetings on **Thursday, March 19, 2020 at the Oxford Civic Center,** 401 McCullars Ln, Oxford, AL 36203. The HAT 1 meeting will be from **9:00 to 12:45 (see attached agenda)**. The purpose of the HAT 1 meeting is to review initial results and progress to date for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives studies.

Please RSVP by Friday, March 13, 2020. Lunch will be provided (~11:15) so please indicate any food allergies or vegetarian preferences on or before March 13, 2020. I encourage everyone to attend in person. If this is not feasible, we are also offering a Skype option (info below). It would be ideal to join on your computer as we will be viewing presentations.

If you have any questions about the agenda or meeting, please email or call me at ARSEGARS@southernco.com or (205) 257-2251.

Join Skype Meeting

+1 (205) 257-2663

Conference ID: 3660816

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

Meeting Agenda
March 19, 2020
9:00 AM – 3:30 PM
Oxford Civic Center: 401 McCullars Lane, Oxford, AL 36203

Meeting Purpose: Update stakeholders on Harris Action Teams' (HATs) progress on Project Operations (HAT 1), Recreation (HAT 5), and Fish and Wildlife (HAT 3).

9:00 AM	**Welcome, Safety Message, and Meeting Purpose**
9:15 AM	**HAT 1: Project Operations** Operating Curve Feasibility Analysis Downstream Release Alternatives
11:15 AM	Lunch
12:00 PM	**HAT 1 Phase 2: Qualitative and Quantitative Evaluations of the Effect(s) of an Operating Curve Change on Resources** Recreation Structure Usability at Winter Pool Alternatives
12:45 PM	**HAT 5: Recreation** Recreation Evaluation
1:30 PM	**HAT 3: Fish and Wildlife** Threatened and Endangered Species Downstream Aquatic Habitat Aquatic Resources
3:30 PM	**Wrap-up, Questions, and Adjourn**

From:	APC Harris Relicensing
To:	"harrisrelicensing@southernco.com"
Bcc:	damon.abernethy@dcnr.alabama.gov; nathan.aycock@dcnr.alabama.gov; steve.bryant@dcnr.alabama.gov; todd.fobian@dcnr.alabama.gov; chris.greene@dcnr.alabama.gov; keith.henderson@dcnr.alabama.gov; mike.holley@dcnr.alabama.gov; evan.lawrence@dcnr.alabama.gov; matthew.marshall@dcnr.alabama.gov; brian.atkins@adeca.alabama.gov; tom.littlepage@adeca.alabama.gov; jhaslbauer@adem.alabama.gov; cljohnson@adem.alabama.gov; mlen@adem.alabama.gov; fal@adem.alabama.gov; djmoore@adem.alabama.gov; arsegars@southernco.com; dkanders@southernco.com; wtanders@southernco.com; jefbaker@southernco.com; jcarlee@southernco.com; kechandl@southernco.com; mcoker@southernco.com; cggoodma@southernco.com; sgraham@southernco.com; ammcvica@southernco.com; tlmills@southernco.com; cmnix@southernco.com; kodom@southernco.com; alpeeple@southernco.com; scsmith@southernco.com; twstjohn@southernco.com; Rasberry, Jennifer S.; mhunter@alabamarivers.org; clowry@alabamarivers.org; jwest@alabamarivers.org; gjobsis@americanrivers.org; kmo0025@auburn.edu; devridr@auburn.edu; irwiner@auburn.edu; wrighr2@aces.edu; lgallen@balch.com; jhancock@balch.com; allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; sarah.salazar@ferc.gov; monte.terhaar@ferc.gov; gene@wedoweelakehomes.com; kate.cosnahan@kleinschmidtgroup.com; colin.dinken@kleinschmidtgroup.com; amanda.fleming@kleinschmidtgroup.com; chris.goodell@kleinschmidtgroup.com; henry.mealing@kleinschmidtgroup.com; jason.moak@kleinschmidtgroup.com; kelly.schaeffer@kleinschmidtgroup.com; jessecunningham@msn.com; mdollar48@gmail.com; drheinzen@charter.net; sforehand@russelllands.com; 1942jthompson420@gmail.com; nancyburnes@centurylink.net; sandnfrench@gmail.com; lgarland68@aol.com; rbmorris222@gmail.com; irapar@centurytel.net; mitchell.reid@tnc.org; richardburnes3@gmail.com; eilandfarm@aol.com; athall@fujifilm.com; ebt.drt@numail.org; georgettraylor@centurylink.net; beckyrainwater1@yahoo.com; dbronson@charter.net; wmcampbell218@gmail.com; jec22641@aol.com; sonjahollomon@gmail.com; butchjackson60@gmail.com; donnamat@aol.com; goxford@centurylink.net; mhpwedowee@gmail.com; jerrelshell@gmail.com; bsmith0253@gmail.com; inspector_003@yahoo.com; paul.trudine@gmail.com; lindastone2012@gmail.com; granddadth@windstream.net; trayjim@bellsouth.net; straylor426@bellsouth.net; robert.a.allen@usace.army.mil; randall.b.harvey@usace.army.mil; james.e.hathorn.jr@sam.usace.army.mil; lewis.c.sumner@usace.army.mil; jonas.white@usace.army.mil; gordon.lisa-perras@epa.gov; holliman.daniel@epa.gov; jennifer_grunewald@fws.gov; jeff_powell@fws.gov; jeff_duncan@nps.gov
Subject:	UPDATE - Harris relicensing - HAT 1 meeting
Date:	Friday, March 13, 2020 12:52:47 PM
Attachments:	2020-03-19 HAT Meeting Agenda.doc
Importance:	High

HAT 1,

Due to the ongoing situation with the spread of COVID-19 (the "coronavirus"), Southern Company has directed its employees to use virtual meetings, when possible. Therefore, the HAT 1 meeting scheduled for Thursday, March 19th will **only be held via the Skype link below and call-in number below**. If you are able to join via Skype, we will be sharing the presentation. If you are not, we will provide the presentation in a PDF document the morning of the meeting and the presenter will help you follow along with the slides.

The Skype link will be available beginning at 8:30 am. I suggest you join early to make sure that your computer is capable of joining (has all the necessary software). We will be muting and unmuting the phones from the control center, so please don't worry about announcing that you joined. **At 9 am, the meeting will begin**, and we will conduct a roll call to make sure we have a record of who attended the meeting. Also, if you use your computer's microphone and speaker to join the call, there is no need to use the phone number.

If you have any questions, please let me know.

From: APC Harris Relicensing
Sent: Friday, February 21, 2020 12:41 PM
To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Subject: Harris relicensing - March 19th HAT 1 meeting

HAT 1,

Alabama Power Company will be hosting a series of HAT meetings on **Thursday, March 19, 2020 at the Oxford Civic Center,** 401 McCullars Ln, Oxford, AL 36203. The HAT 1 meeting will be from **9:00 to 12:45 (see attached agenda)**. The purpose of the HAT 1 meeting is to review initial results and progress to date for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives studies.

Please RSVP by Friday, March 13, 2020. Lunch will be provided (~11:15) so please indicate any food allergies or vegetarian preferences on or before March 13, 2020. I encourage everyone to attend in person. If this is not feasible, we are also offering a Skype option (info below). It would be ideal to join on your computer as we will be viewing presentations.

If you have any questions about the agenda or meeting, please email or call me at ARSEGARS@southernco.com or (205) 257-2251.

Join Skype Meeting

+1 (205) 257-2663

Conference ID: 3660816

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: APC Harris Relicensing
To: APC Harris Relicensing
Bcc: "damon.abernethy@dcnr.alabama.gov"; nathan.aycock@dcnr.alabama.gov; "steve.bryant@dcnr.alabama.gov"; todd.fobian@dcnr.alabama.gov; "chris.greene@dcnr.alabama.gov"; "keith.henderson@dcnr.alabama.gov"; "mike.holley@dcnr.alabama.gov"; "evan.lawrence@dcnr.alabama.gov"; "matthew.marshall@dcnr.alabama.gov"; "brian.atkins@adeca.alabama.gov"; "tom.littlepage@adeca.alabama.gov"; "jhaslbauer@adem.alabama.gov"; "cljohnson@adem.alabama.gov"; "mlen@adem.alabama.gov"; "fal@adem.alabama.gov"; "djmoore@adem.alabama.gov"; Anderegg, Angela Segars; Anderson, Dave; Anderson, Wesley Taylor; Baker, Jeffery L.; Carlee, Jason; Chandler, Keith Edward; Coker, Mary Paulette; Goodman, Chris G.; Graham, Stacey A.; McVicar, Ashley M; Mills, Tina L.; Nix, Christy M.; Odom, Kenneth; Peeples, Alan L.; Smith, Sheila C.; St. John, Thomas W.; Rasberry, Jennifer S.; "mhunter@alabamarivers.org"; "clowry@alabamarivers.org"; jwest@alabamarivers.org; "gjobsis@americanrivers.org"; "kmo0025@auburn.edu"; "devridr@auburn.edu"; "irwiner@auburn.edu"; "wrighr2@aces.edu"; Allen, Leslie G. (Balch); Hancock, Jim (Balch); allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; "sarah.salazar@ferc.gov"; monte.terhaar@ferc.gov; "gene@wedoweelakehomes.com"; "kate.cosnahan@kleinschmidtgroup.com"; "colin.dinken@kleinschmidtgroup.com"; "amanda.fleming@kleinschmidtgroup.com"; "chris.goodell@kleinschmidtgroup.com"; "henry.mealing@kleinschmidtgroup.com"; "jason.moak@kleinschmidtgroup.com"; "kelly.schaeffer@kleinschmidtgroup.com"; "jessecunningham@msn.com"; "mdollar48@gmail.com"; "drheinzen@charter.net"; "sforehand@russelllands.com"; "1942jthompson420@gmail.com"; "nancyburnes@centurylink.net"; "sandnfrench@gmail.com"; "lgarland68@aol.com"; "rbmorris222@gmail.com"; "irapar@centurytel.net"; "mitchell.reid@tnc.org"; "richardburnes3@gmail.com"; eilandfarm@aol.com; "athall@fujifilm.com"; "ebt.drt@numail.org"; "georgettraylor@centurylink.net"; "beckyrainwater1@yahoo.com"; "dbronson@charter.net"; wmcampbell218@gmail.com; "jec22641@aol.com"; sonjahollomon@gmail.com; "butchjackson60@gmail.com"; "donnamat@aol.com"; "goxford@centurylink.net"; "mhpwedowee@gmail.com"; "jerrelshell@gmail.com"; "bsmith0253@gmail.com"; "inspector_003@yahoo.com"; "paul.trudine@gmail.com"; "lindastone2012@gmail.com"; "granddadth@windstream.net"; "trayjim@bellsouth.net"; "straylor426@bellsouth.net"; "robert.a.allen@usace.army.mil"; "randall.b.harvey@usace.army.mil"; "james.e.hathorn.jr@sam.usace.army.mil"; "lewis.c.sumner@usace.army.mil"; "jonas.white@usace.army.mil"; "gordon.lisa-perras@epa.gov"; "holliman.daniel@epa.gov"; "jennifer_grunewald@fws.gov"; "jeff_powell@fws.gov"; "jeff_duncan@nps.gov"
Subject: CANCELLED - Harris relicensing - HAT 1 meeting
Date: Monday, March 16, 2020 12:51:10 PM

HAT 1,

First, I apologize for the multiple emails regarding this week's meeting and I appreciate you bearing with us. Because we are all in such a state of flux with schools closing and more and more of us being asked to telecommute, and the uncertainty of how well our technology is going to work when we're all trying to use it at once, we have decided to cancel this Thursday's stakeholder meeting. The information we were going to cover will be included in the Initial Study Report filing, along with several draft reports, in April.

Again, thank you for bearing with us. Stay well!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com